

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

BI 121 Lecture 1



G. Waples

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

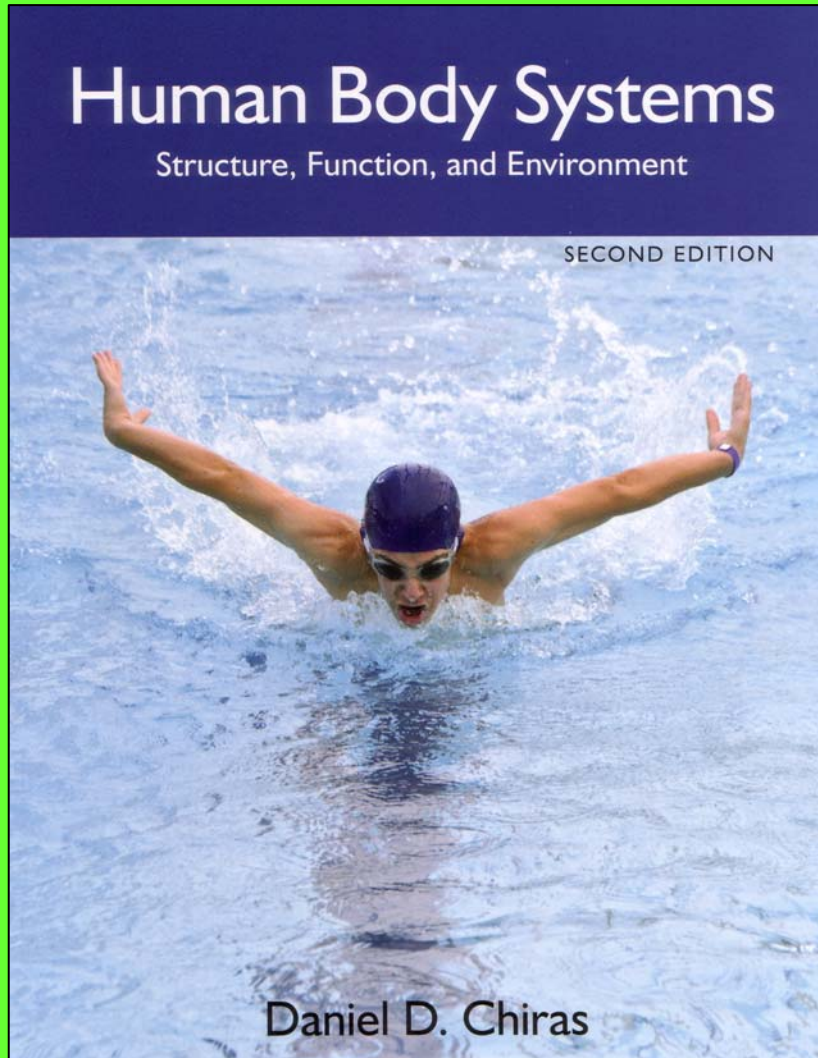
B. Where? ECF = Plasma + Interstitium LS fig 1-4 p 8

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

BI 121 Required Texts
<http://uoduckstore.com/>



**Introduction to Human Physiology
Department of Biology, BI 121
Laboratory Manual
University of Oregon
Eugene, OR 97403
Fall 2014**

DC

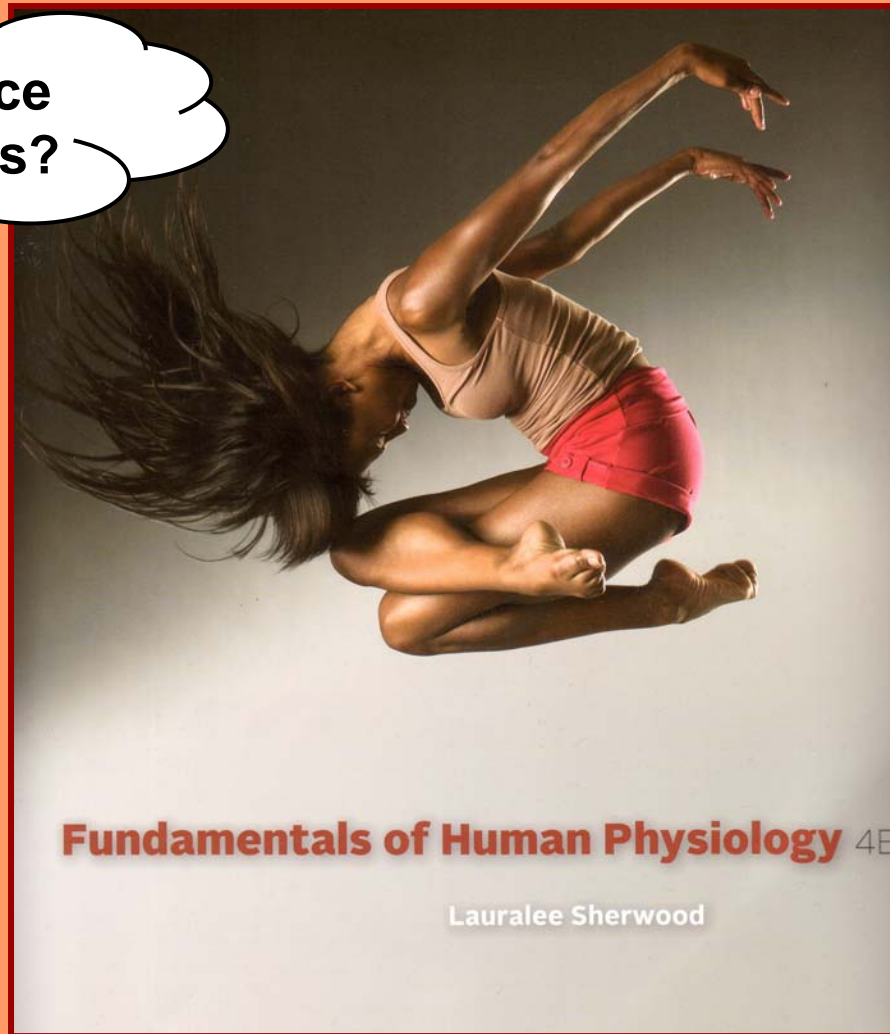
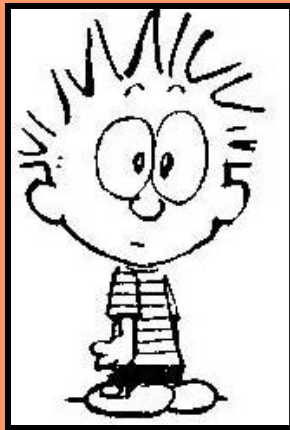
New (2013 ed) \$26.00 Used \$19.50

LM

Lab Notebook \$ 9.75

**BI 121 Optional Source @
ValoreBooks.com, Smith Family Bookstore,
Google.com or Amazon.com**

**Publisher's Price
→ Gold Nuggets?**



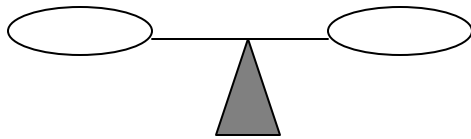
LS 2012

\$210.99 New; \$141.59 Used; \$53.06 Rental; International Ed. \$17.57!

Metabolic

ANA-

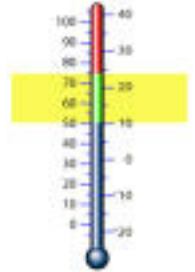
CATA-



H₂O

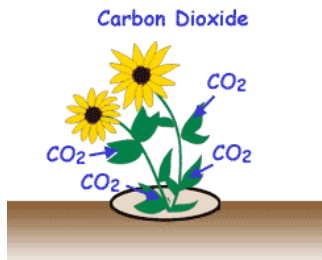


ToC



Dr. Evonuk's 6 Balances

O₂/CO₂

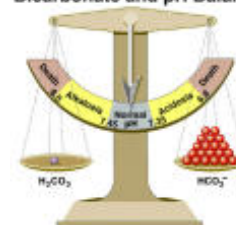


Ion^{+/-}

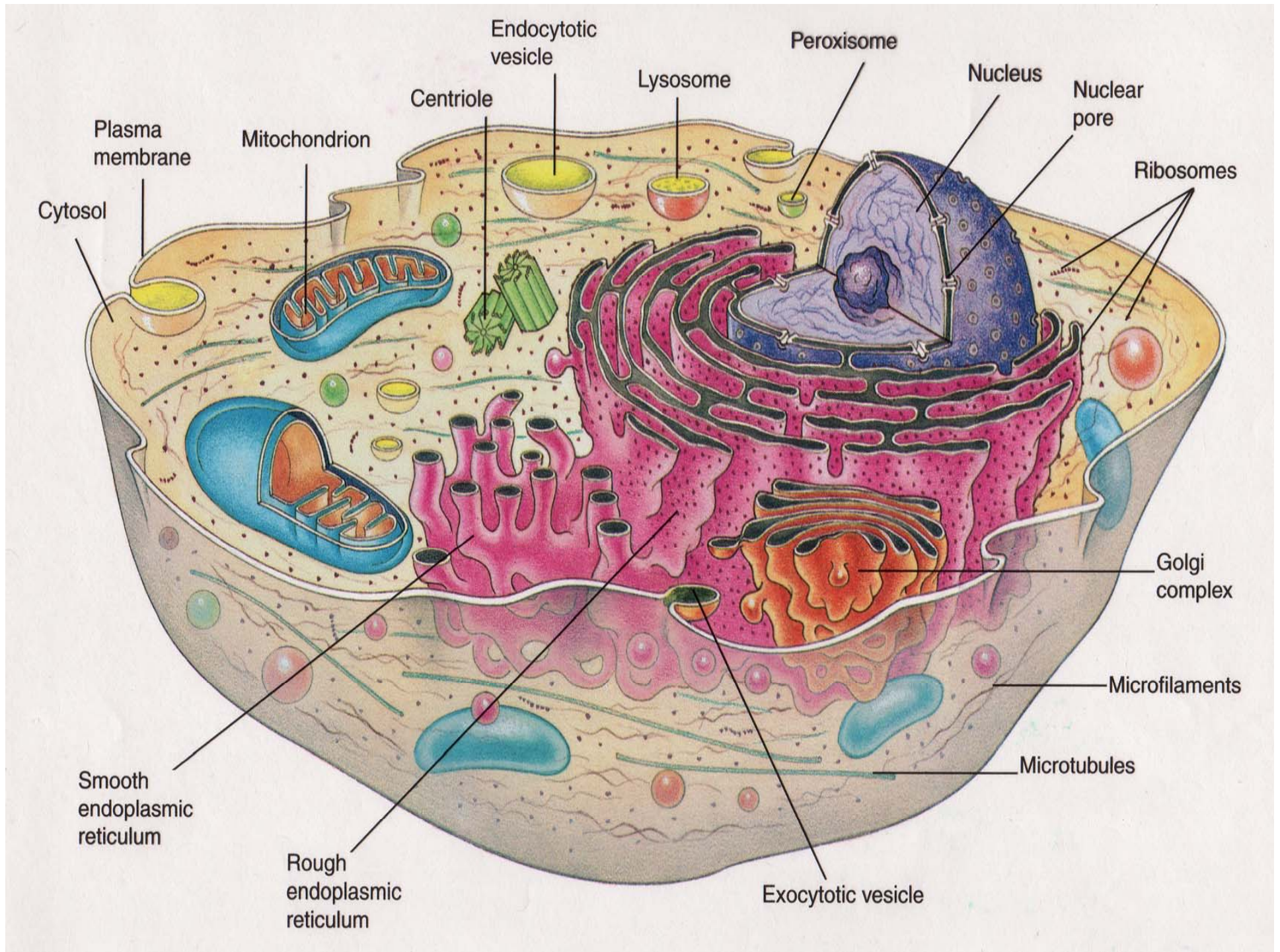


pH

Bicarbonate and pH Balance







Mitochondria: Energy Organelles

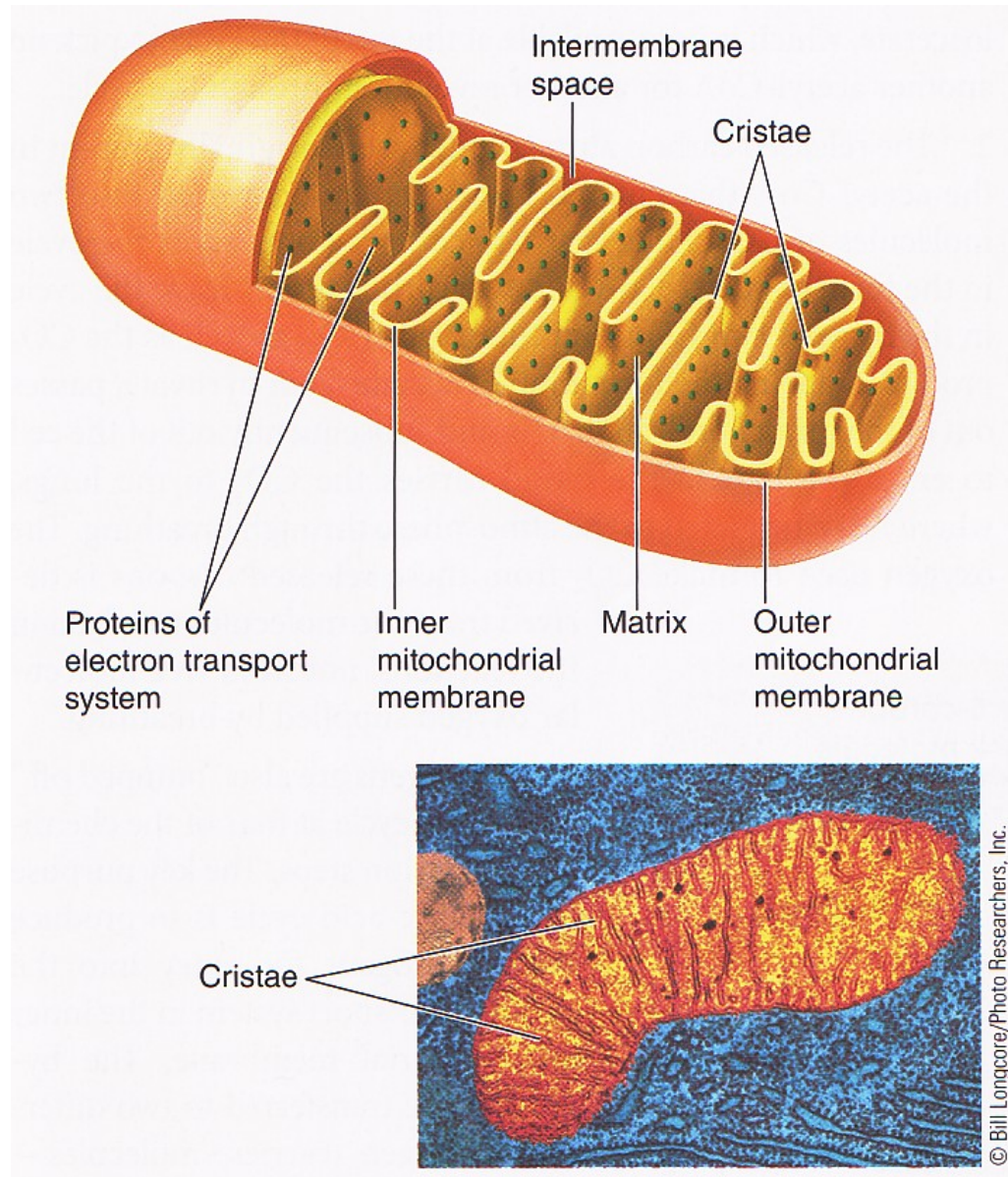
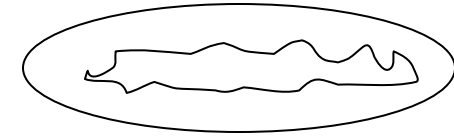
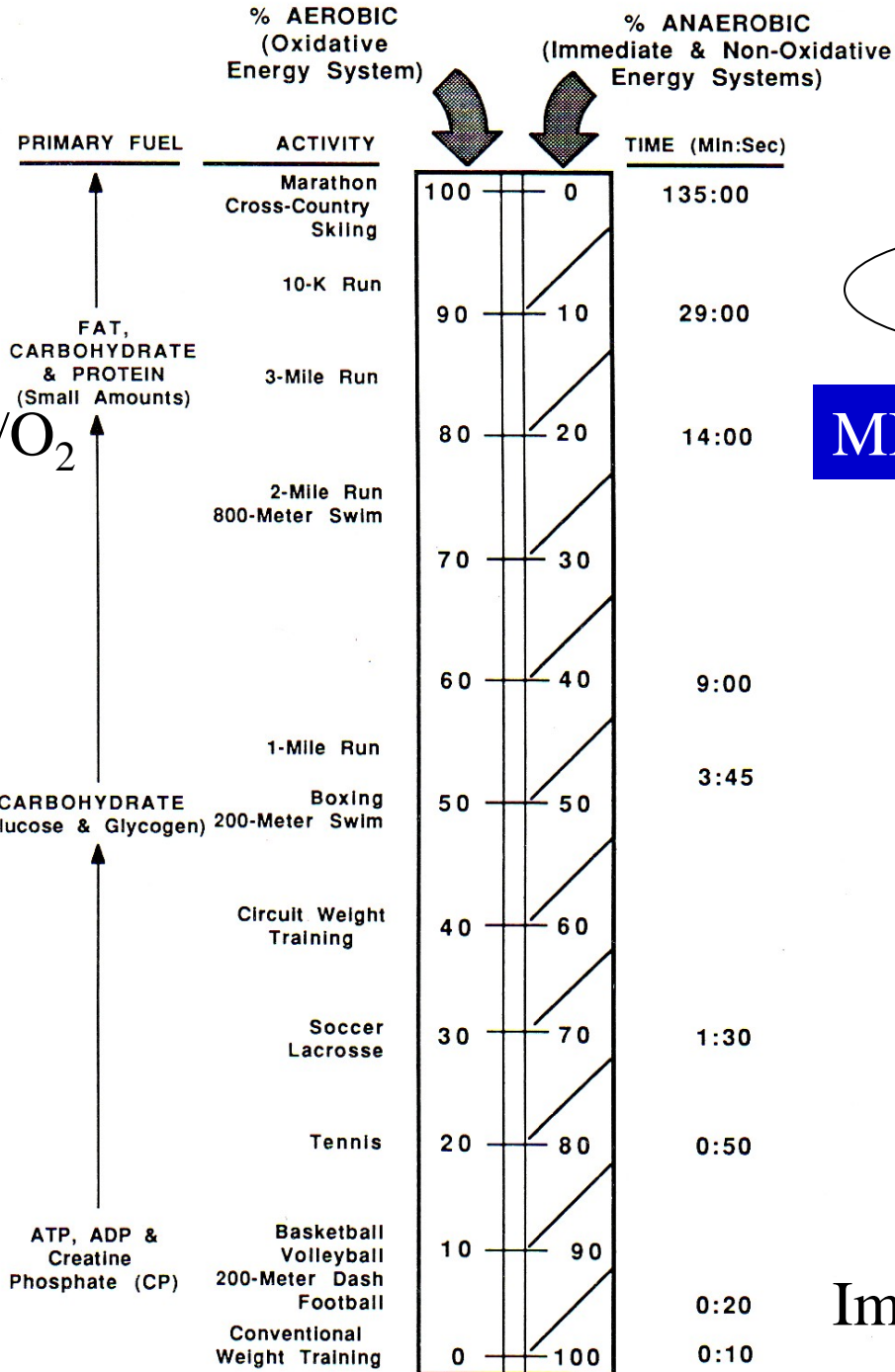


fig 2-8 LS 2012



AEROBIC

w/O₂



MITOCHONDRIA

CYTOSOL

Glycolysis

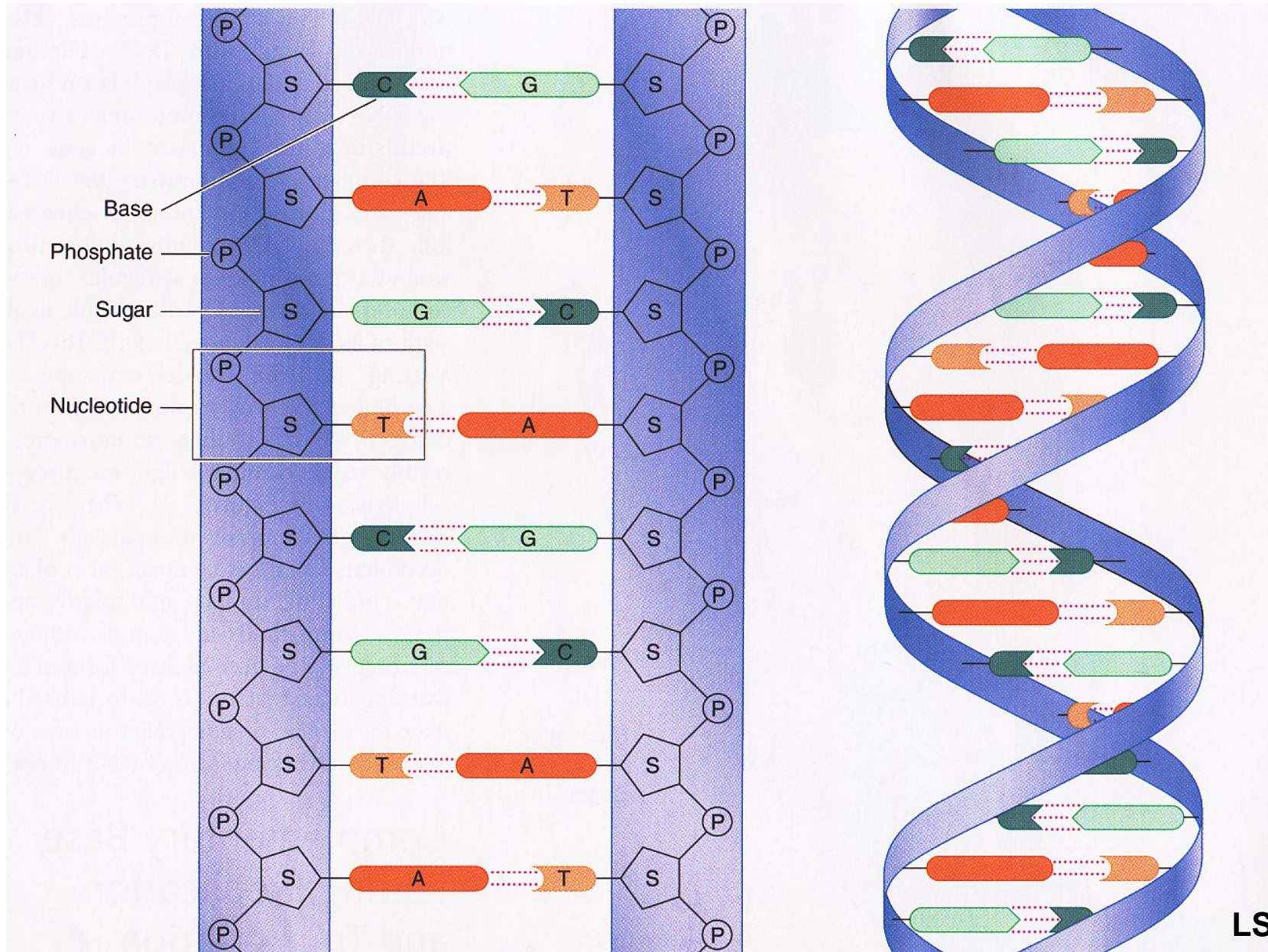


Immediate/ATP-PC



ANAEROBIC

What does DNA look like? Double-helix!!

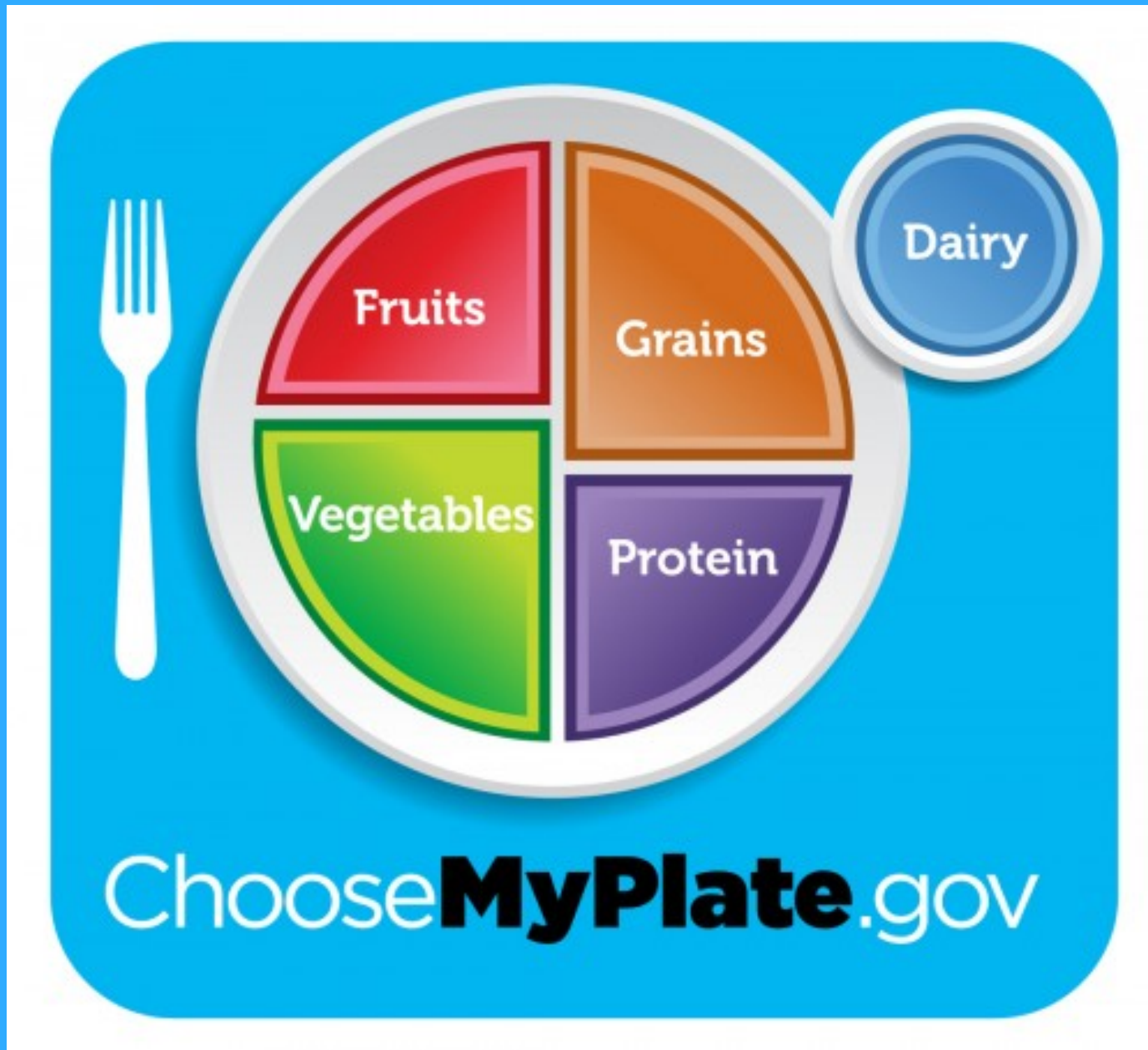


LS fig C-2

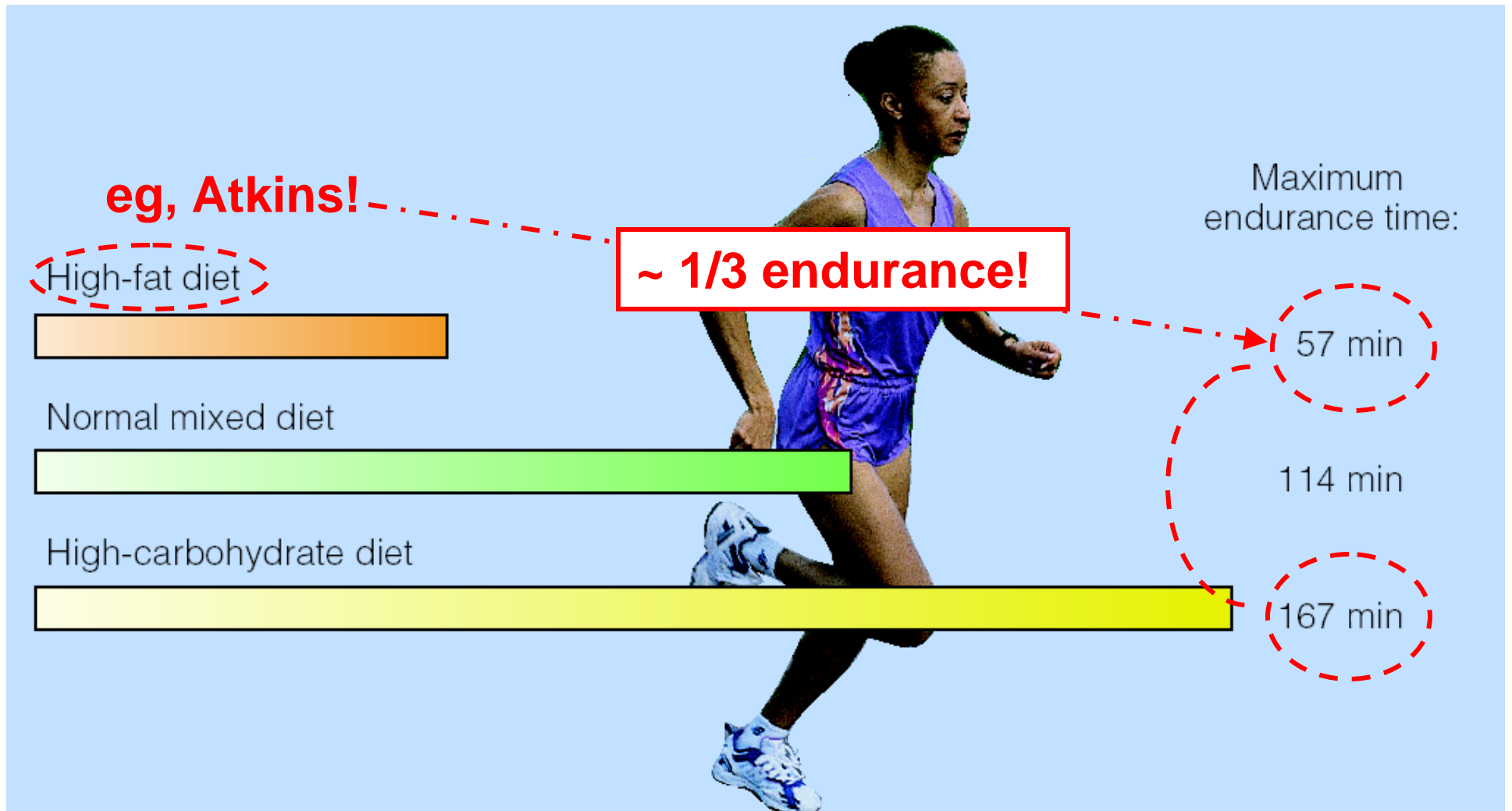
What are DNA's major functions? Heredity + Day-to-Day Cell Function



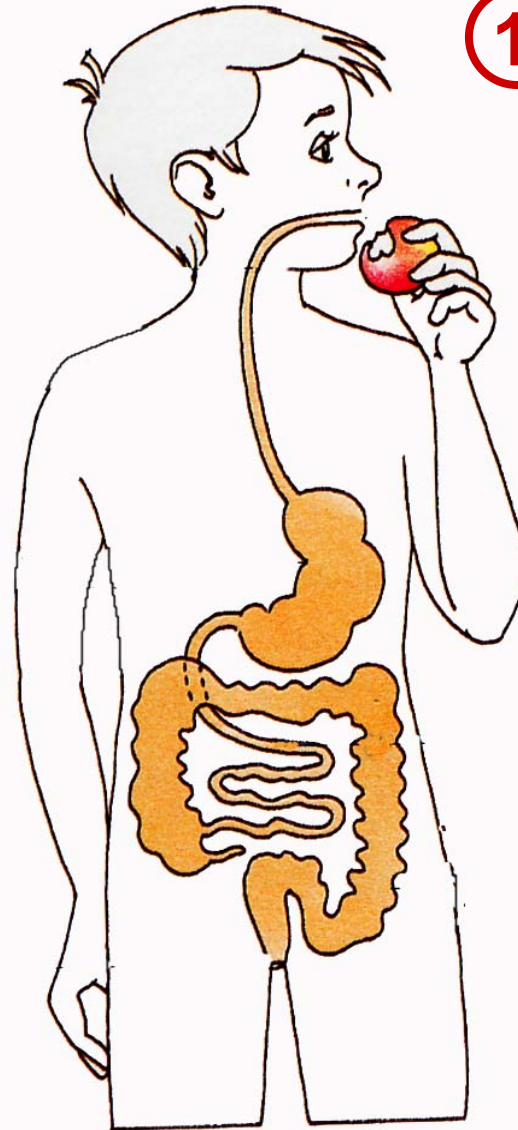
Dietary Analyses Thanks to Michelle Obama!



Dietary Composition & Physical Endurance



Digestion Steps

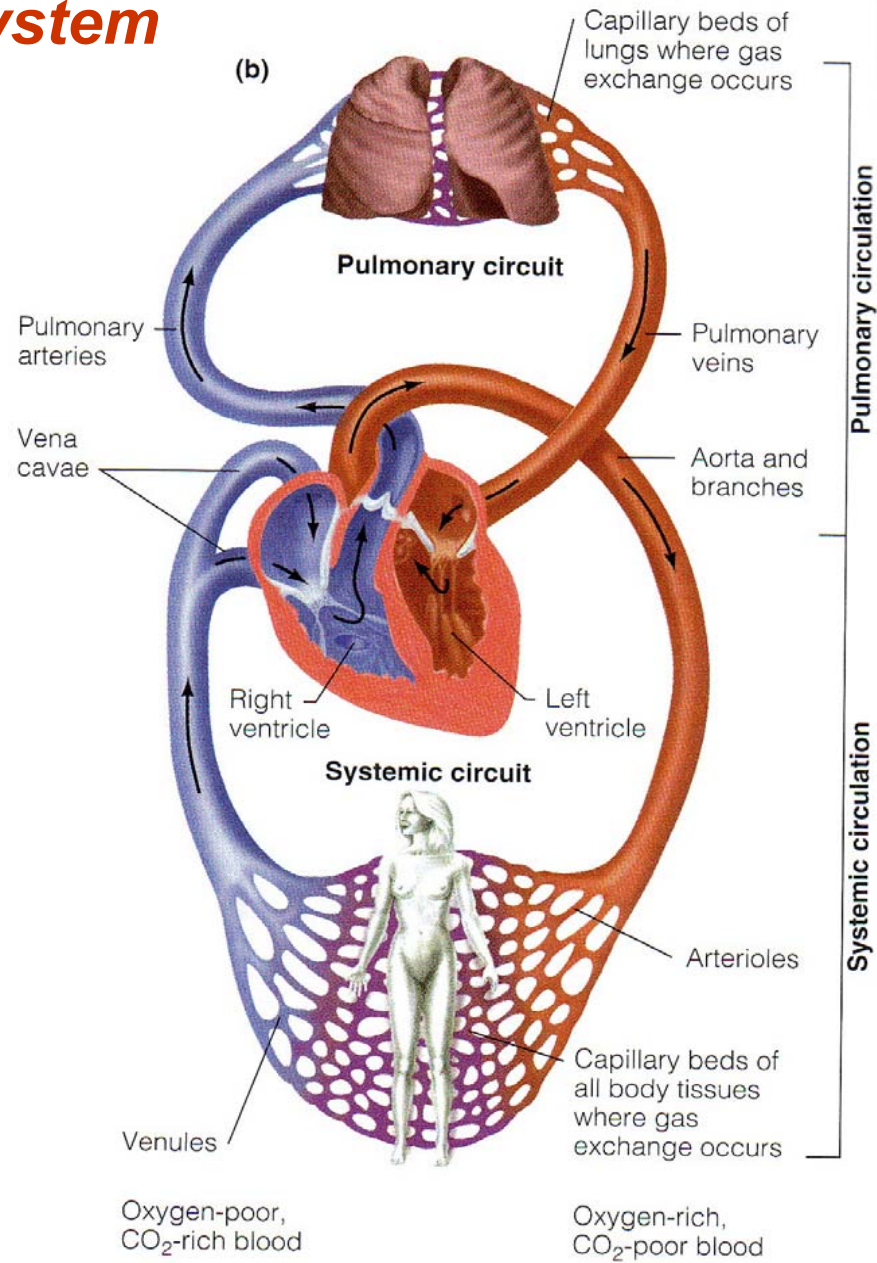
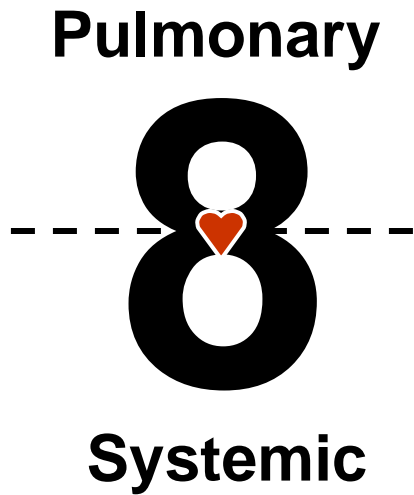


- ① Ingestion
- ② Mechanical Digestion
- ③ Chemical Digestion
- ④ Peristalsis
- ⑤ Absorption
- ⑥ Storage
- ⑦ Defecation

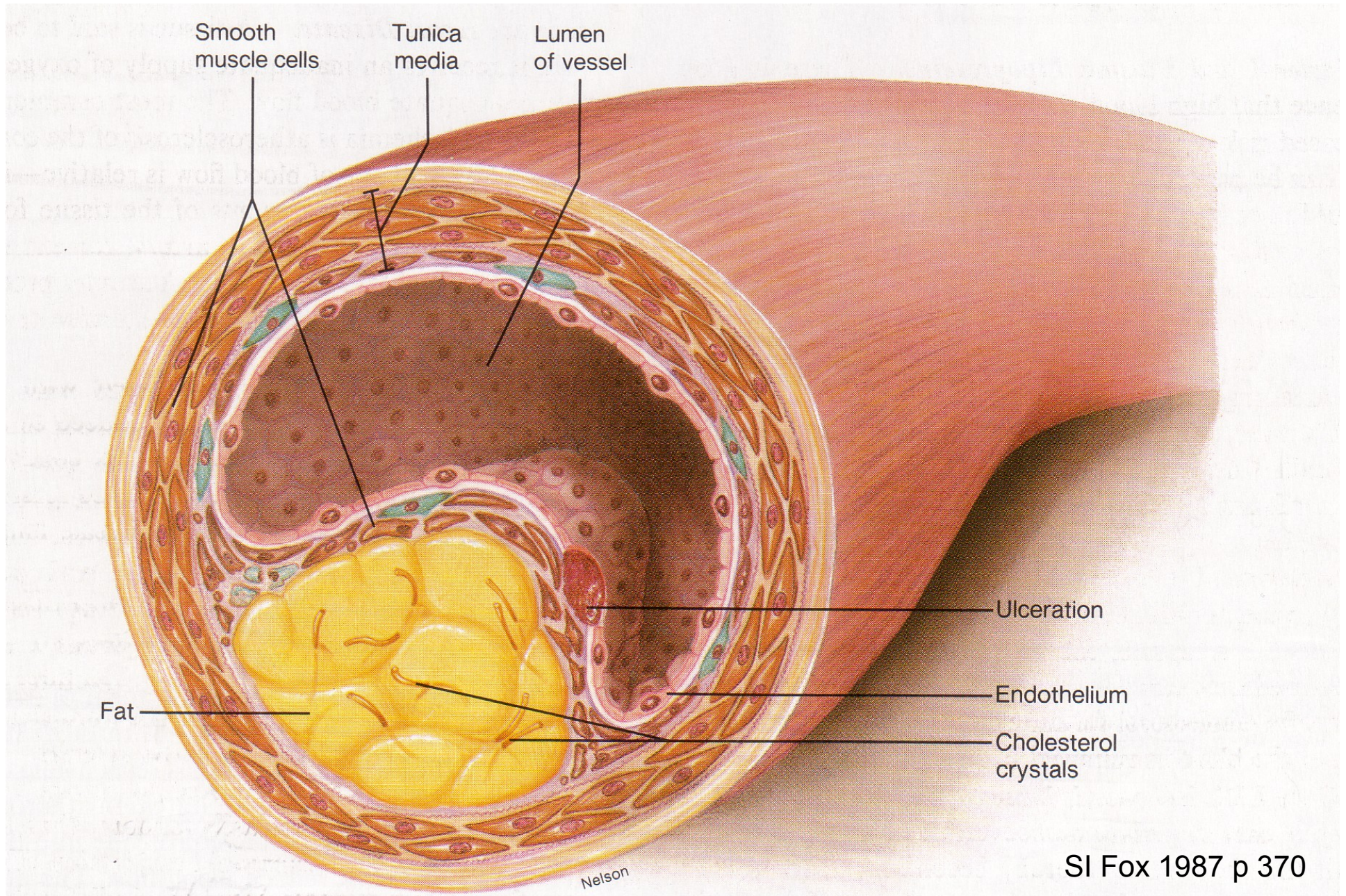
SOURCE: Dr. Eugene Evonuk, 1989. cf. L Sherwood, 2012 pp 437-8.

Cardiovascular System

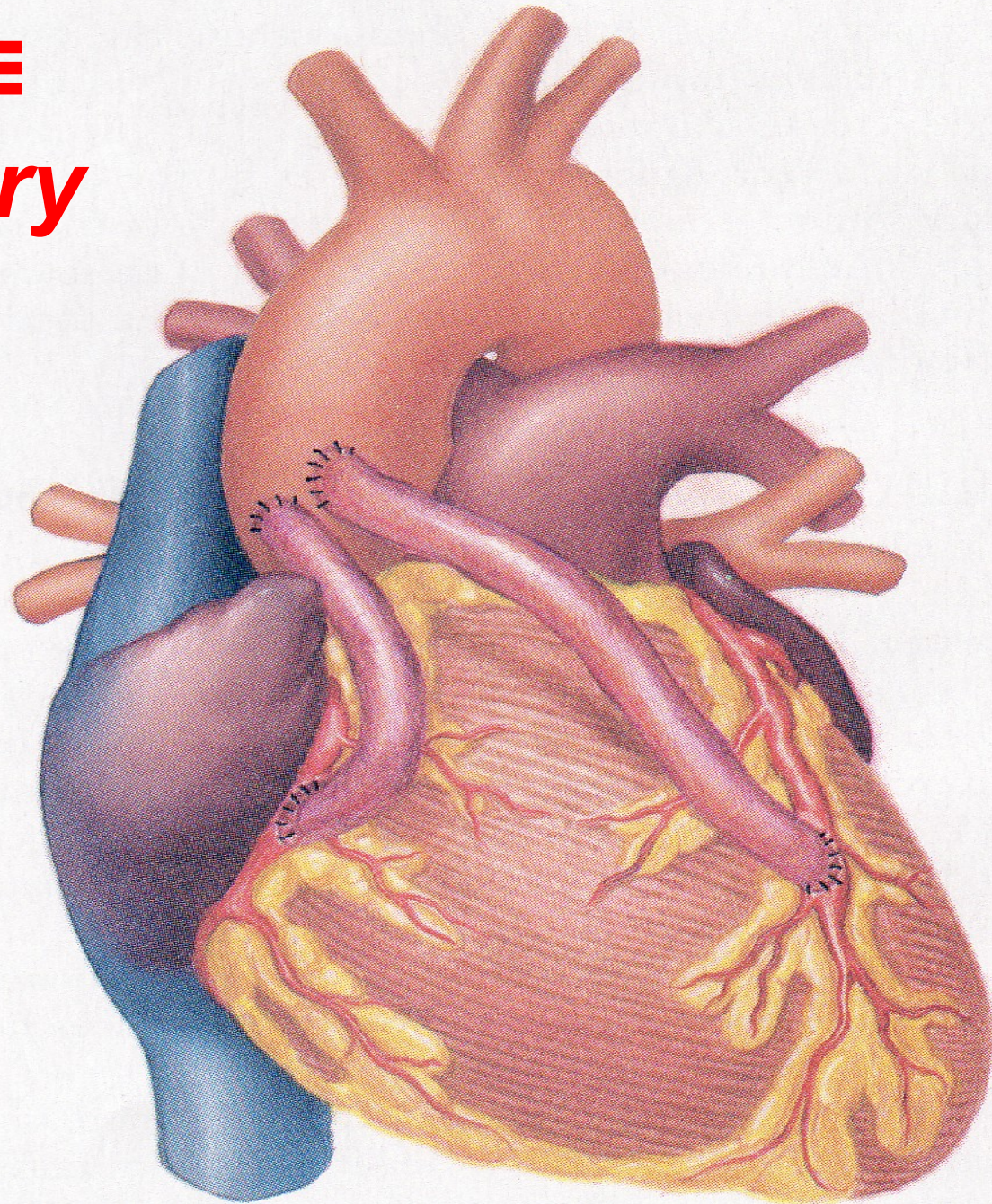
Figure-8 Loop



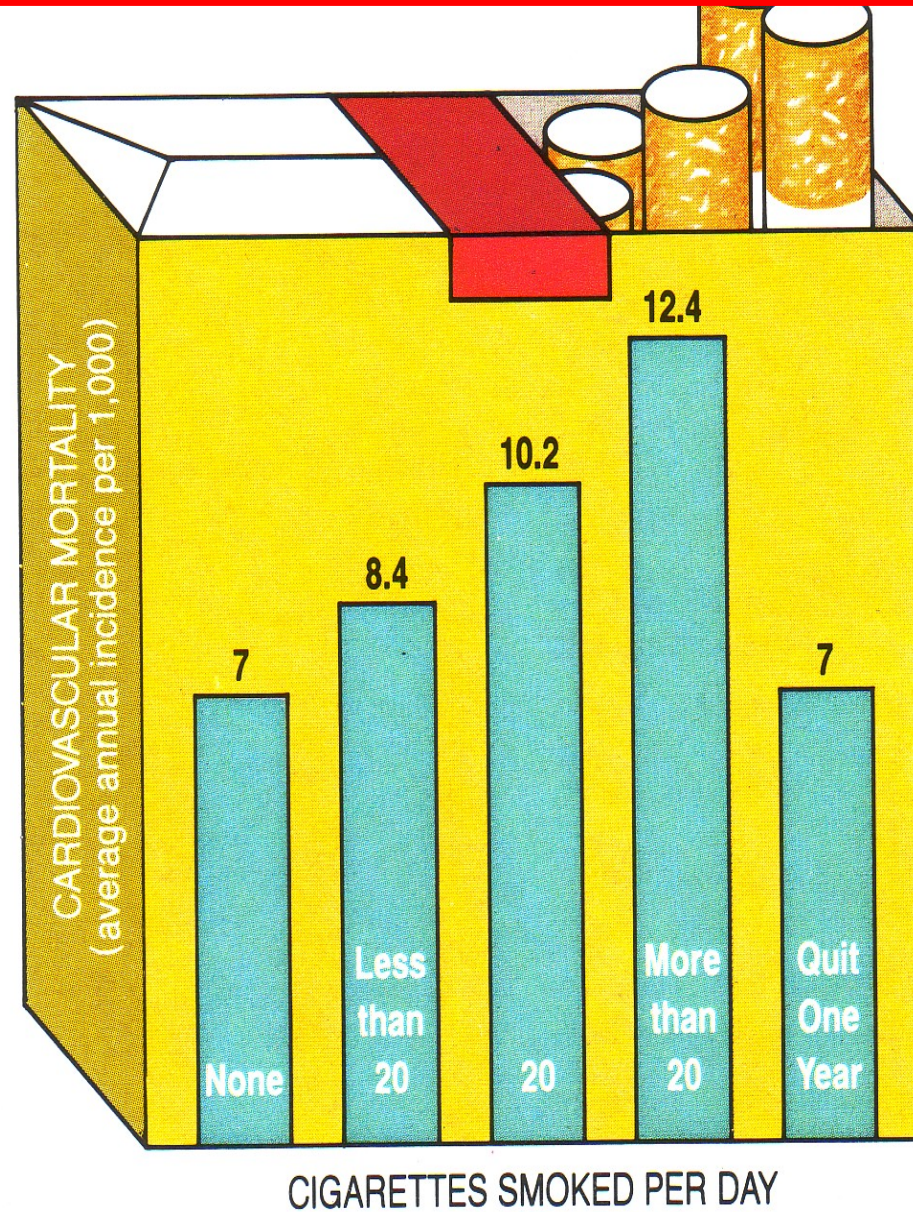
Atherosclerosis developing within vessel walls!



CABG ≡
Coronary
Artery
Bypass
Graft



Cigarette Smoking: #1 Preventable Cause of Premature Death in the US



How much aerobic?



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





♥ *Healthy Oils to Minimize Atherosclerosis*
HAPOC?

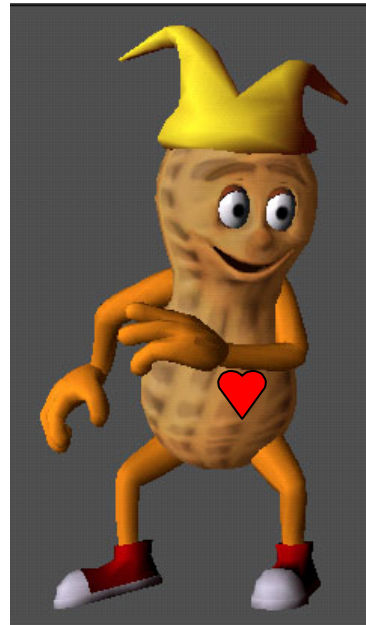
H



A



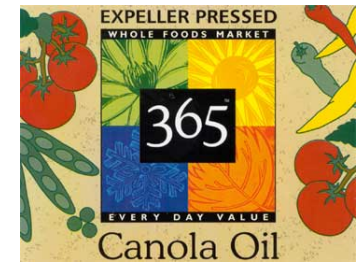
P



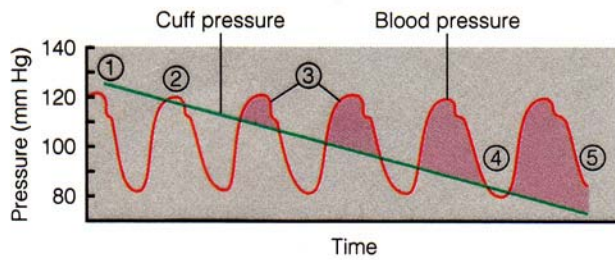
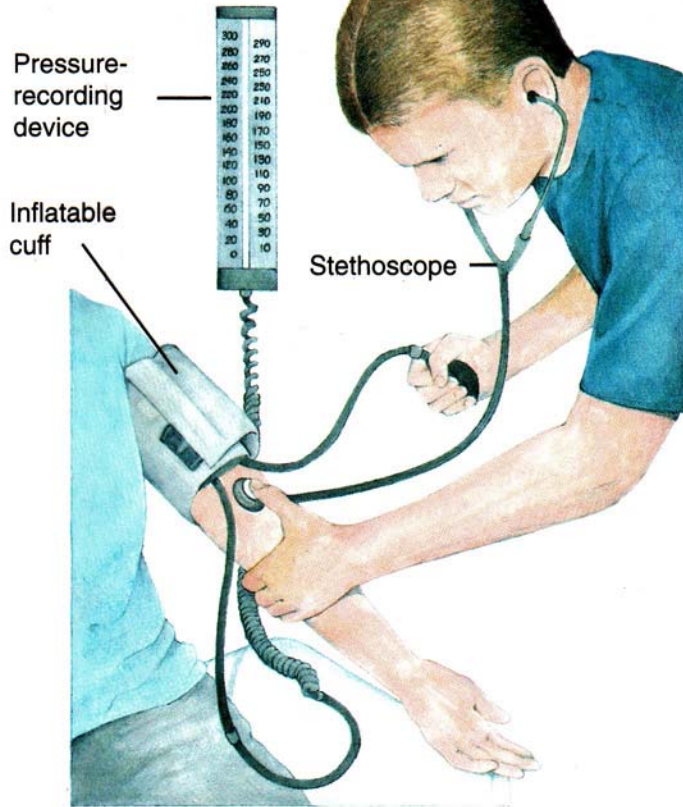
O



C

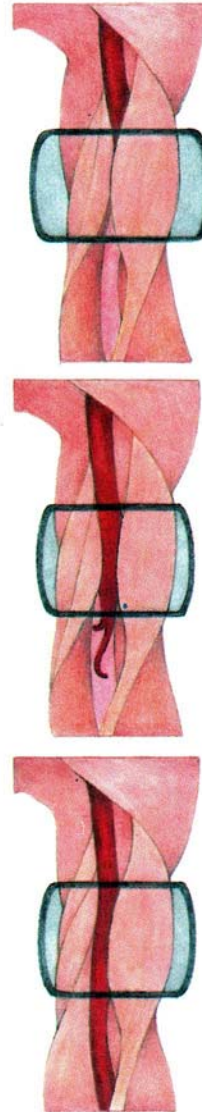


(a)



(b)

(c) When blood pressure is 120/80:



Cuff pressure is greater than 120 mm Hg.

No blood flows through vessel.

No sound is heard.

Cuff pressure is between 120 and 80 mm Hg.

Blood flow through vessel is turbulent whenever blood pressure exceeds cuff pressure.

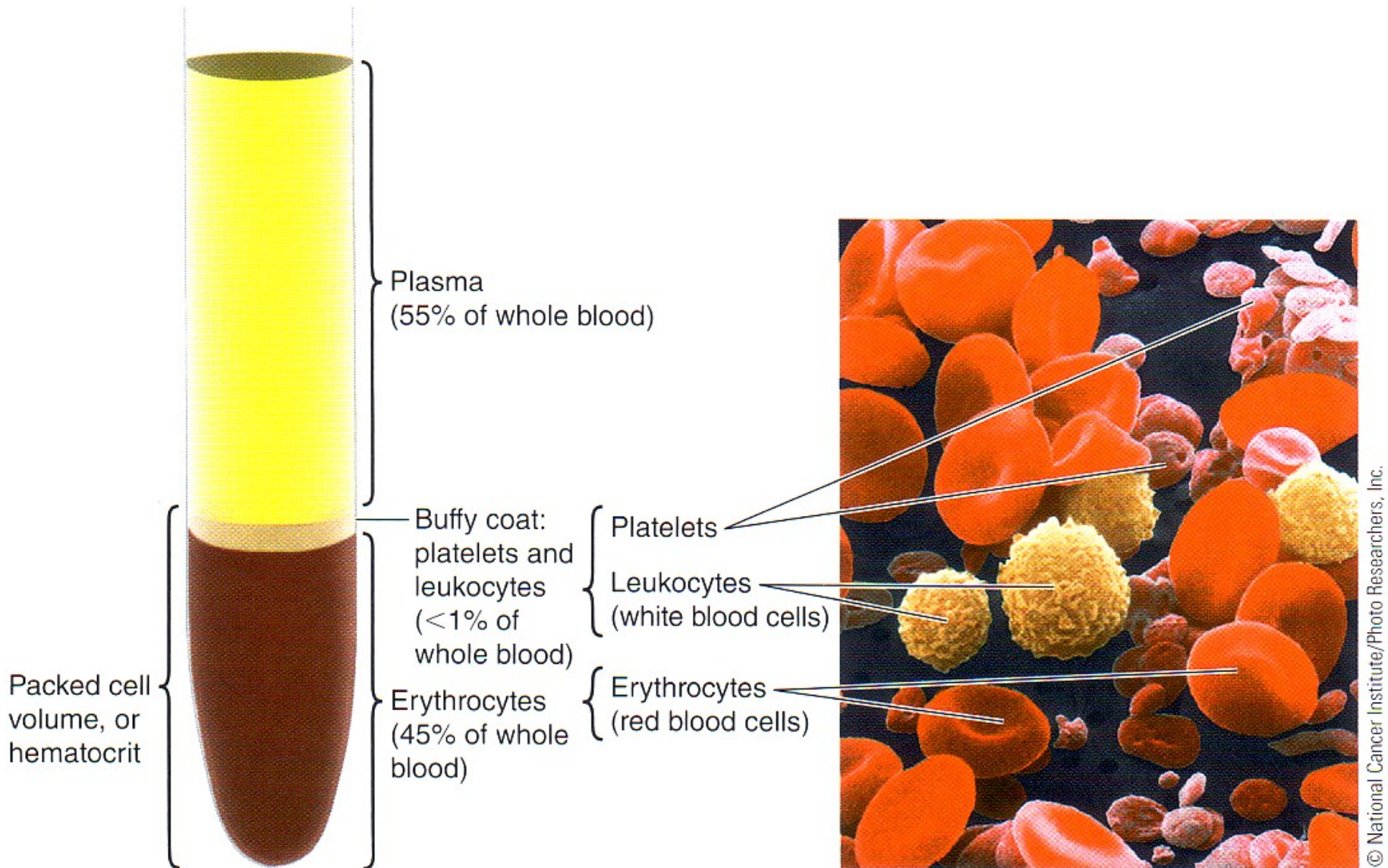
Intermittent sounds are heard as blood pressure fluctuates throughout cardiac cycle.

Cuff pressure is less than 80 mm Hg.

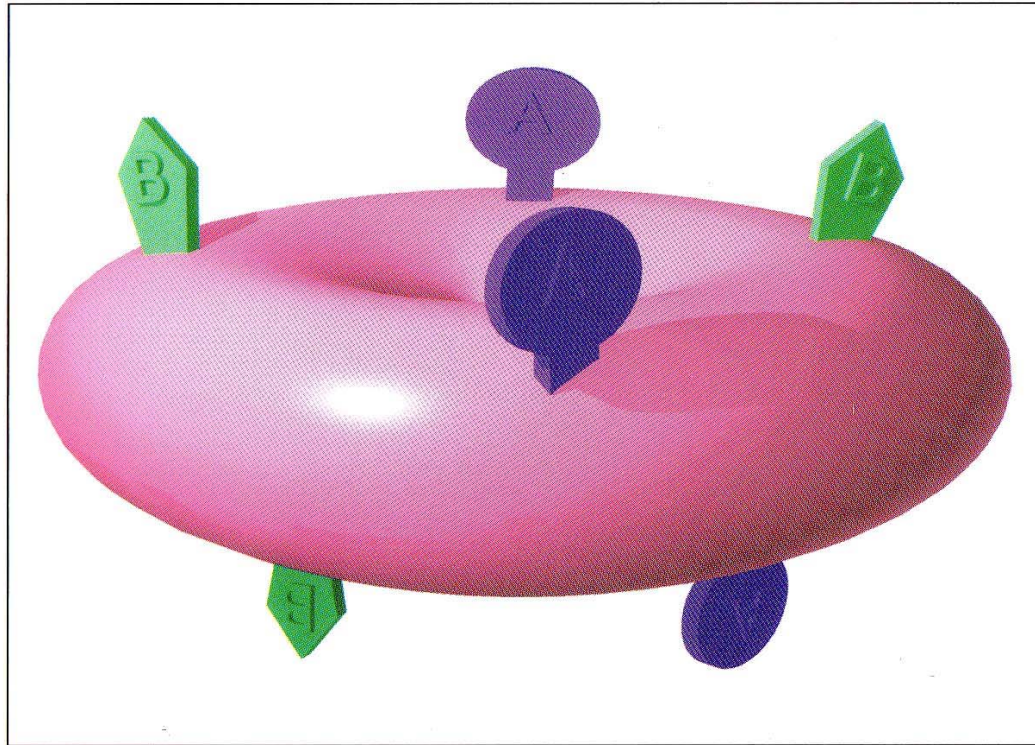
Blood flows through vessel in smooth, laminar fashion.

No sound is heard.

What's in Blood? Plasma & Blood Cells



AB



A & B Antigens
(Agglutinogens)

Glucose:
Sugar in Blood

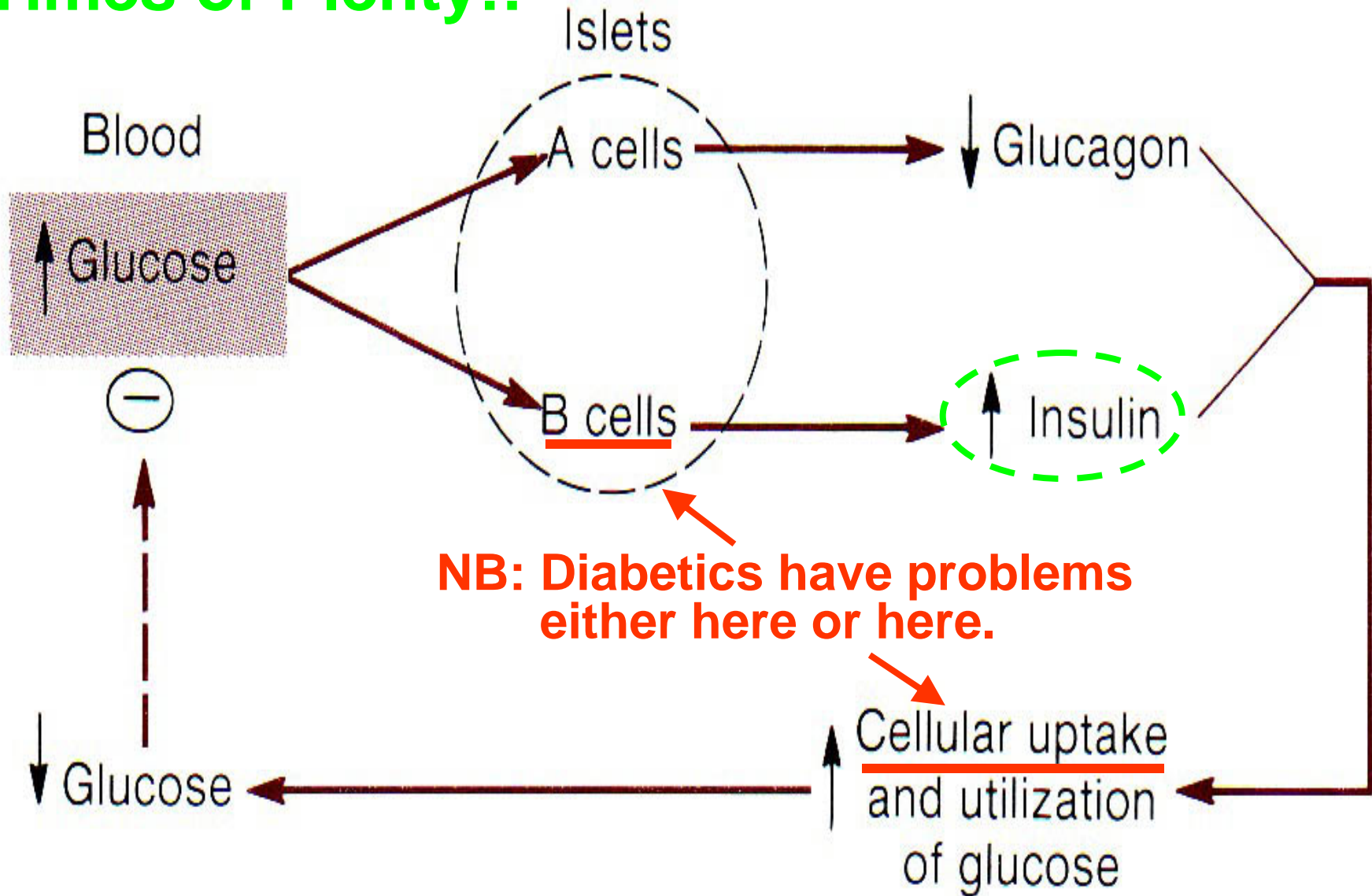


Normal: 70-99

Pre-Diabetes: 100-125

Diabetes: ≥ 126 mg/dL

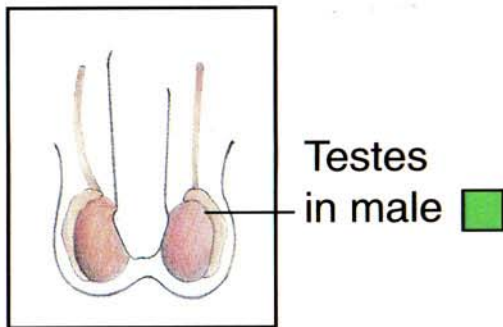
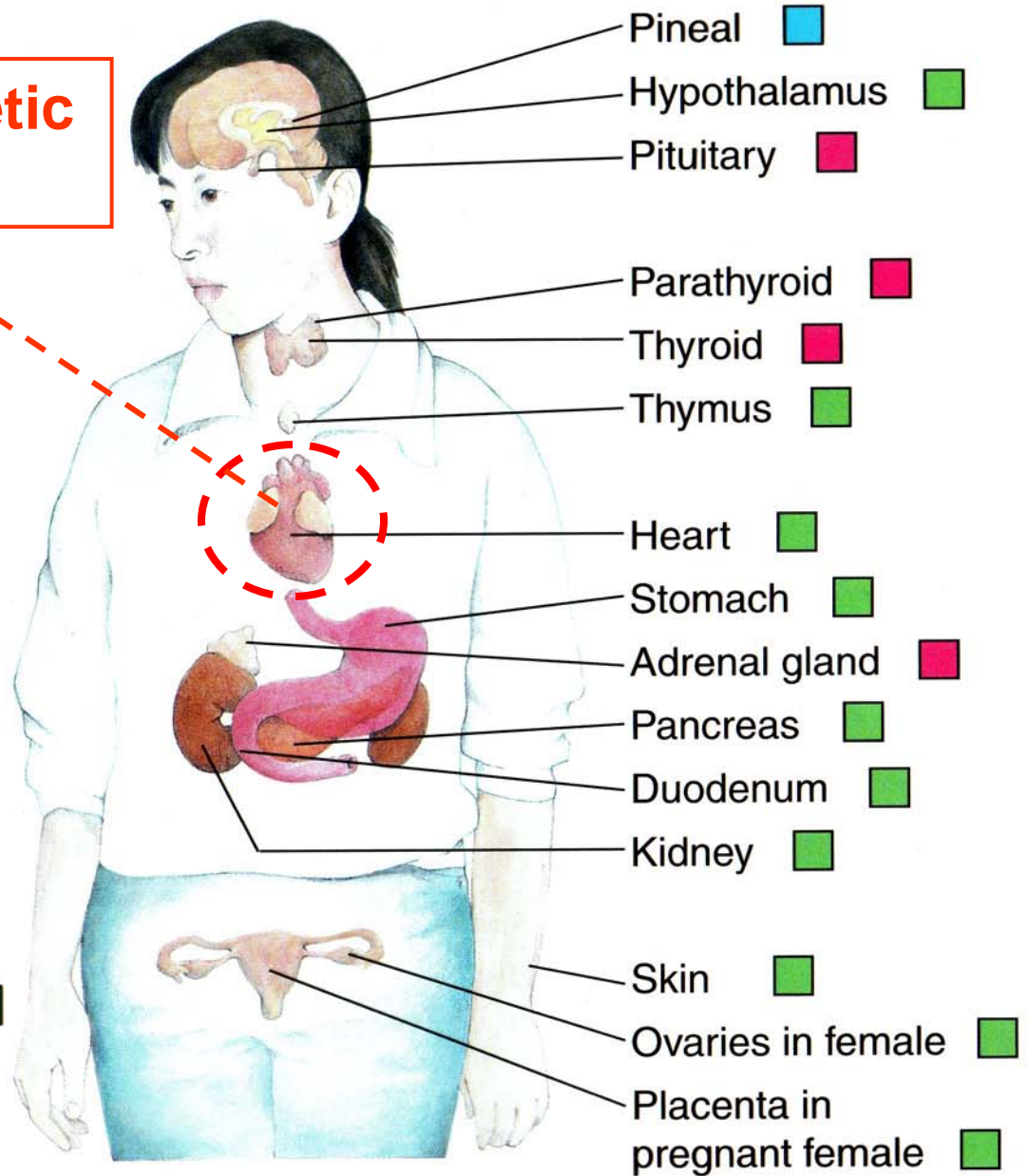
Times of Plenty!!



Endocrine System

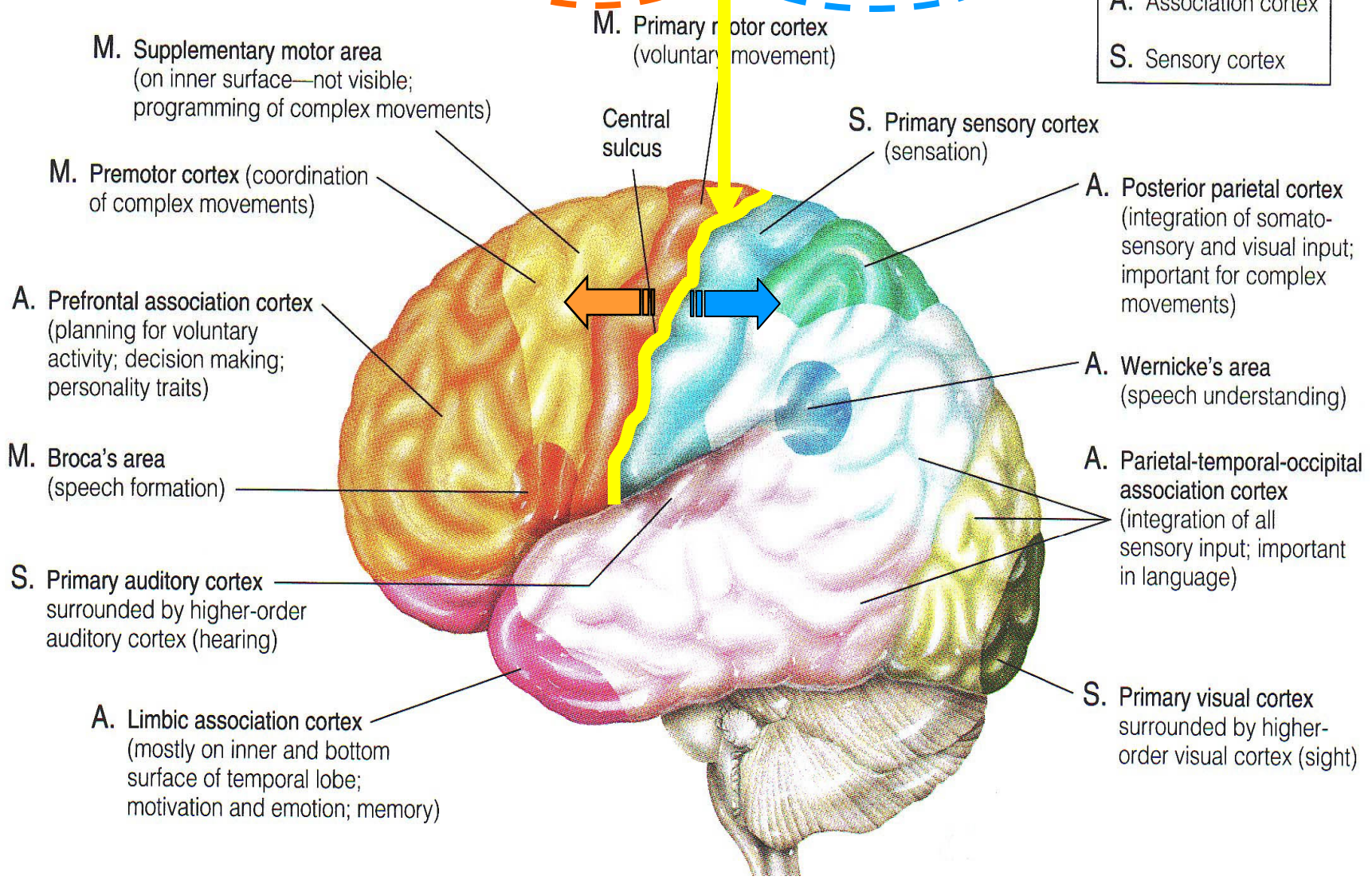
ANP = Atrial Natriuretic Polypeptide

- Solely endocrine function
- Mixed function
- Complete function uncertain

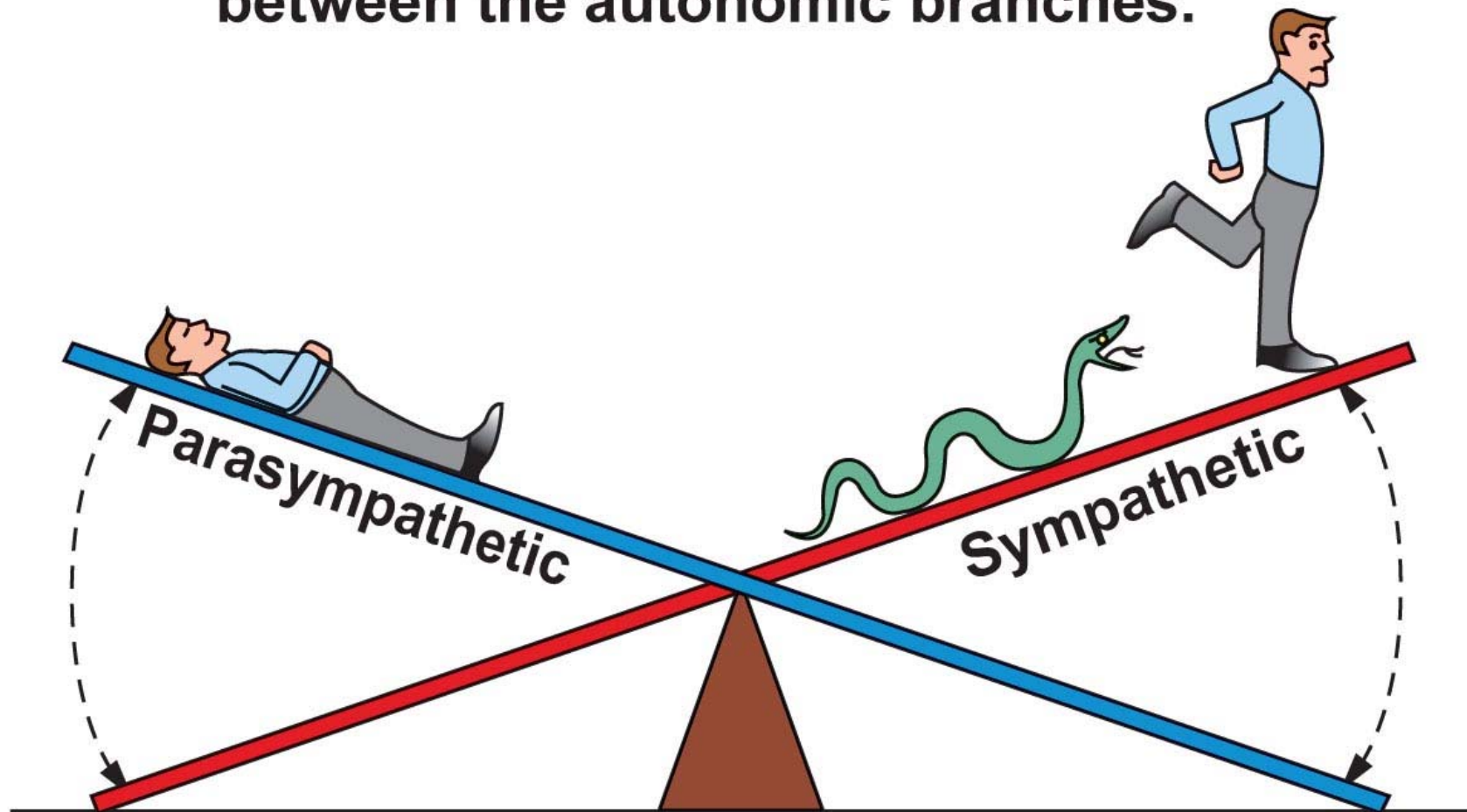




Key
M. Motor cortex
A. Association cortex
S. Sensory cortex



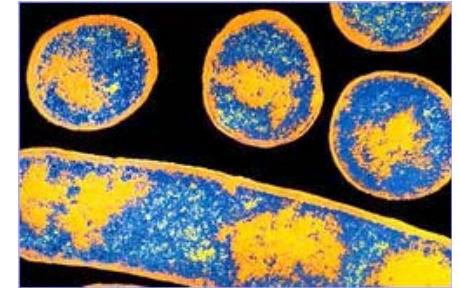
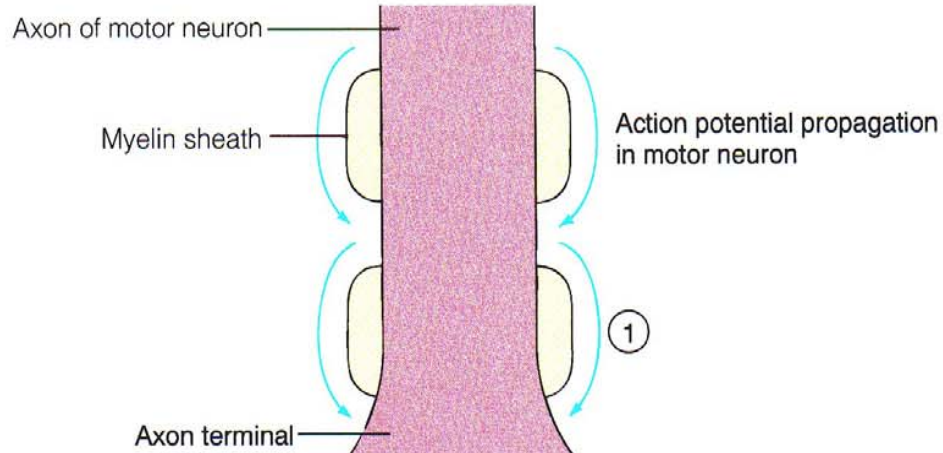
Homeostasis is a dynamic balance between the autonomic branches.



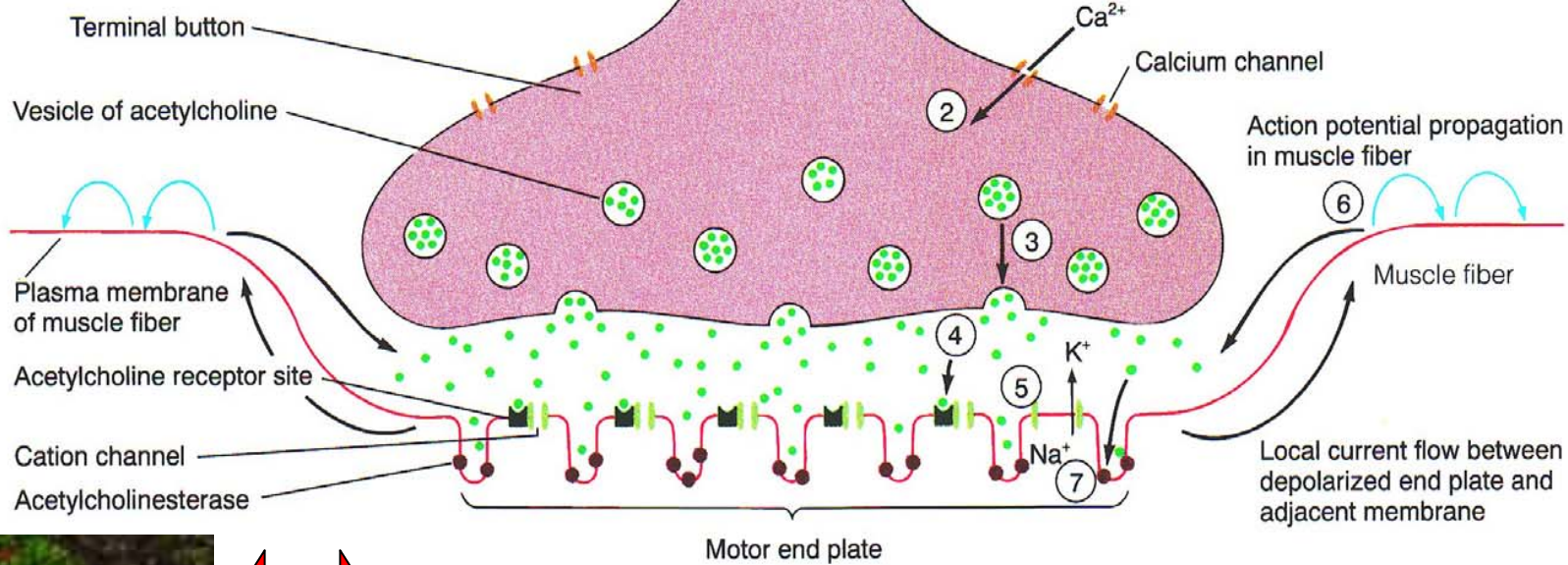
**Rest-and-digest:
Parasympathetic
activity dominates.**

**Fight-or-flight:
Sympathetic activity
dominates.**

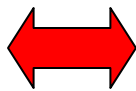
↑ 3



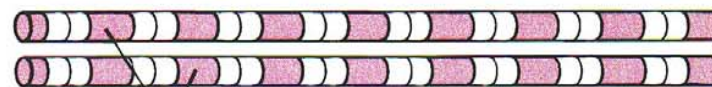
~~3~~



~~7~~



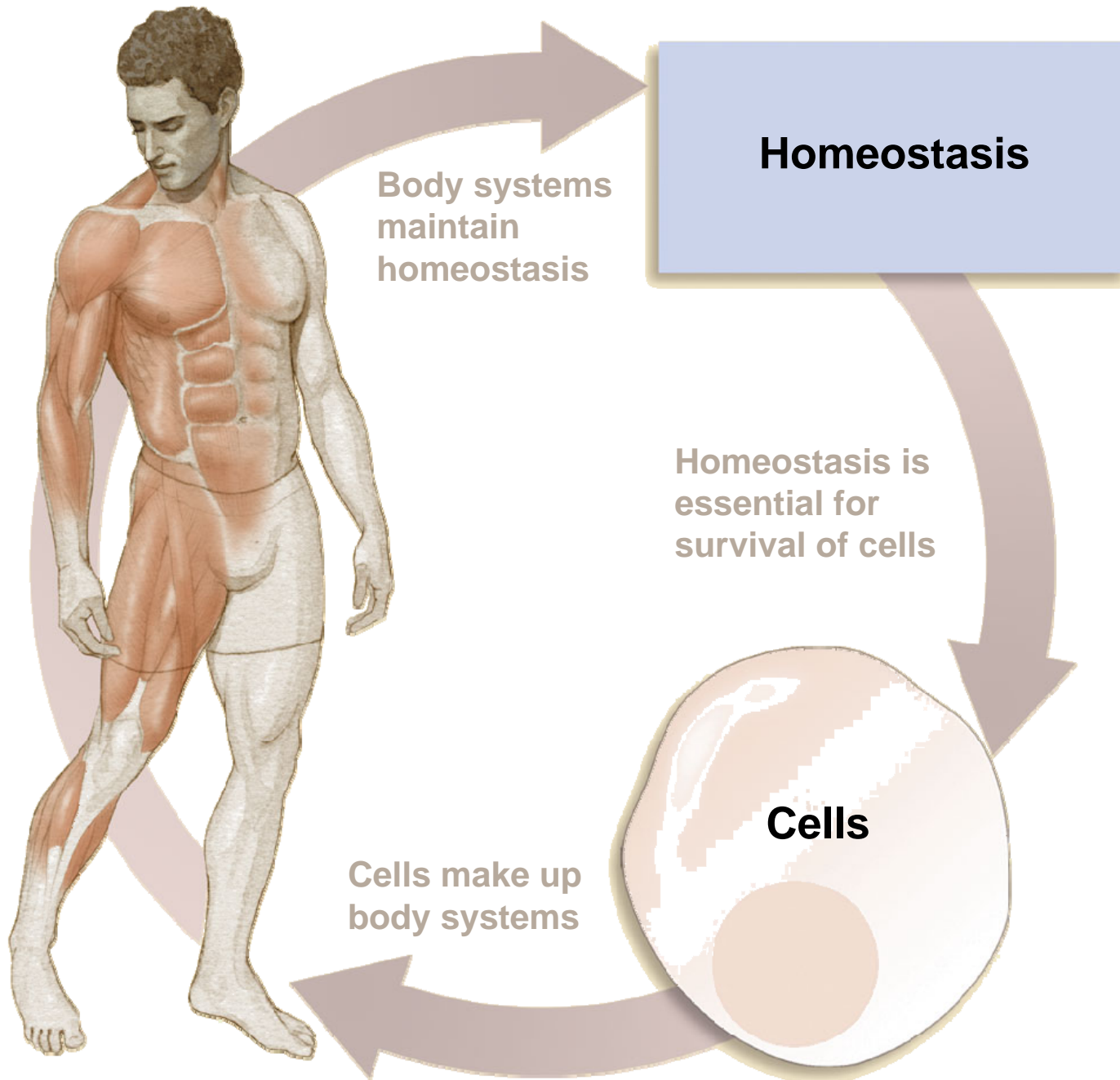
4

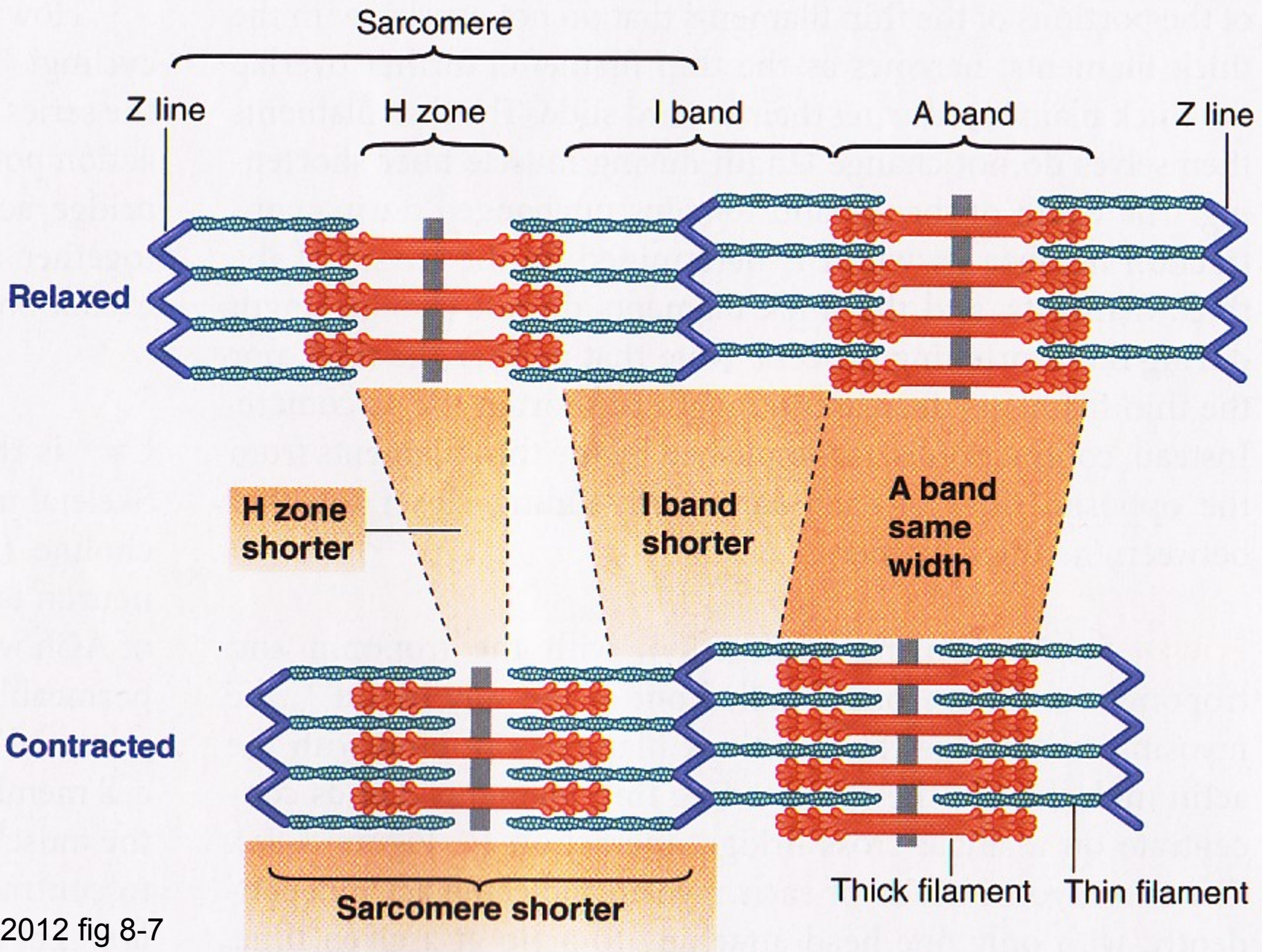


Contractile elements within muscle fiber



Muscular System





LS 2012 fig 8-7



Atrophy

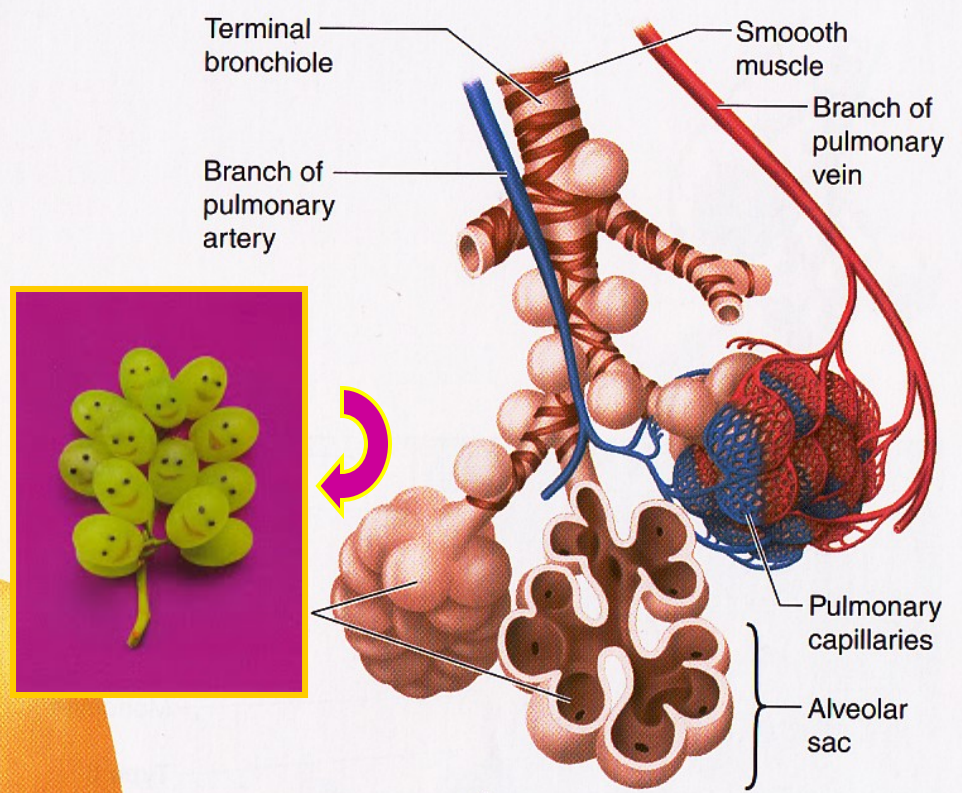
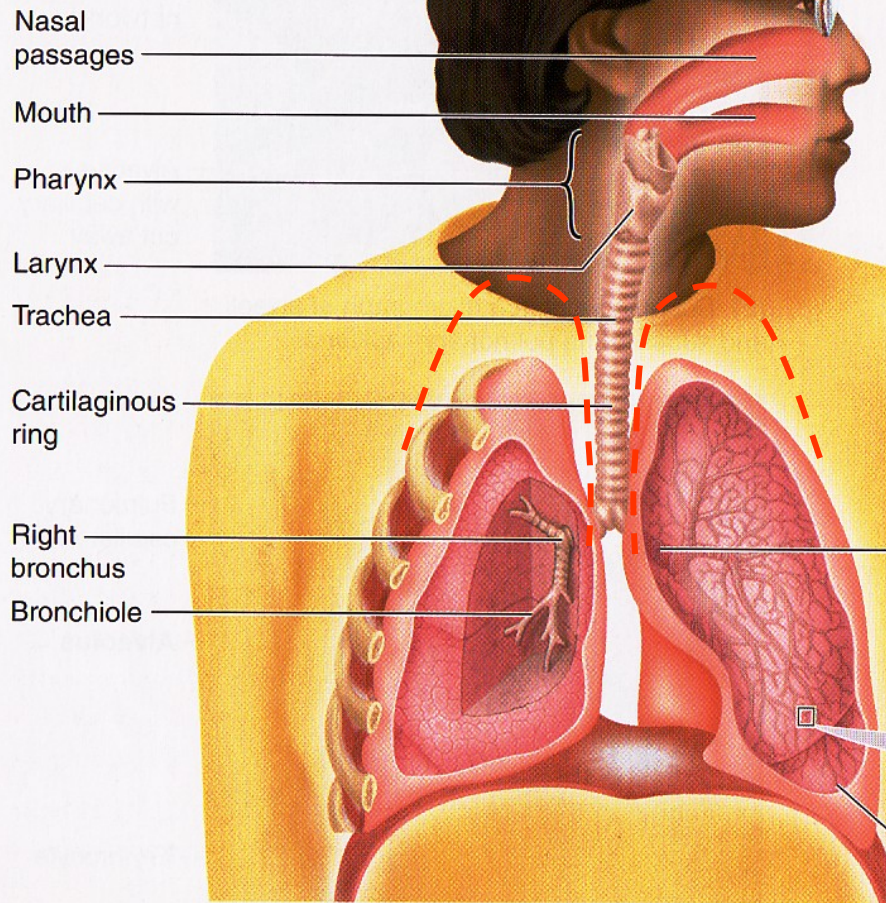
*decrease in size
& strength*

Hypertrophy

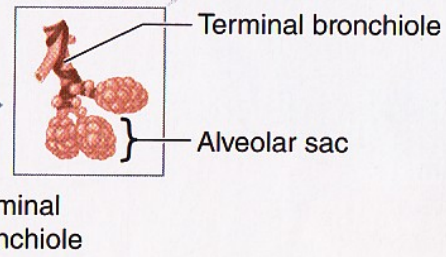
*increase in size
& strength*

Respiratory System Anatomy

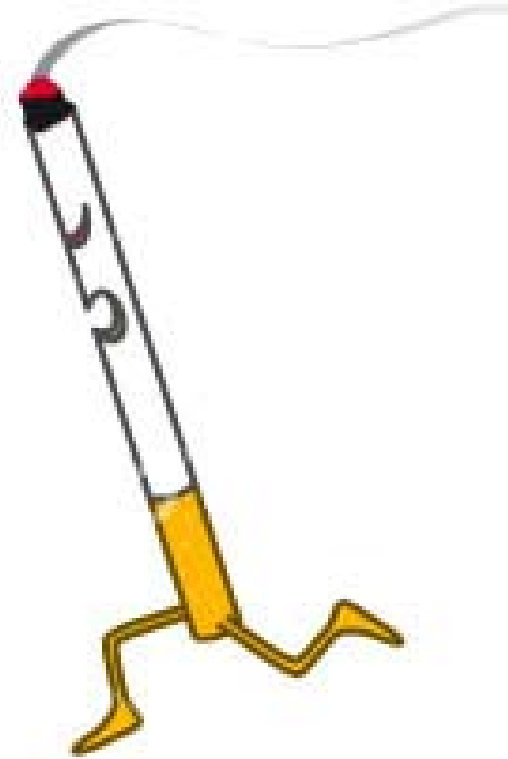
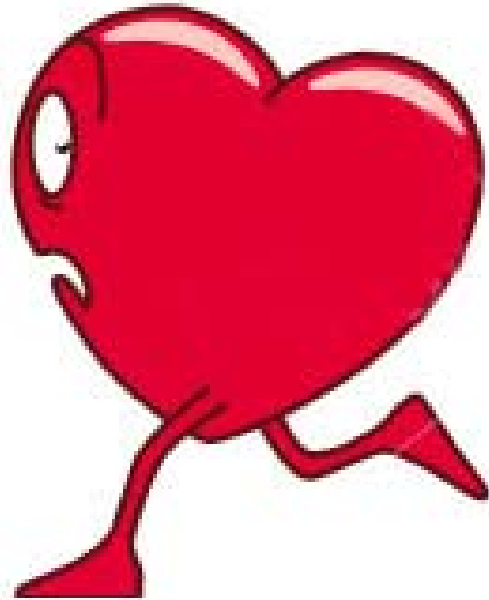
NB: In vivo, Cupola or peak of each lung goes into neck > clavicle line!



(b) Enlargement of alveoli (air sacs) at terminal ends of airways



***Not only the Brain, but the Heart & 100s of Other
Tissues and Organs are Adversely Affected!***



  ...I ♥ U of O!

Students who succeed are usually those who:

(1) **Attend** class regularly



(2) **Ask** questions

(3) **Come** to office hours & problem-solving sessions

(4) **Study** outside class both alone & in study groups

(5) **Seek** to understand methods & overarching principles/concepts rather than specific answers

(6) **Teach** or tutor others &

(7) **Discuss** concepts informally with fellow students.

Science Teaching Reconsidered, National Academy Press, 1997.

ANATOMY
STRUCTURE
WHAT?
WHERE?

VS

PHYSIOLOGY

VS

FUNCTION

VS

HOW?

VS

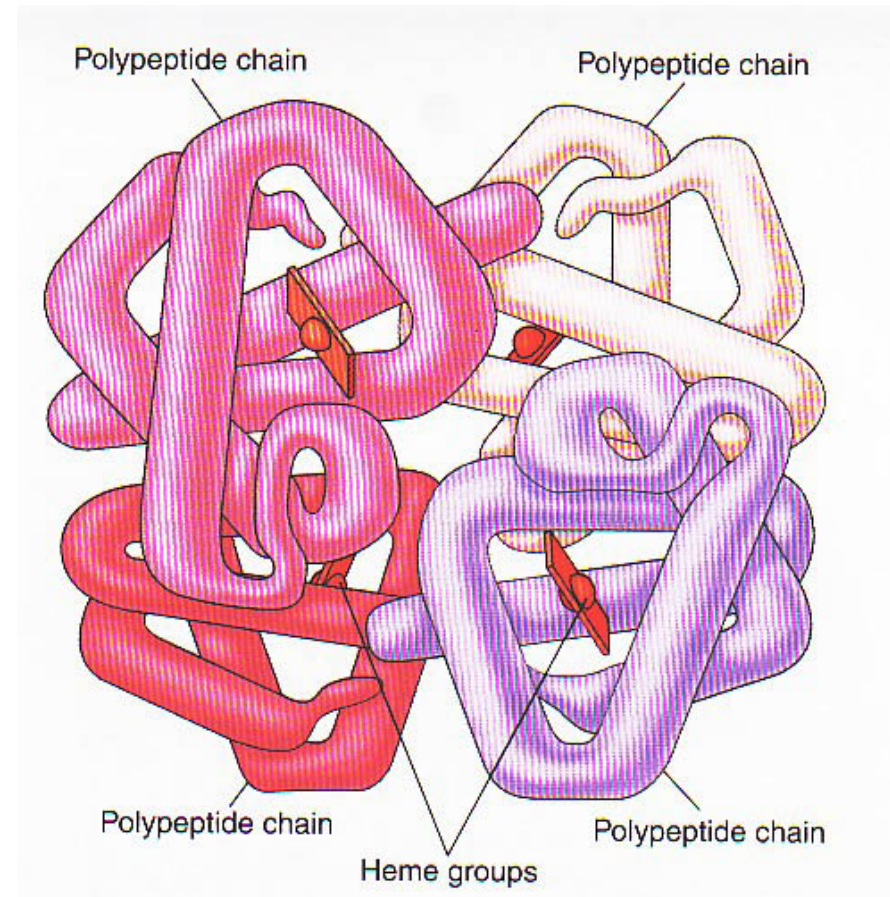
WHY?



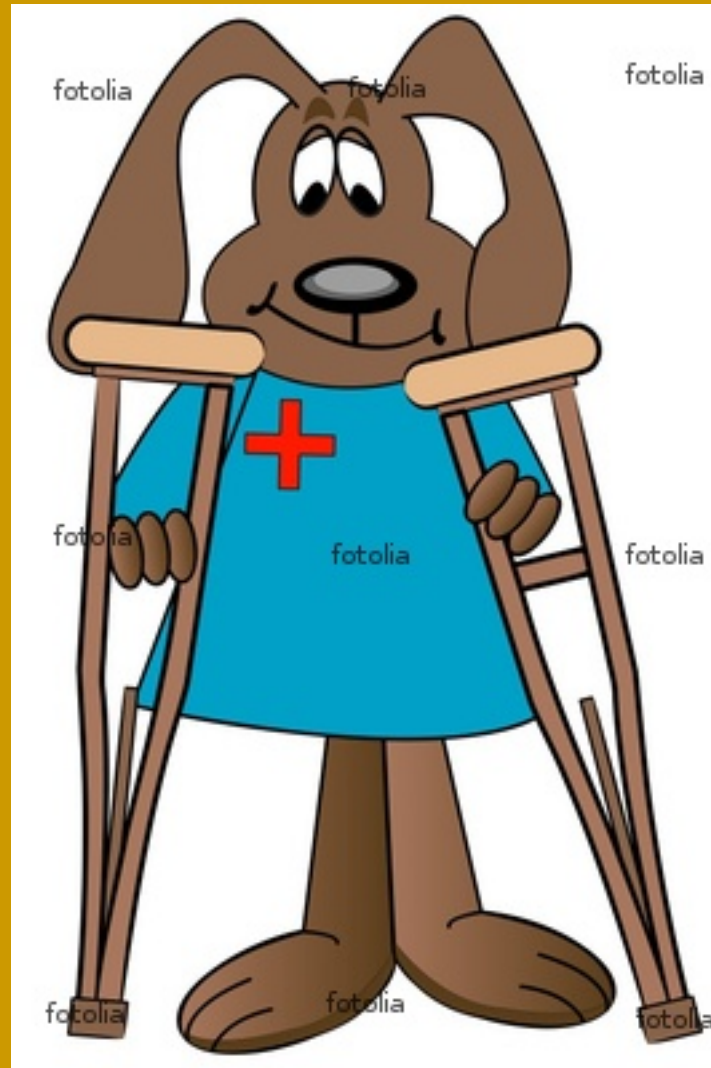
VS



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



Knee Structure-Function?



Preoperative Diagnoses: R Knee

Degenerative Joint Disease (DJD) = arthritis

Varus malalignment = bow-leg



Procedures:

Arthroscopy & microfracture

High Tibial Osteotomy (HTO)

Packing bone graft substitute



Blocks/Medications:

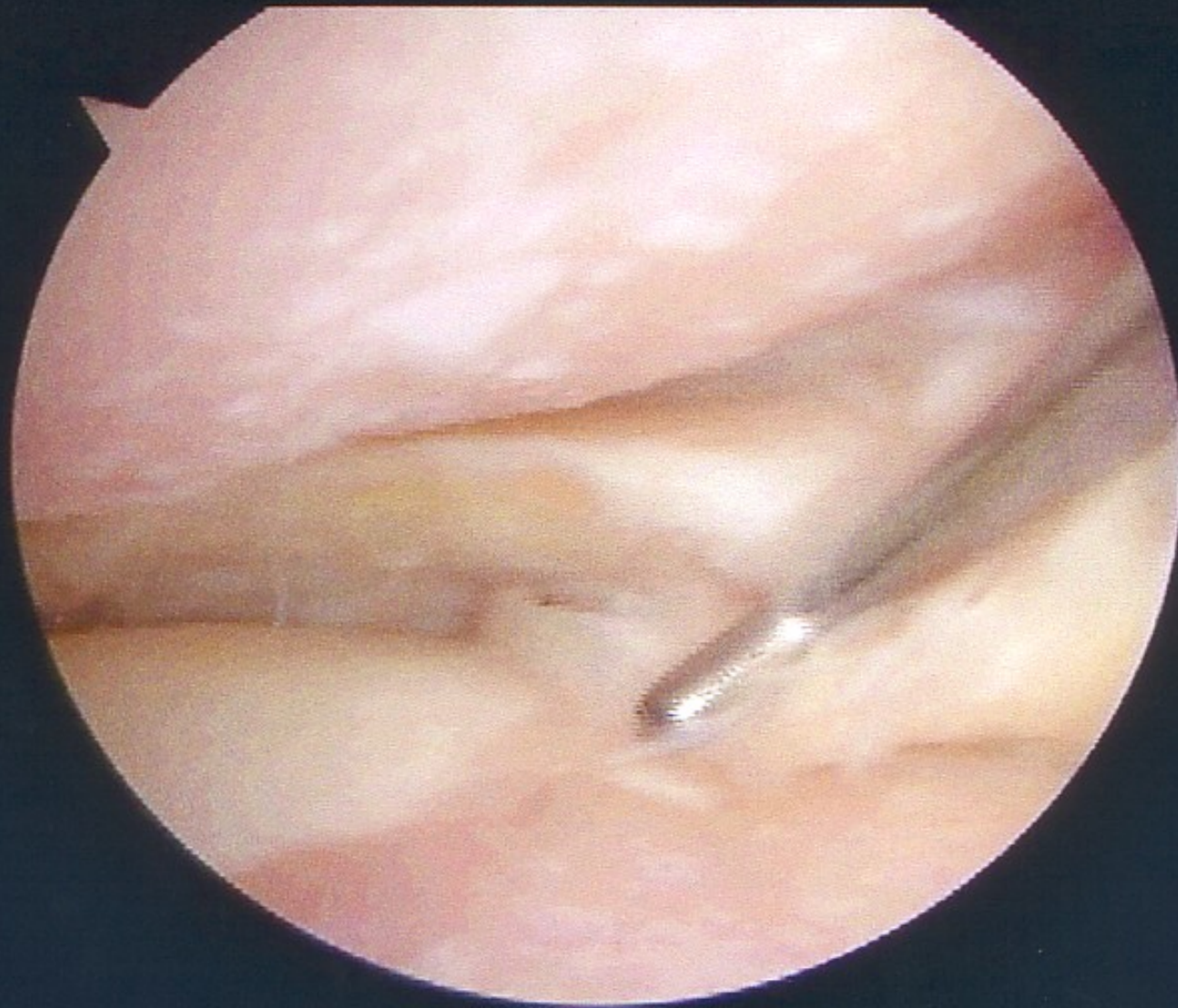
Femoral n. block

General anesthesia

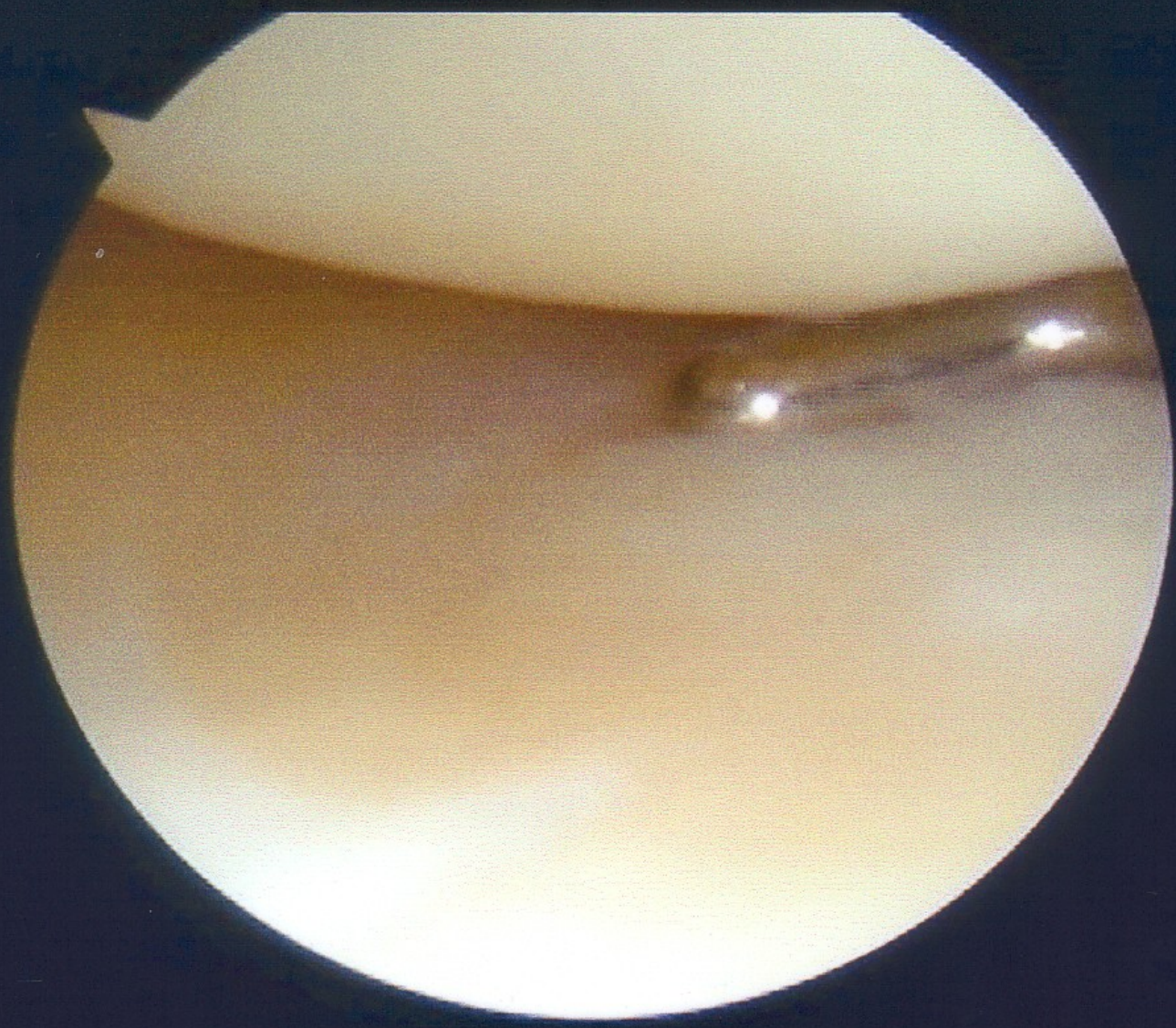
IV Morphine, Oral Oxycotin + Oxycodone,

Tylenol, Injectable Lovenox (enoxaparin Na)

***William Sterett, MD
Ben Hogan, PAC
Vail Summit Orthopedics***



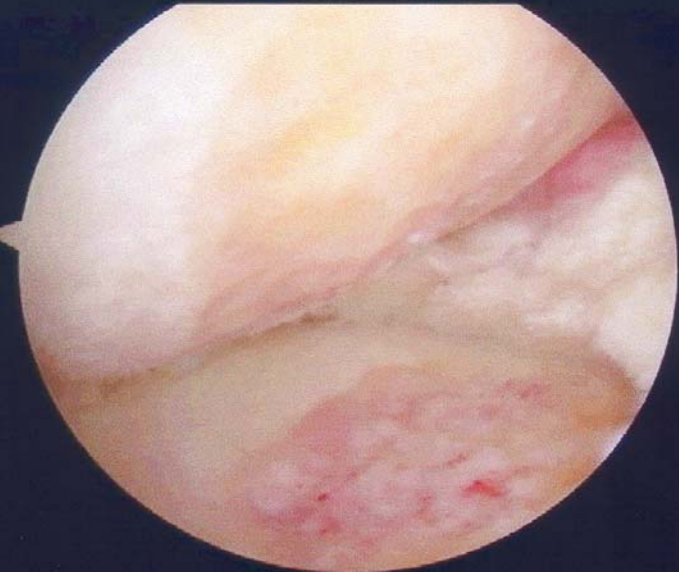
R knee medial meniscus cleavage & tear



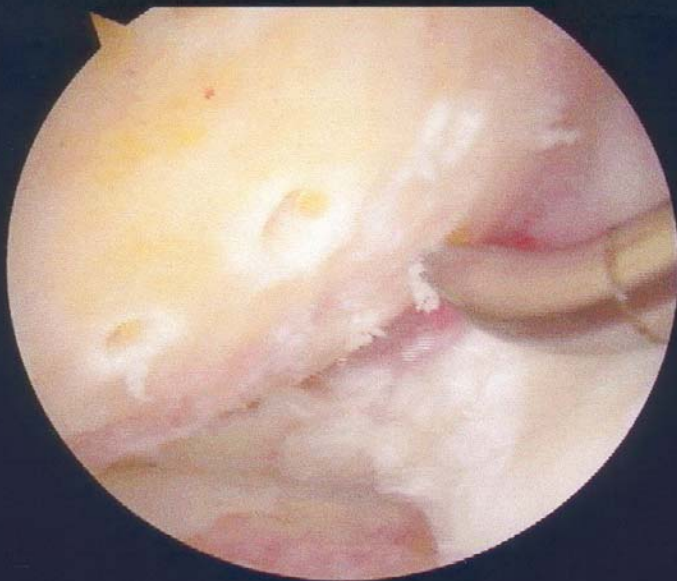
R knee lateral compartment in good shape!



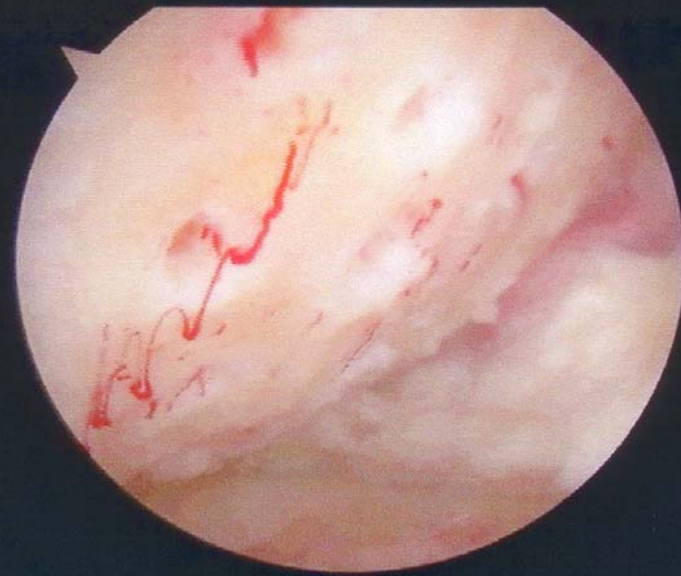
1. Arthroscopy clean-up



2. Debridement complete



3. Microfracture with awl



4. Punctuate bleeding



Further bleeding to create superclot!

High-Tibial Osteotomy (HTO) to Realign the Joint



1. Oscillating saw cut



2. R plate/scaffolding insert



3. Align, stabilize w/screws & pack defect

Post-Operative Reality: 10 d injectable anti-coagulant, 3 wk oral anti-coagulant, 4 wk CPM machine, non-wt bearing 8 wk, 12 wk PT, 3-5 d/wk,...

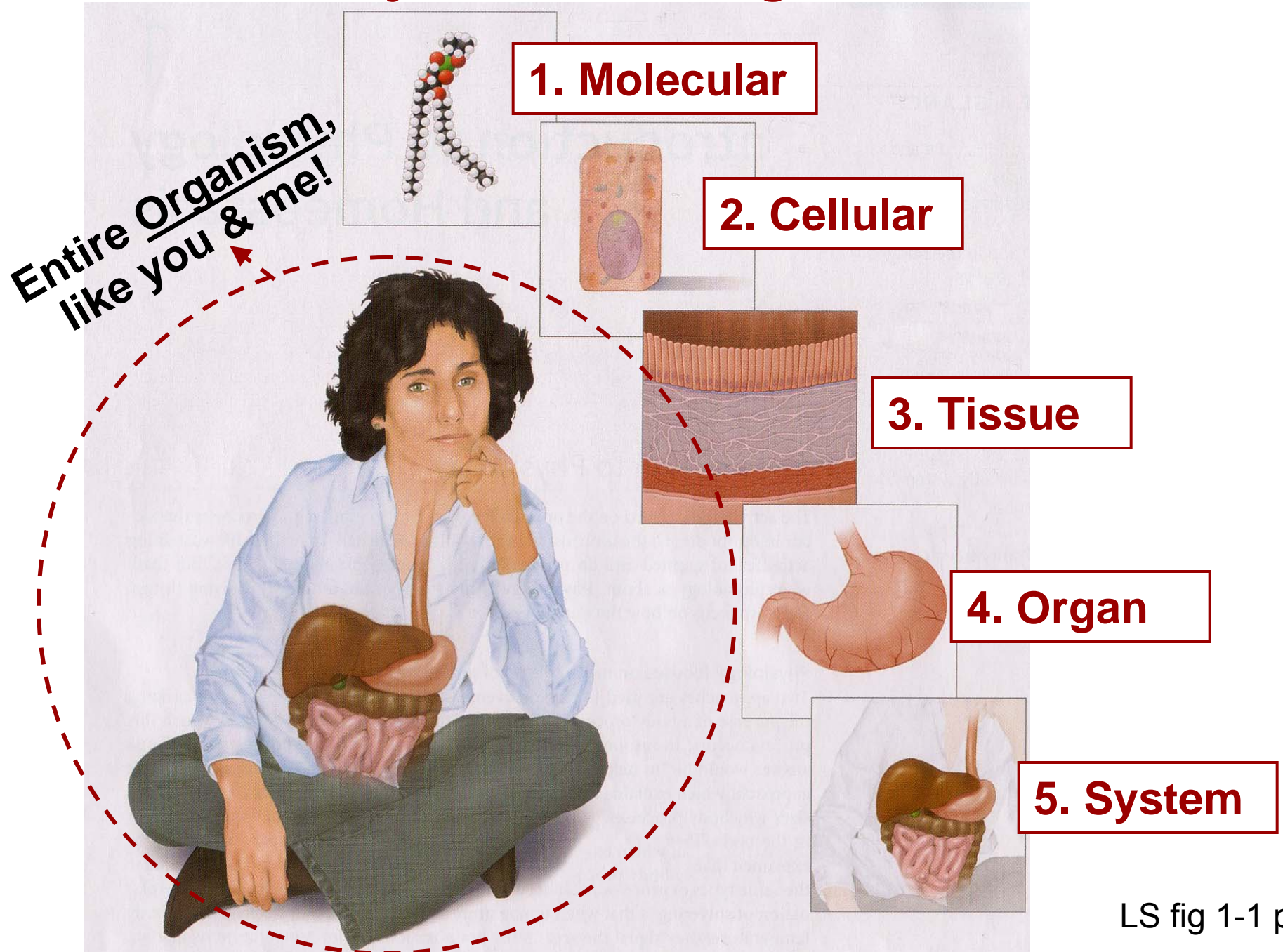


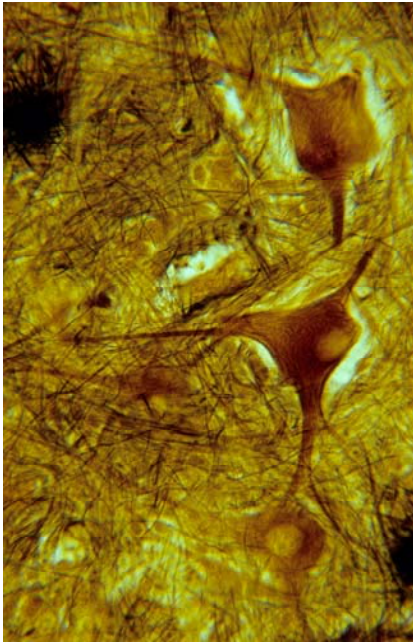
CPM ≡ Torture Device

Break for discussion/questions!

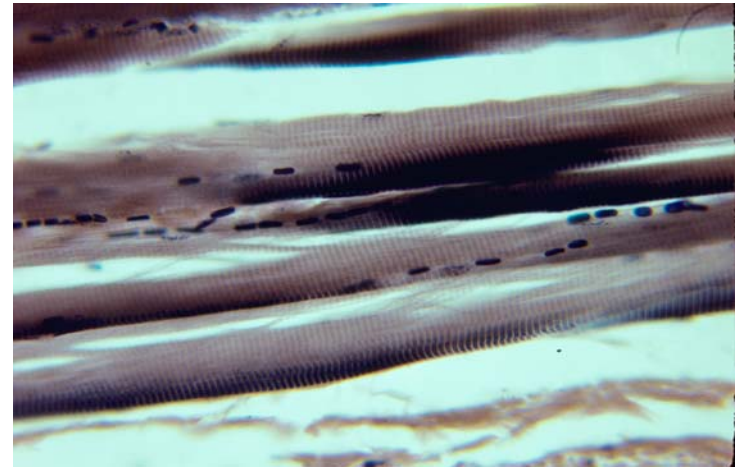


Body Levels of Organization

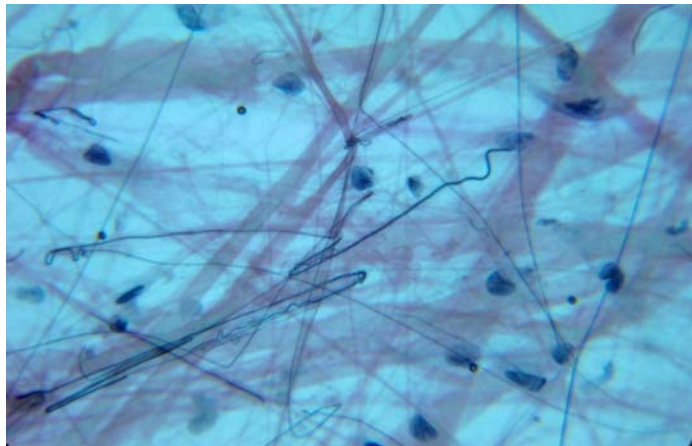




Nerve conducts



Muscle contracts

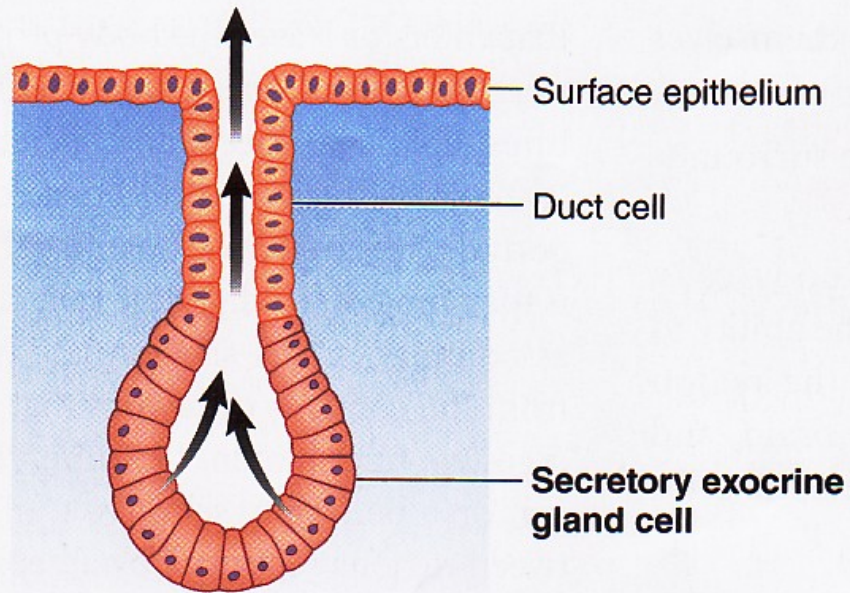


Connective connects!!

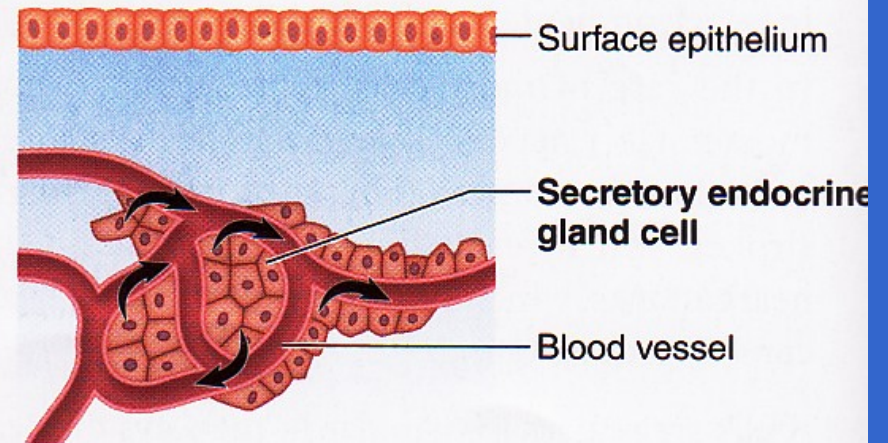


Epithelial covers

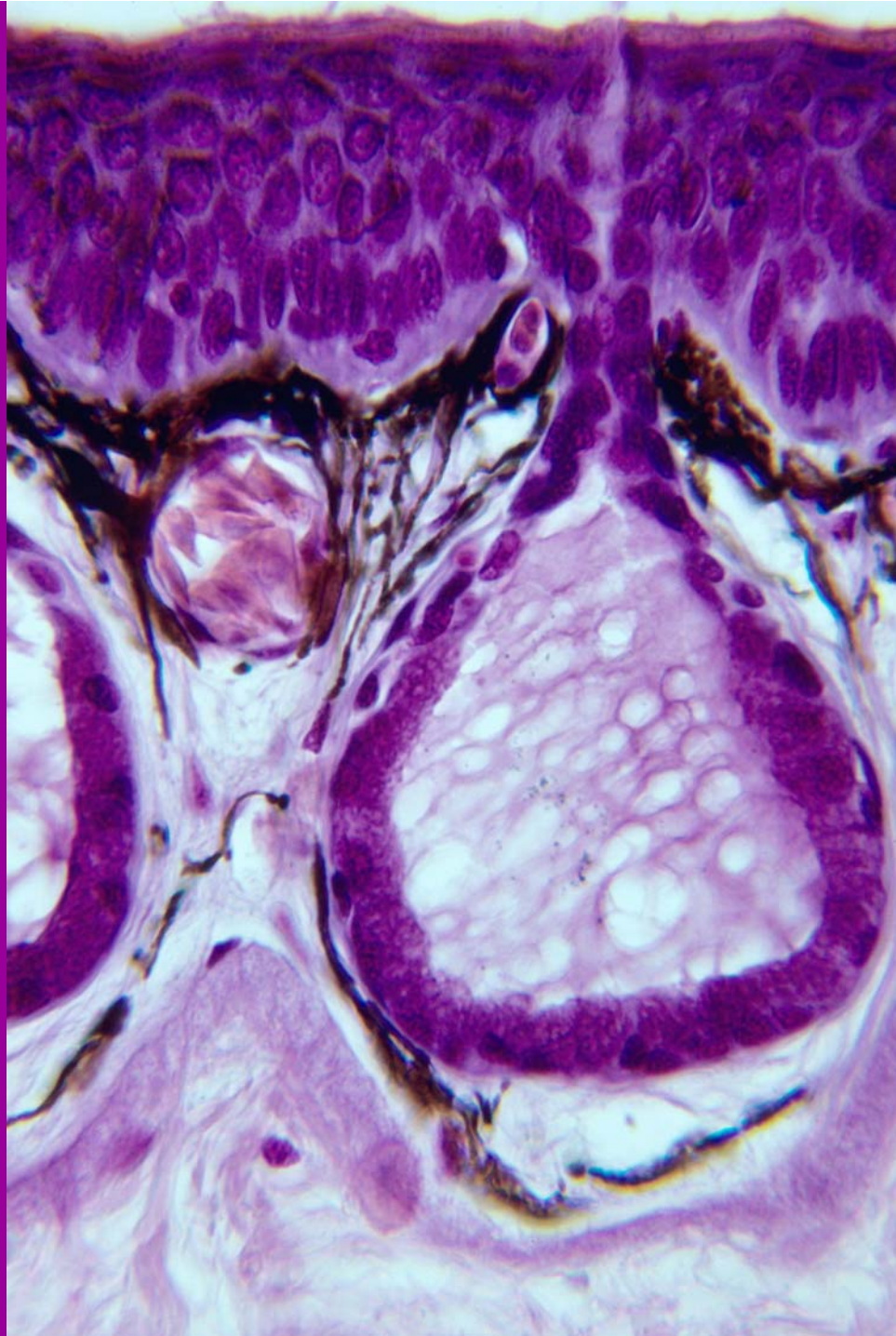
Epithelial tissue gives rise to glands: (a) exocrine & (b) endocrine



(a) Exocrine gland

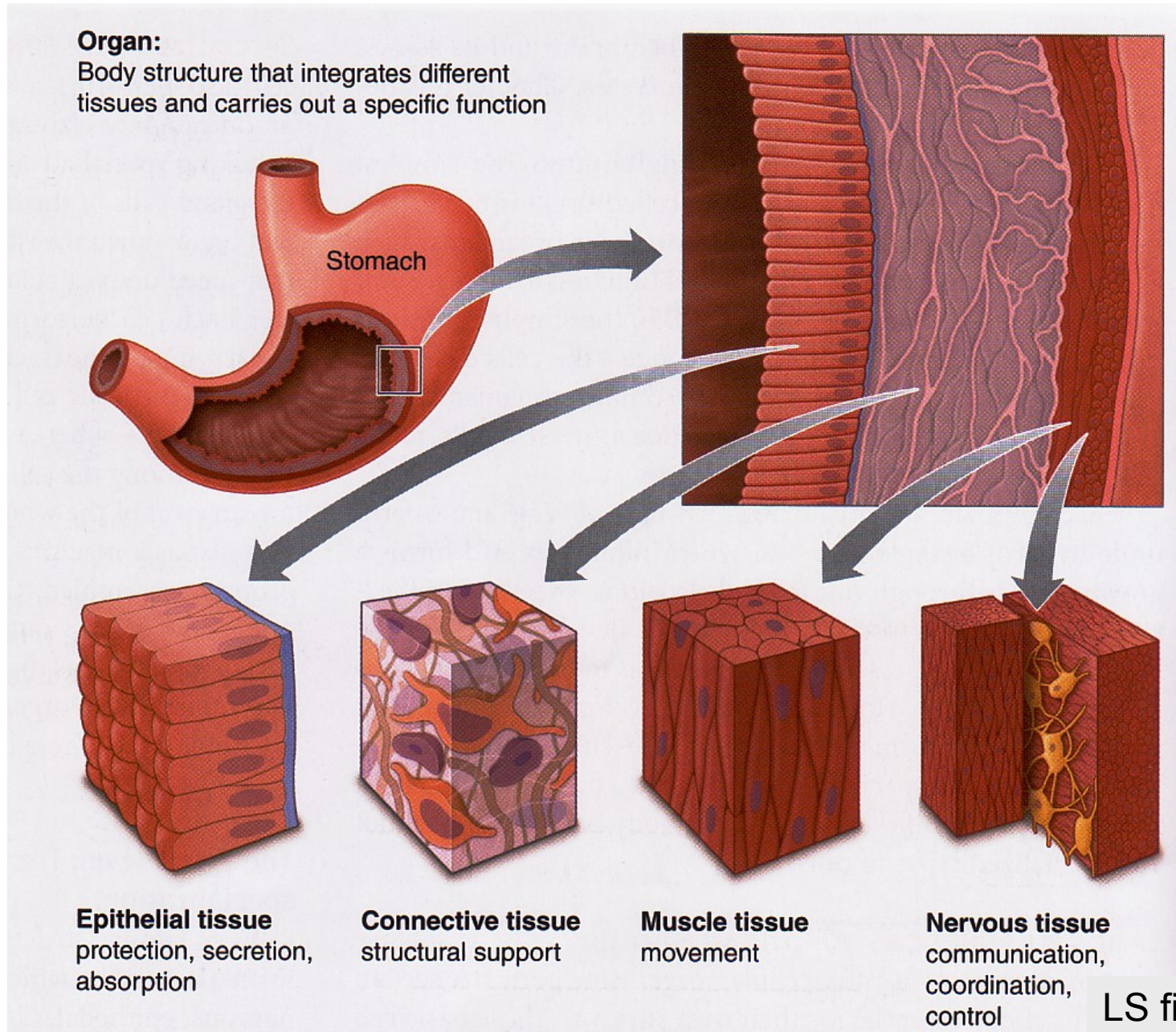


(b) Endocrine gland

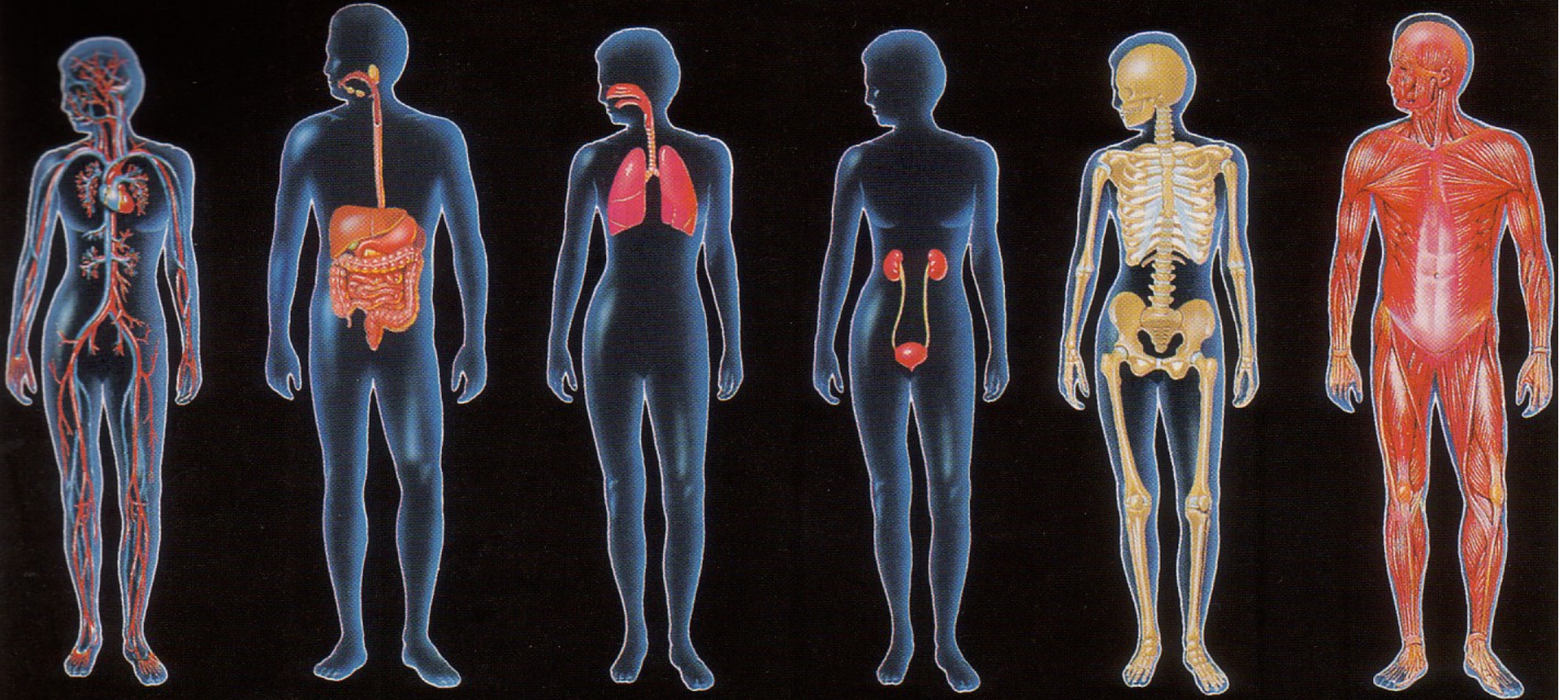


**Epithelial
tissue in
frog skin
developing
into an
exocrine
gland!**

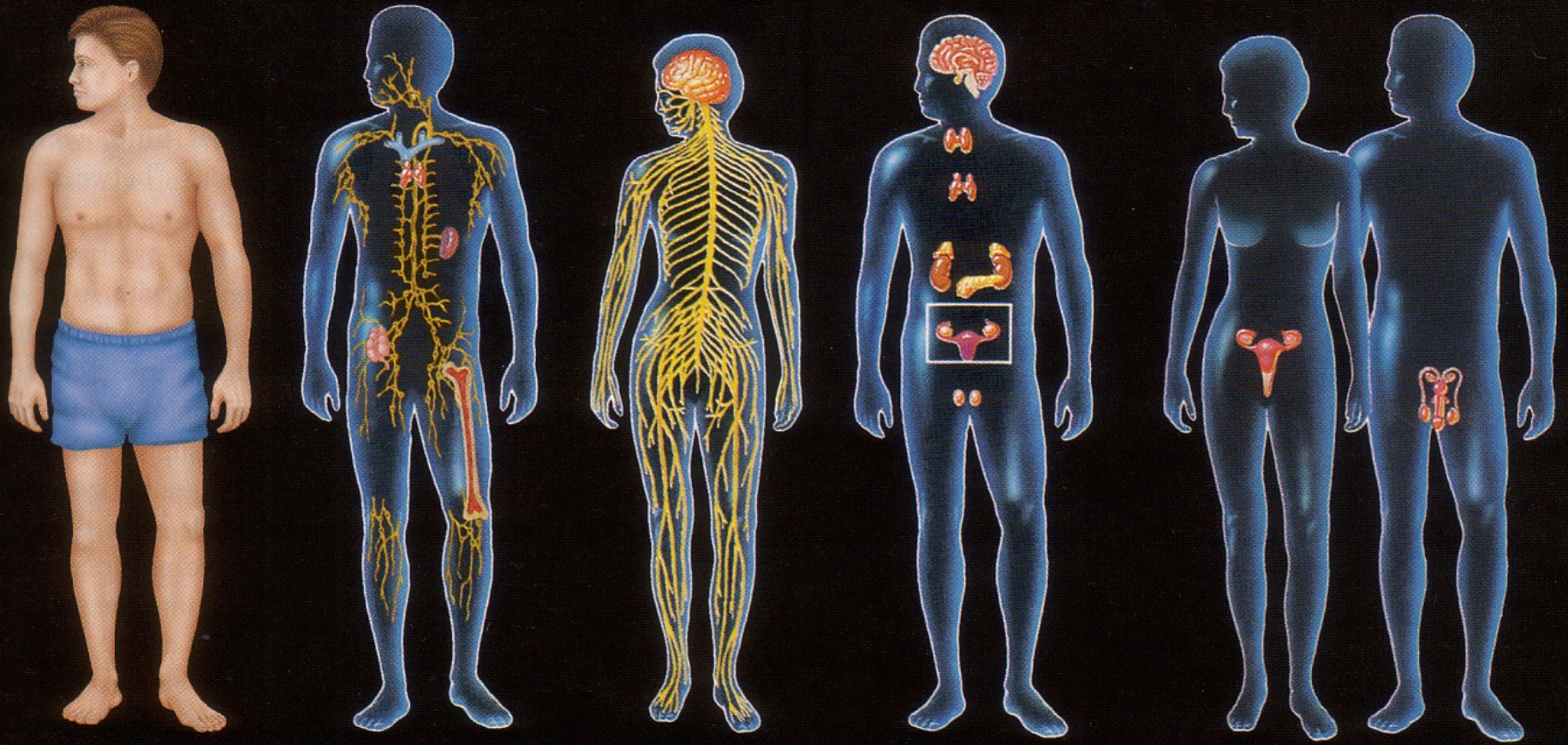
Organs are made up ≥ 2 tissue types



Which body systems?



Which body systems?



Why study human physiology?





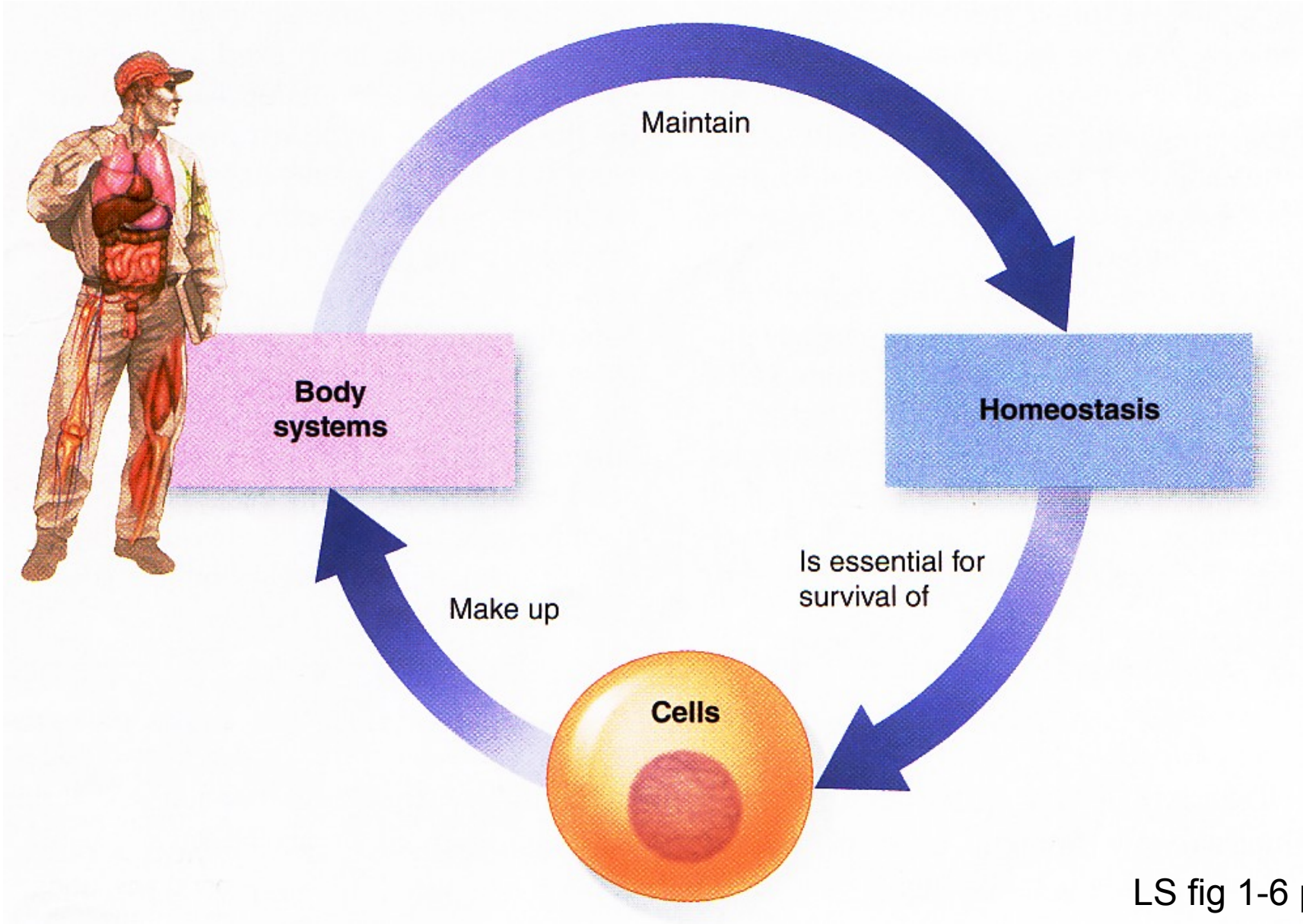


KNOWLEDGE IS POWER!!!



**Thomas Hobbes of Malmesbury
English Philosopher, 1658**

Homeostasis is essential for cell survival!

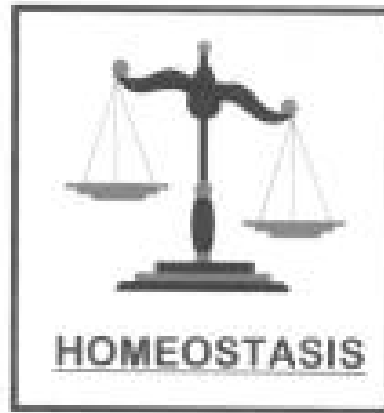


Maintenance of a relative constancy in the Internal environment = ECF = fluid outside of cells

**milieu
interieur?**



Claude Bernard

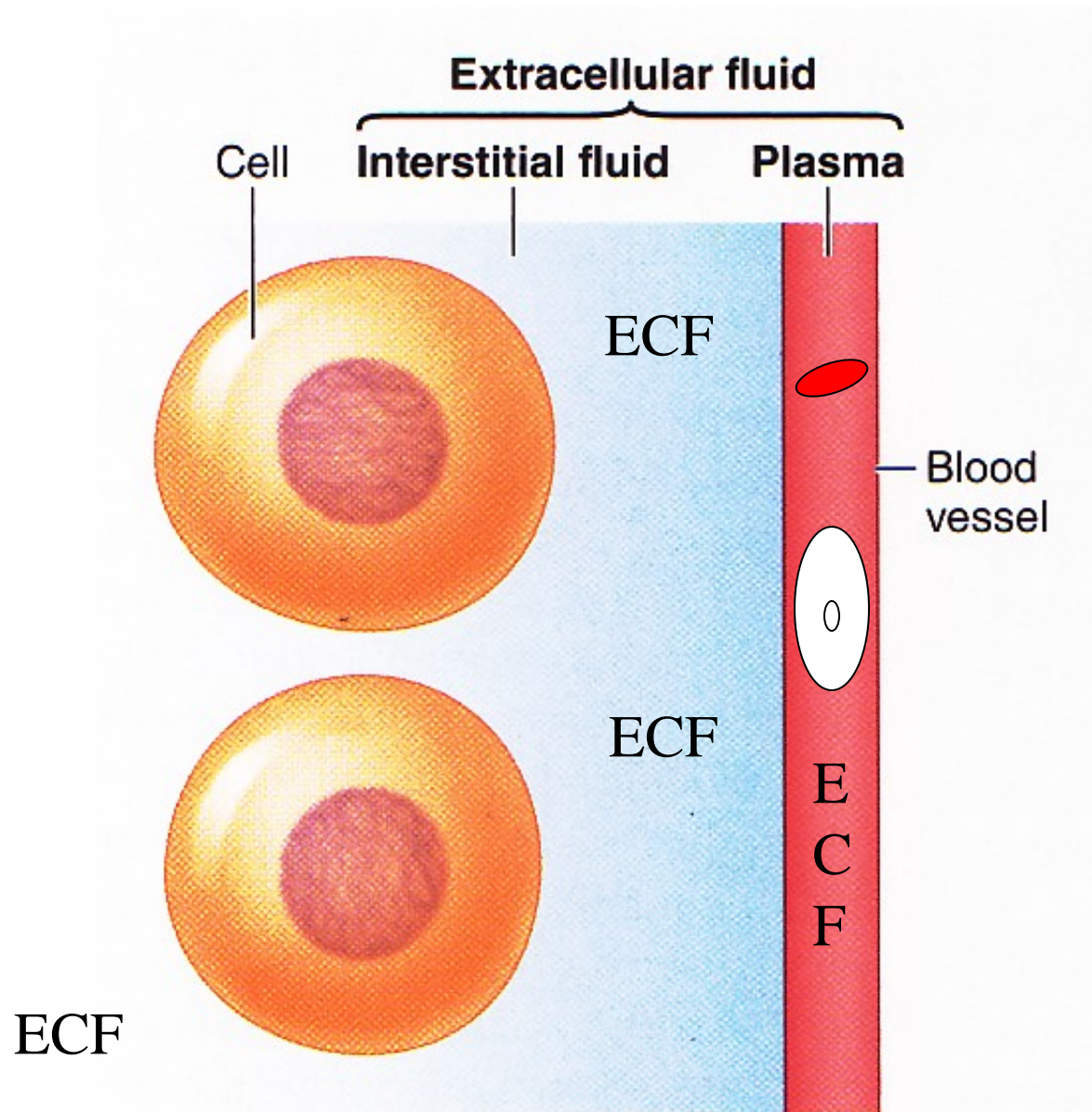


**100 trillion
cells working
intimately**

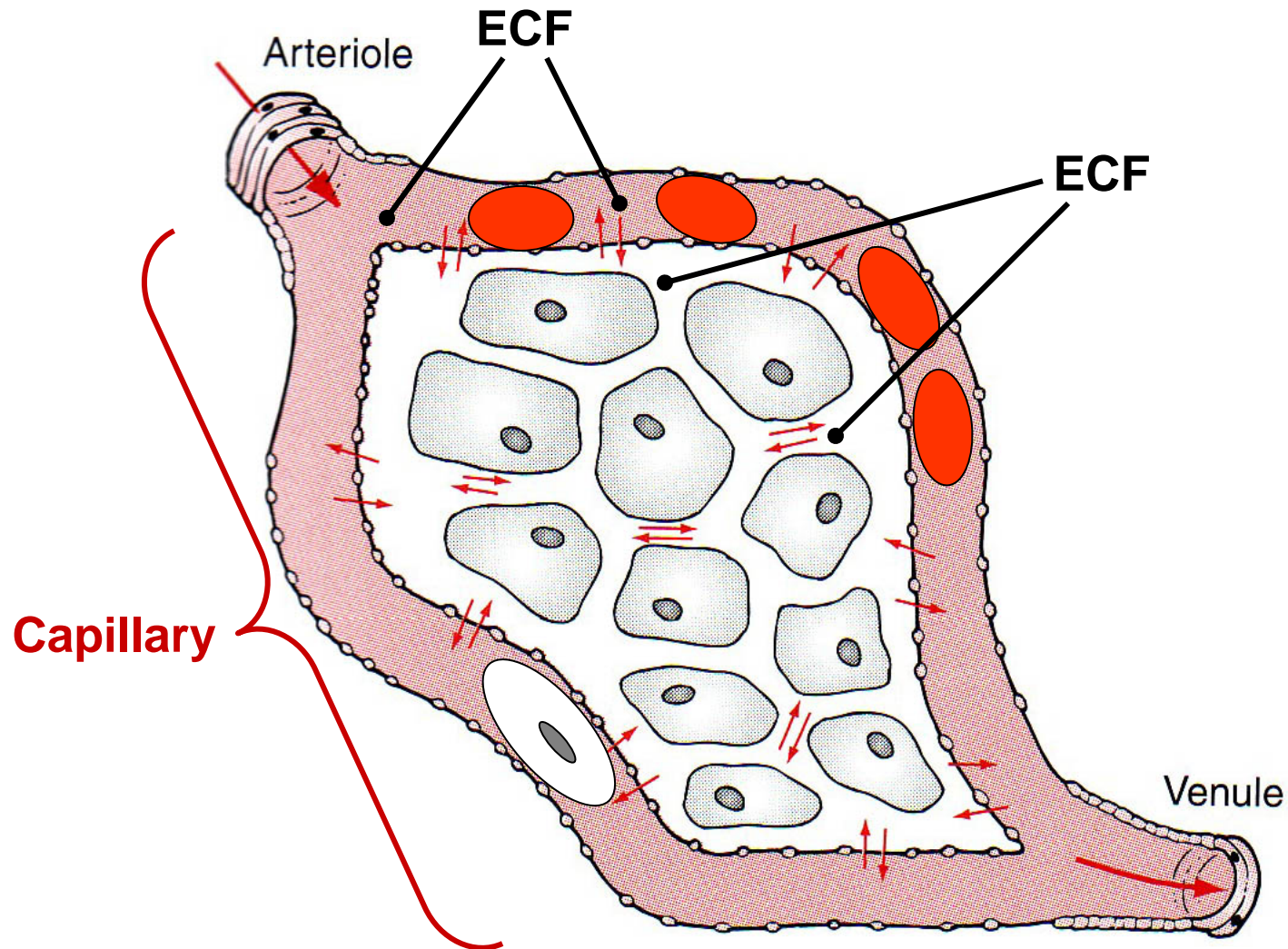


Walter B. Cannon

Where is extracellular fluid?

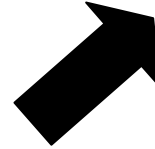


Where is extracellular fluid?

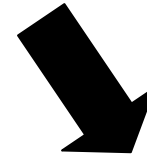


As long as between/outside cells, ECF everywhere?

ECF = Extracellular



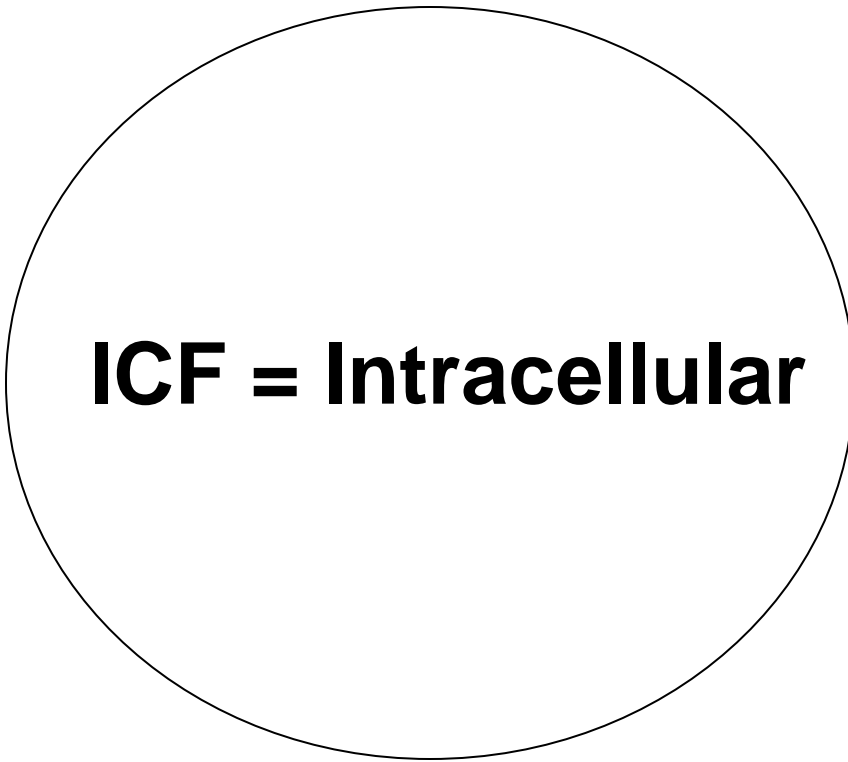
Plasma
(within CV System)



Interstitium

(eg, between
muscle cells)

ICF = Intracellular



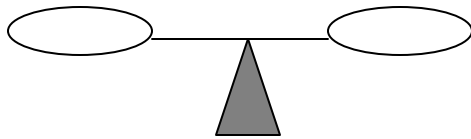
HOMEOKINESIS?



Metabolic

ANA-

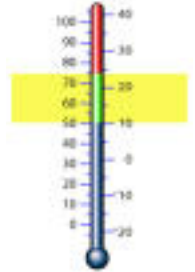
CATA-



H₂O

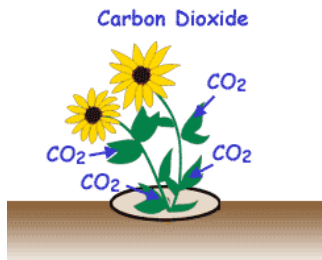


ToC



Dr. Evonuk's 6 Balances

O₂/CO₂



Ion^{+/-}



pH

Bicarbonate and pH Balance

