



*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

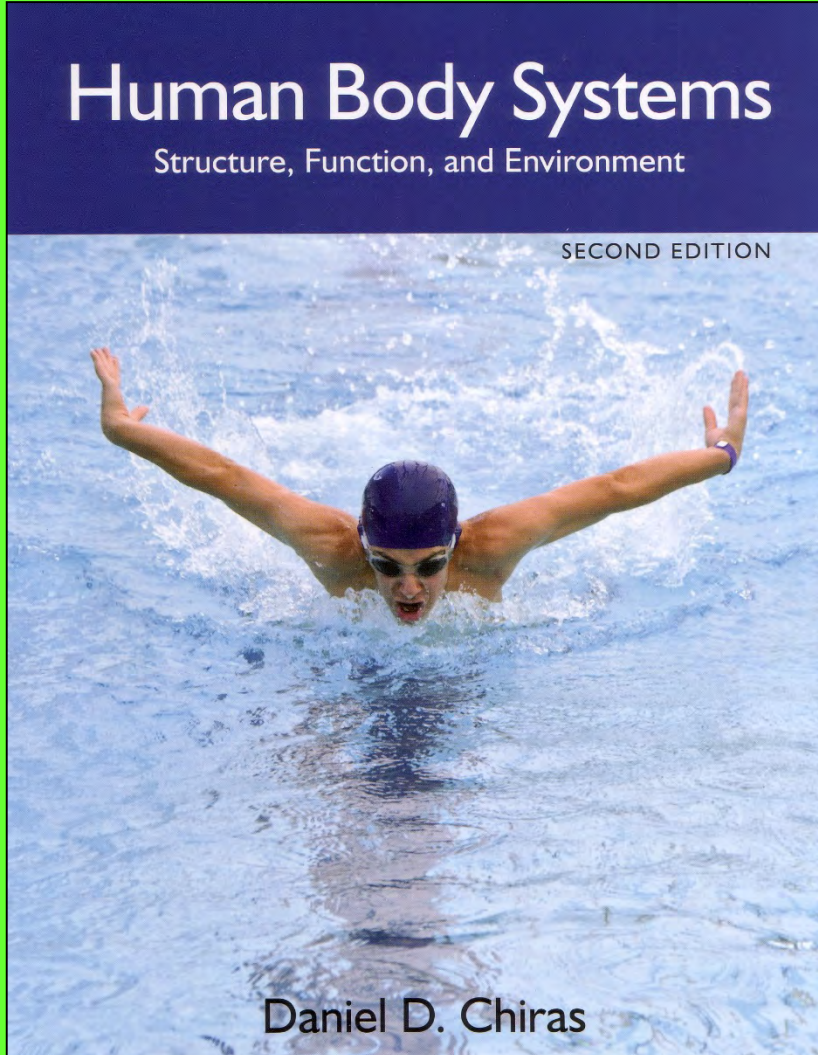
B. Where? ECF = Plasma + Interstitium LS fig 1-4 p 8

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

# **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 2015**

**DC**

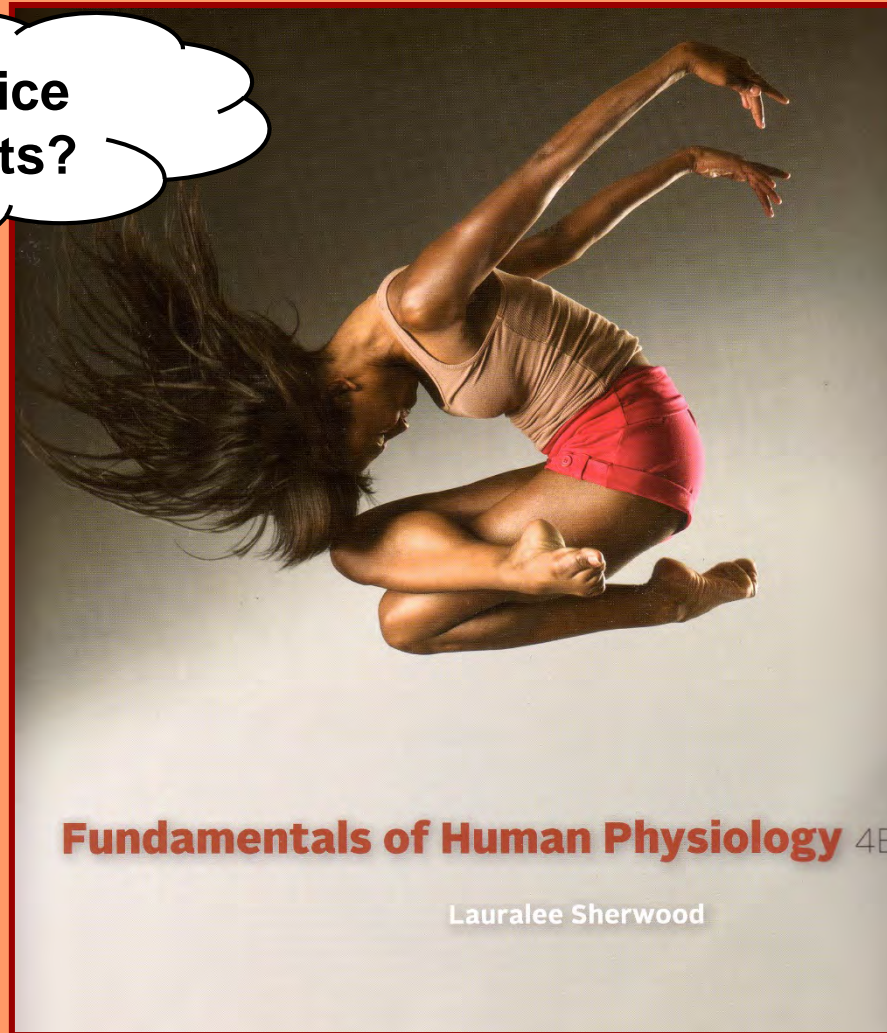
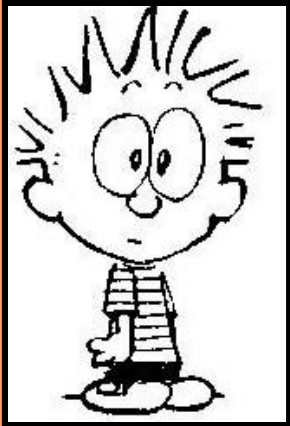
**New (2013 ed) \$28.25 Used \$19.50**

**LM**

**Lab Notebook \$ 9.75**

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

**Publisher's Price  
→ Gold Nuggets?**



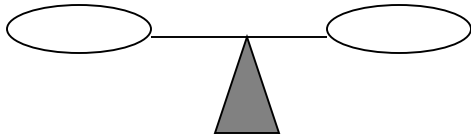
**LS 2012**

**\$234.55 New; \$134.93 Used; \$63.49 Rental; Valore Books \$11.23!**

# Metabolic

ANA-

CATA-



H<sub>2</sub>O

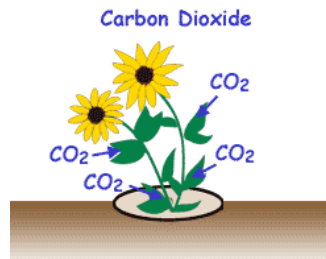


T<sub>o</sub>C



## Dr. Evonuk's 6 Balances

O<sub>2</sub>/CO<sub>2</sub>



Ion<sup>+/-</sup>

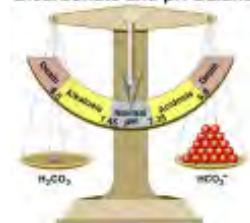


Captain Calcium

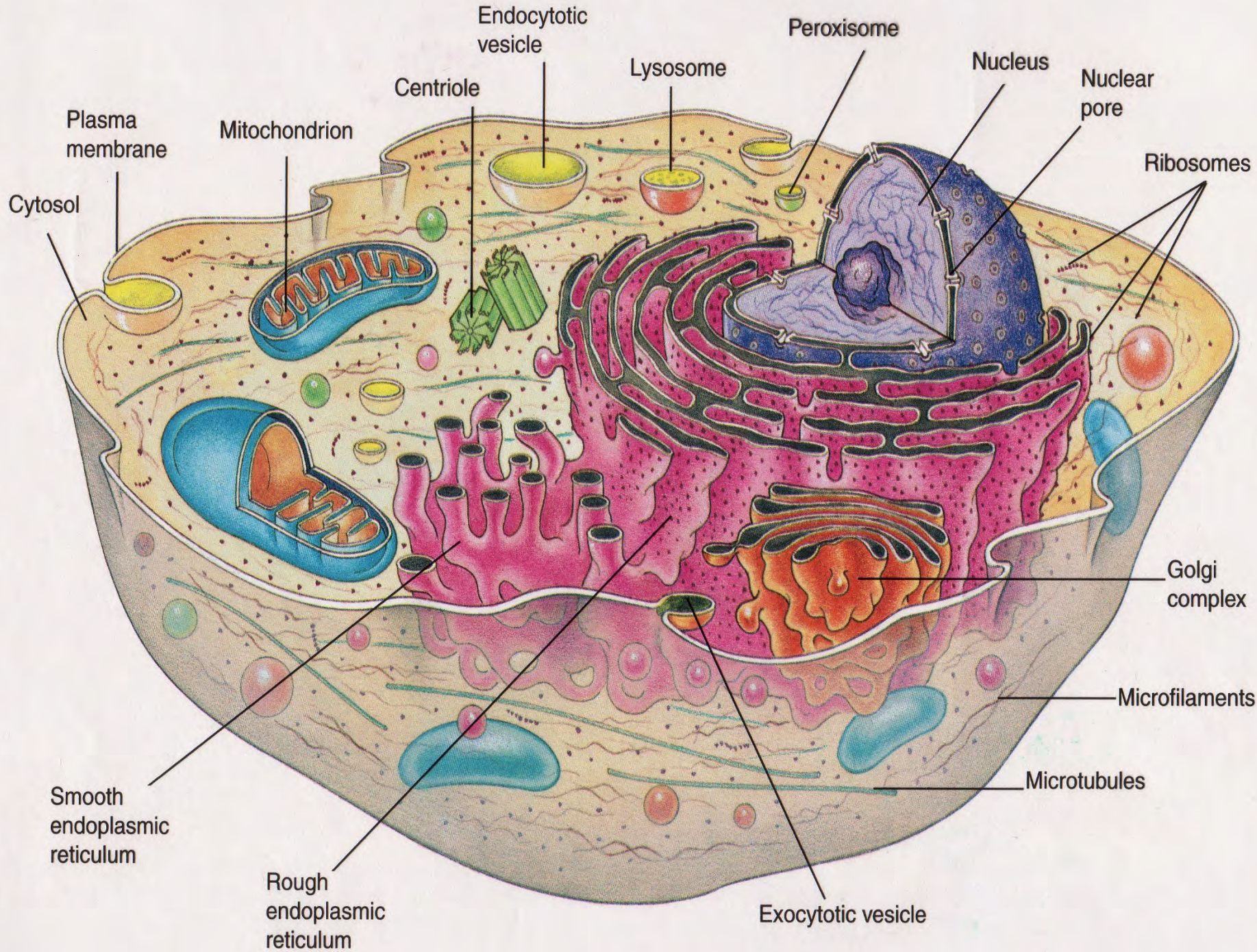


pH

Bicarbonate and pH Balance







# Mitochondria: Energy Organelles

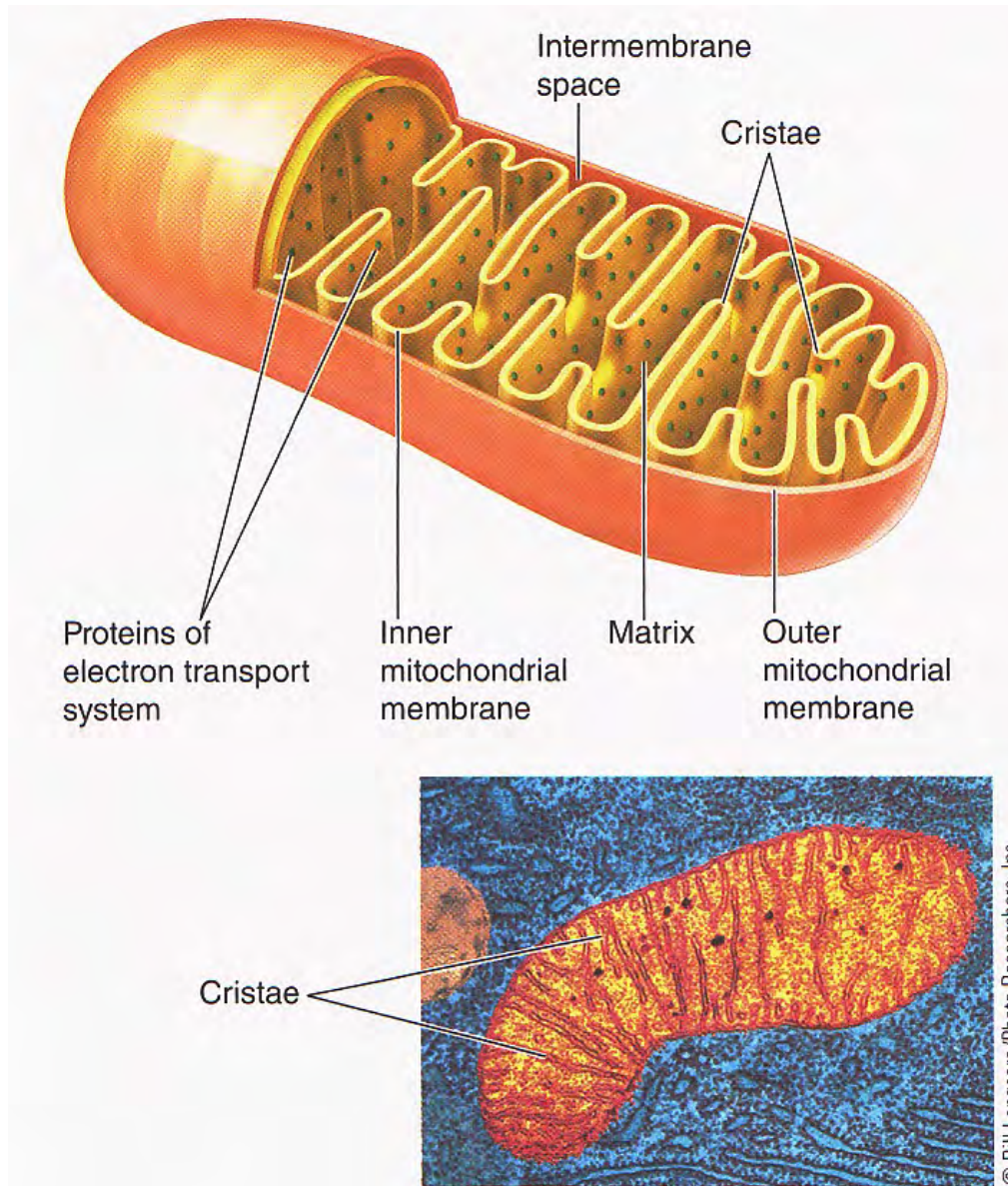
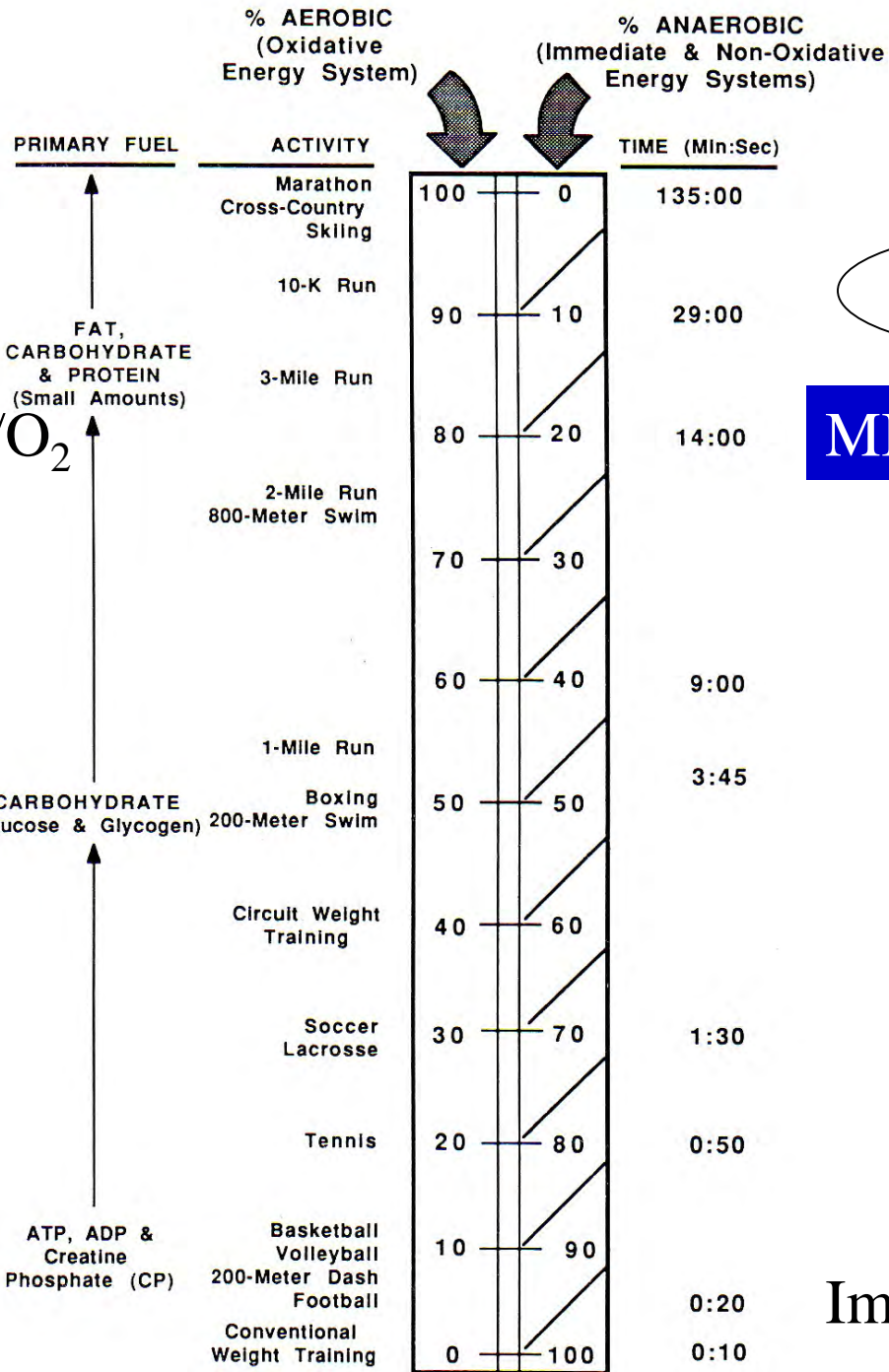


fig 2-8 LS 2012



**AEROBIC**

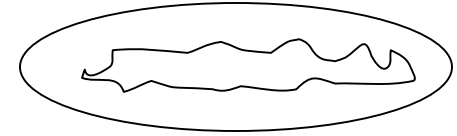
w/O<sub>2</sub>



FAT,  
CARBOHYDRATE  
& PROTEIN  
(Small Amounts)

CARBOHYDRATE  
(Glucose & Glycogen)

ATP, ADP &  
Creatine  
Phosphate (CP)



**MITOCHONDRIA**

**CYTOSOL**

Glycolysis

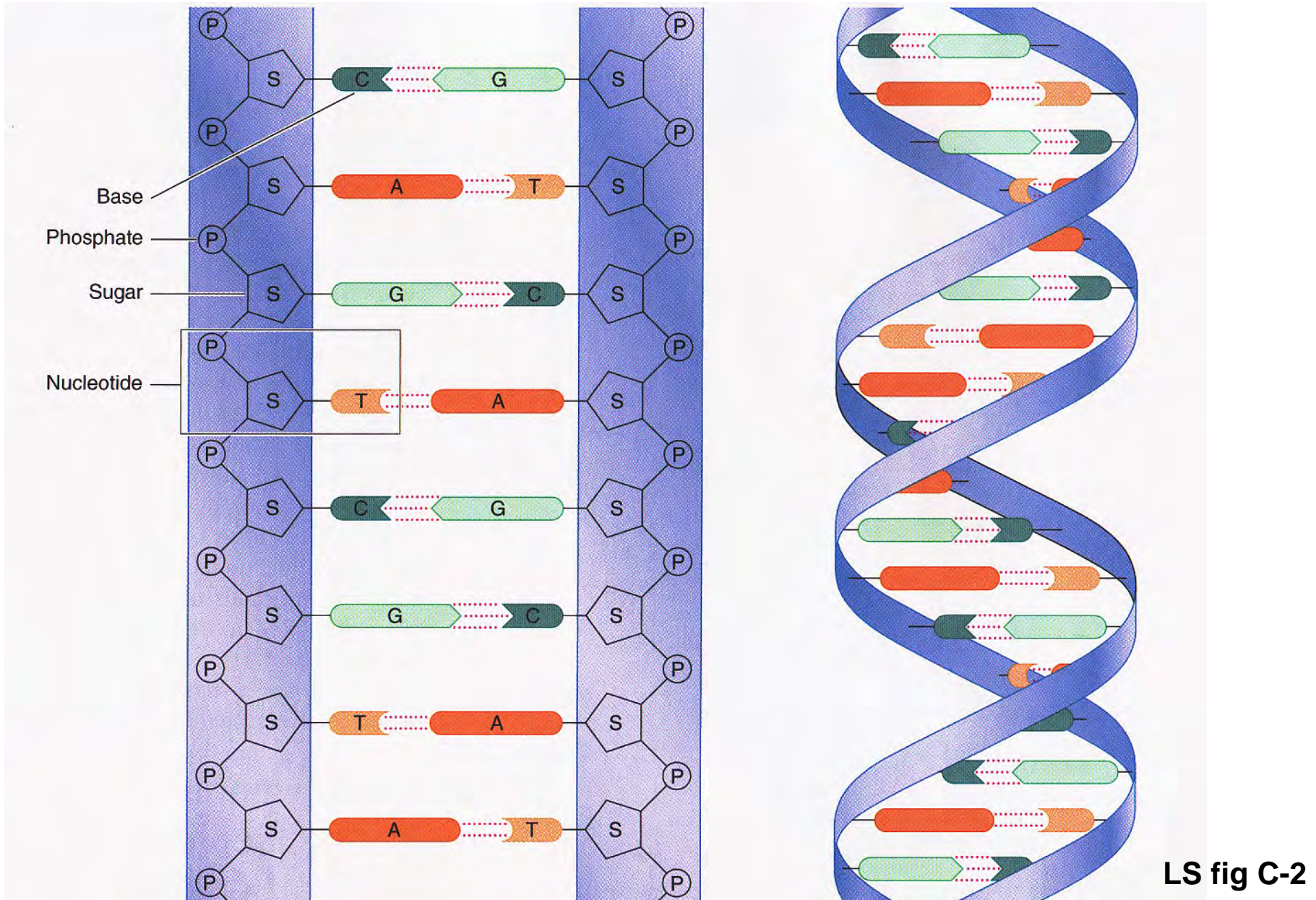
Immediate/ATP-PC



**ANAEROBIC**



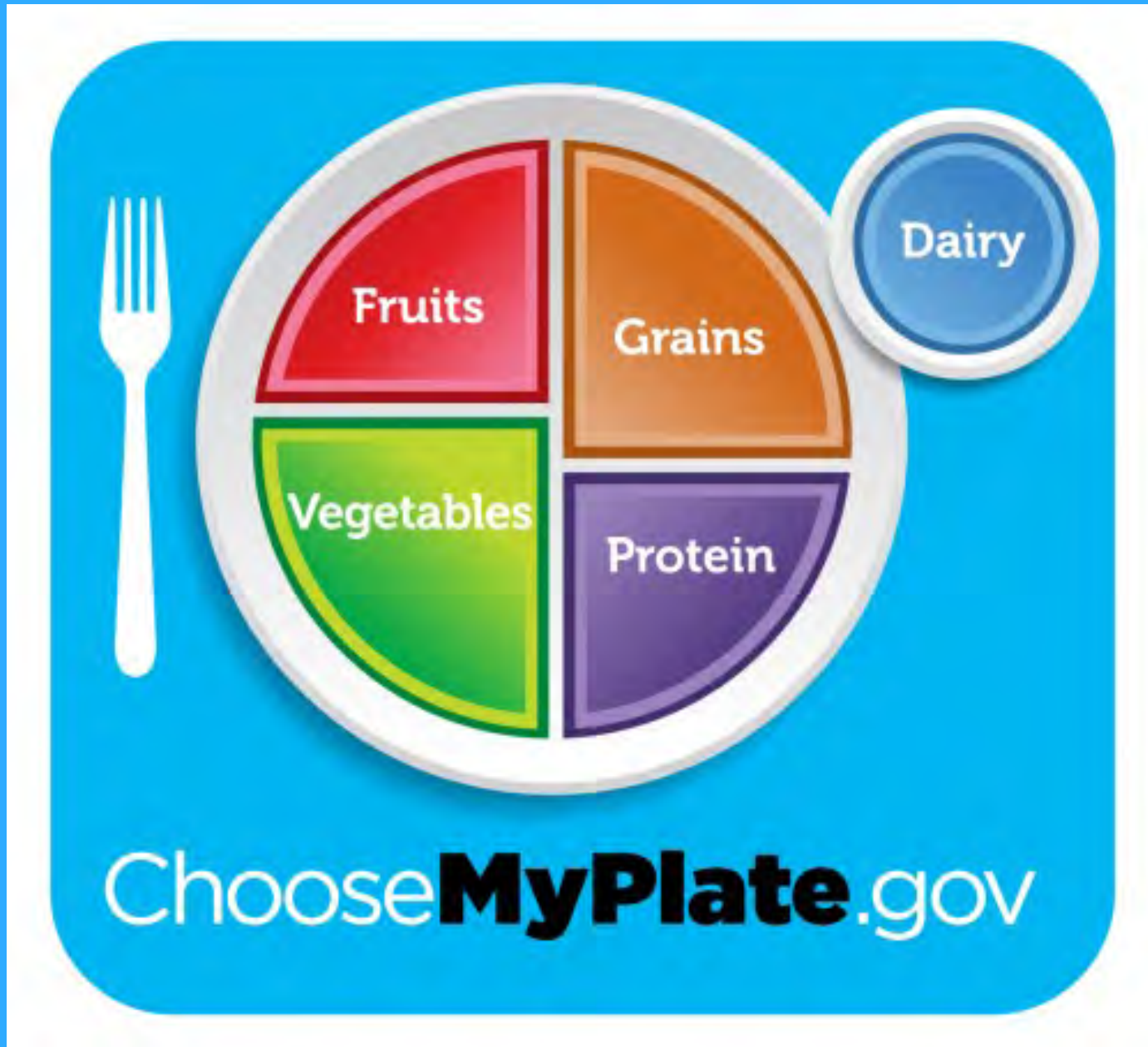
# What does DNA look like? Double-helix!!



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



# *Dietary Analyses Thanks to Michelle Obama!*



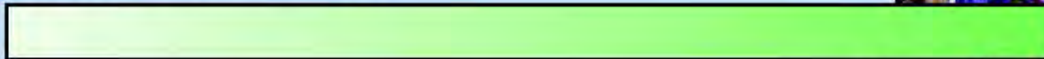
# Dietary Composition & Physical Endurance

eg, Atkins!

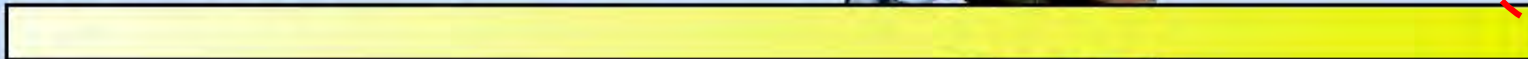
High-fat diet



Normal mixed diet



High-carbohydrate diet



~ 1/3 endurance!

Maximum endurance time:

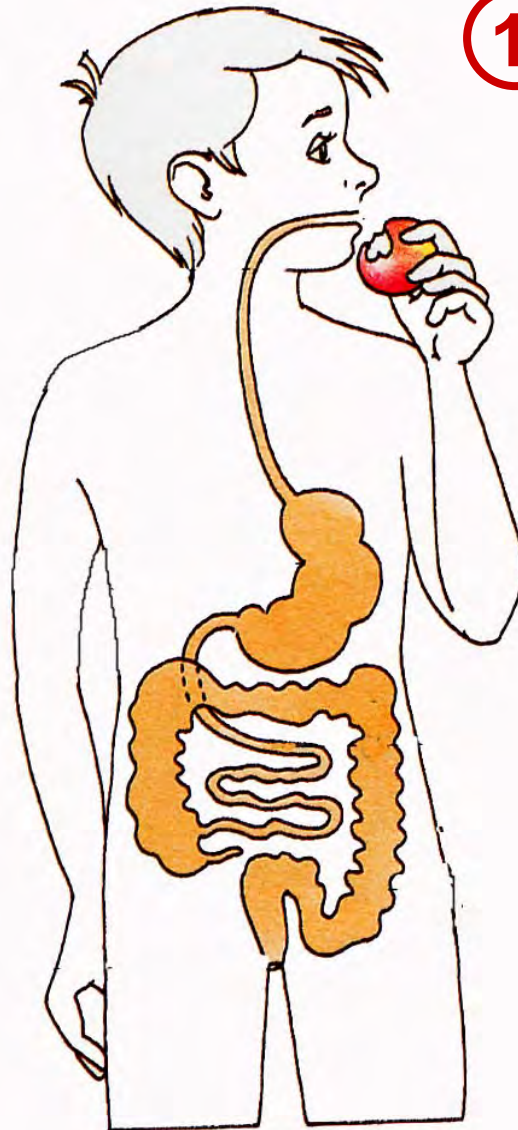
57 min

114 min

167 min



# Digestion Steps



① Ingestion

② Mechanical Digestion

③ Chemical Digestion

④ Peristalsis

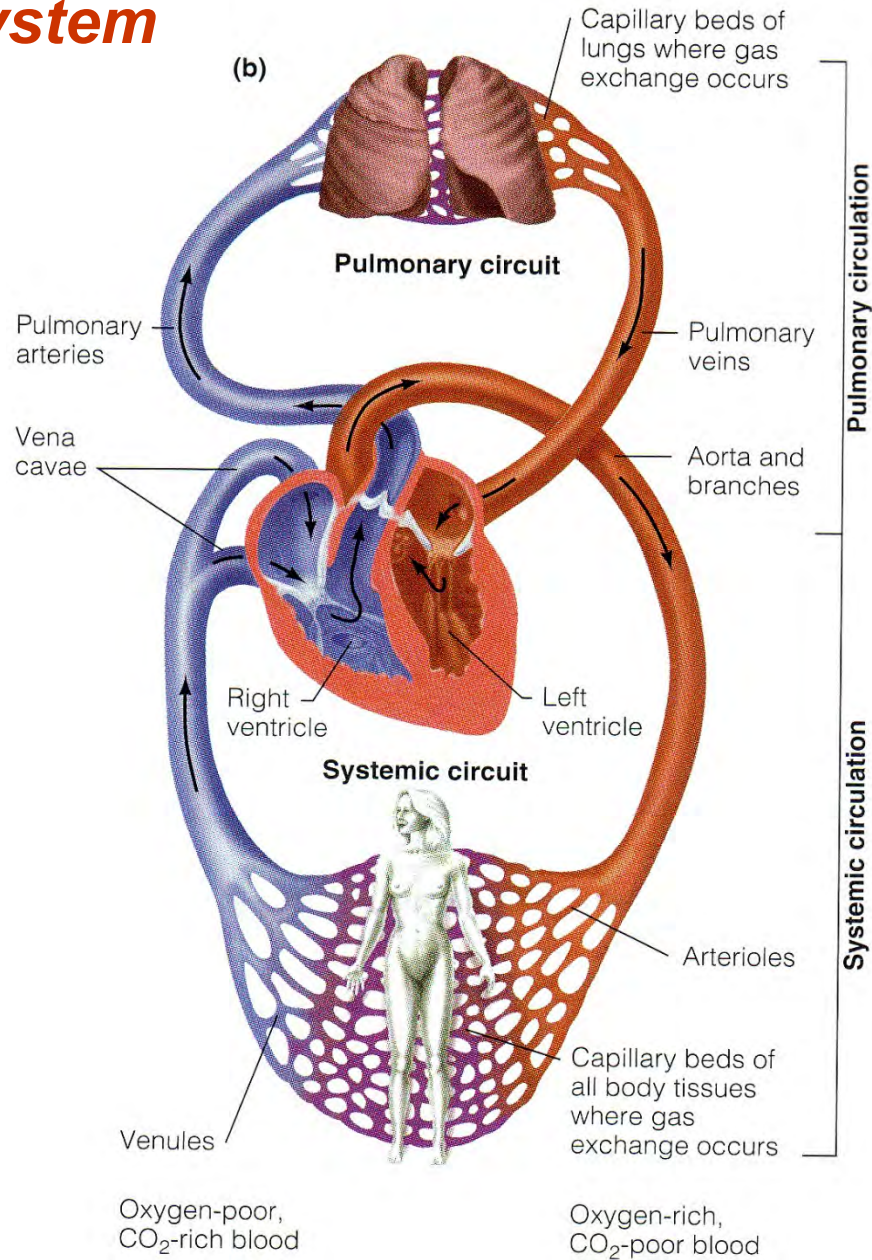
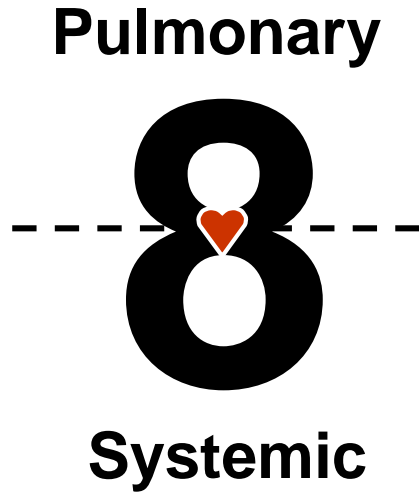
⑤ Absorption

⑥ Storage

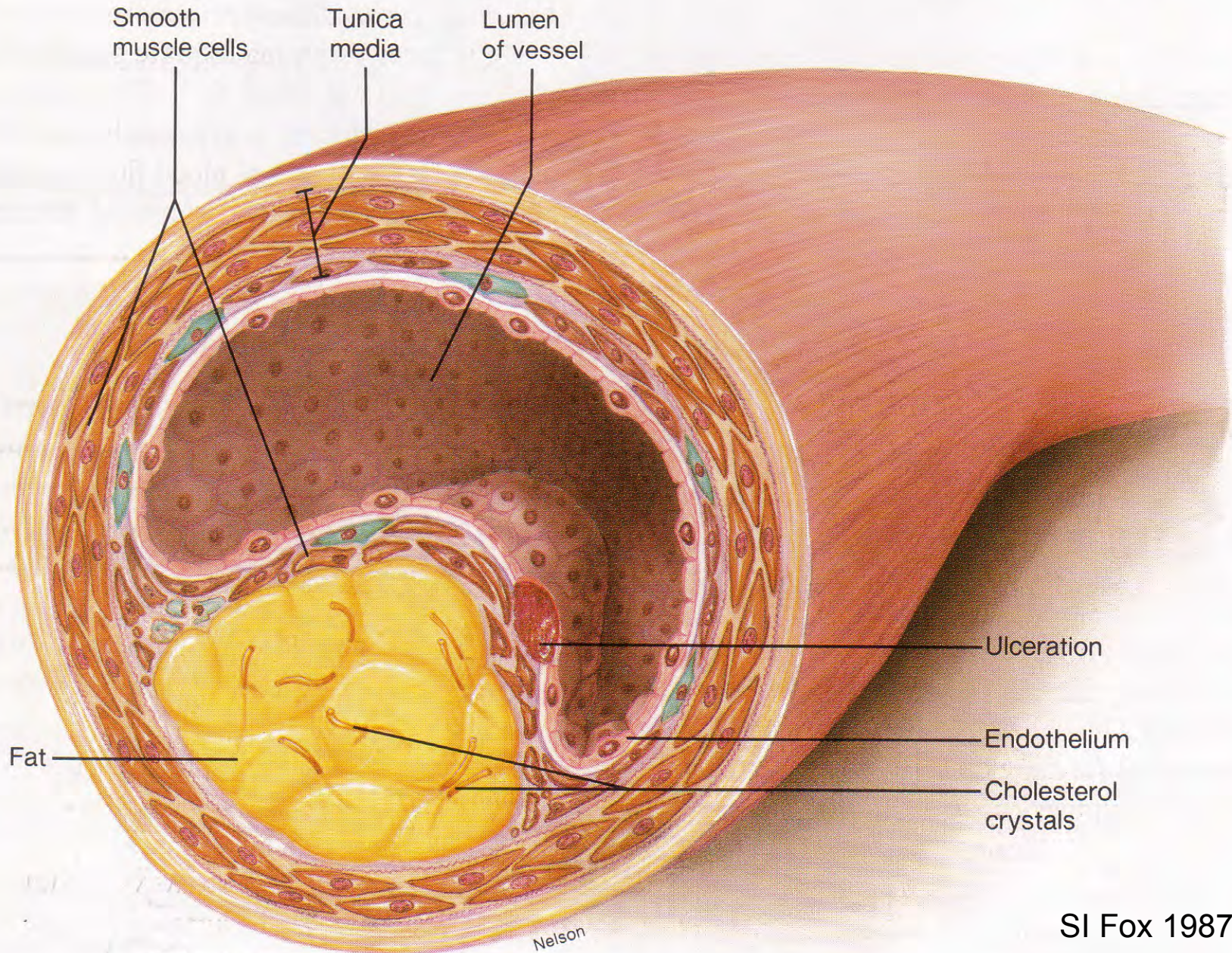
⑦ Defecation

# Cardiovascular System

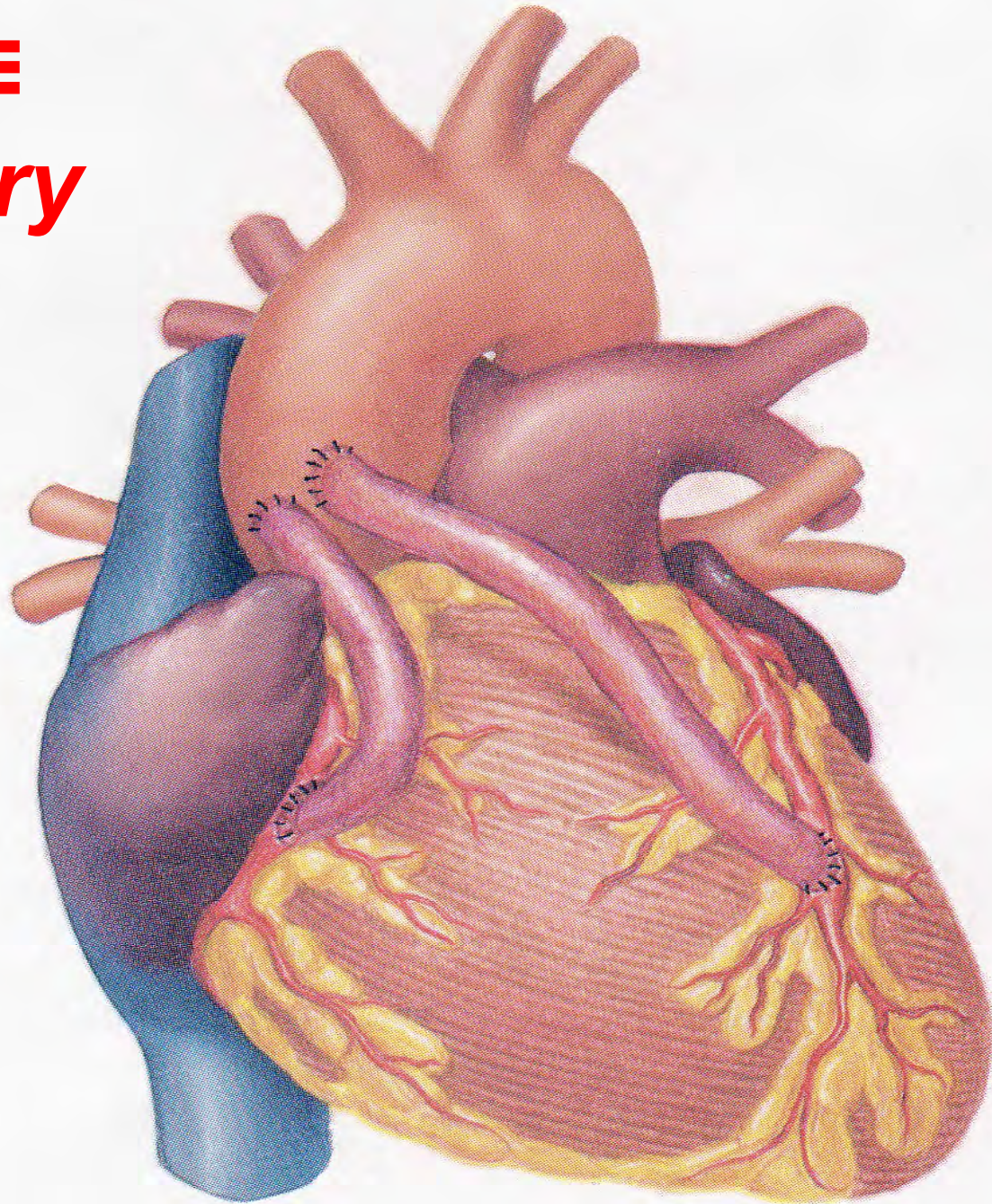
## Figure-8 Loop



# Atherosclerosis developing within vessel walls!

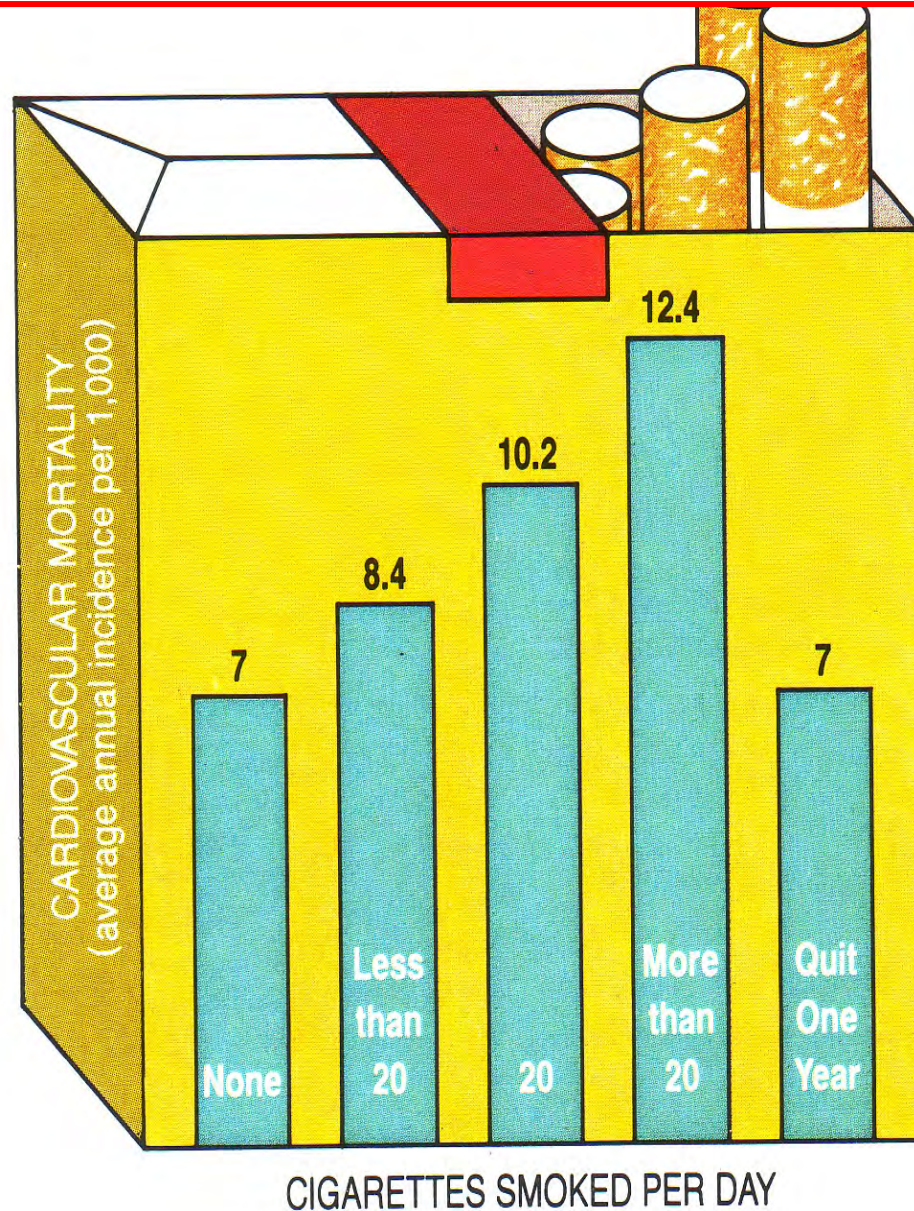


**CABG ≡**  
**Coronary**  
**Artery**  
**Bypass**  
**Graft**





# 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

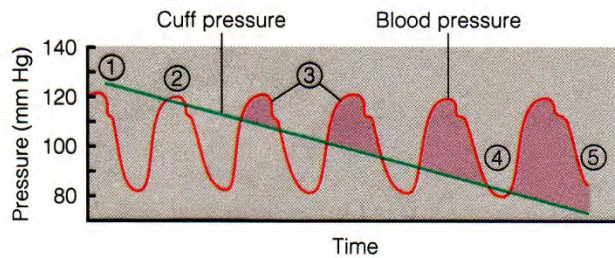
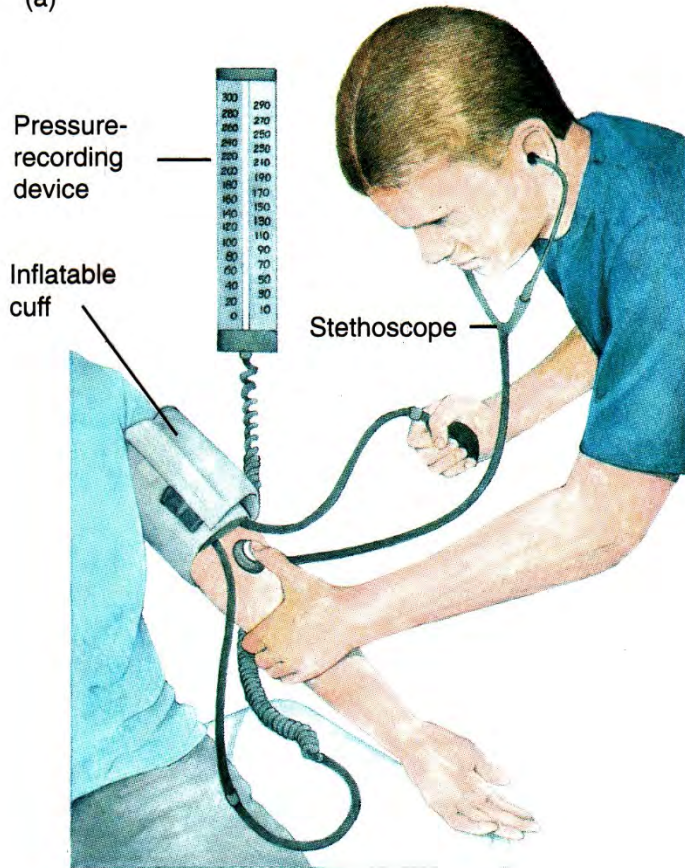
# P

# O

# C

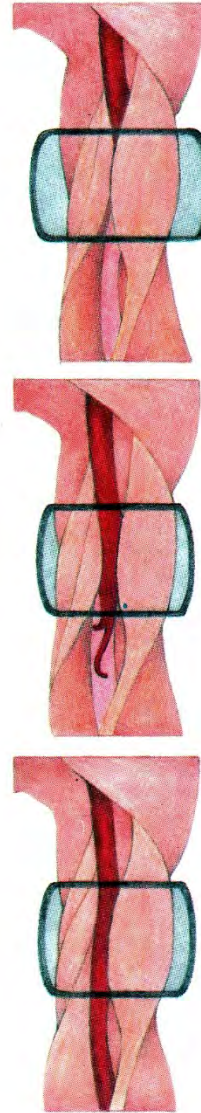


(a)



(b)

(c) When blood pressure is 120/80:

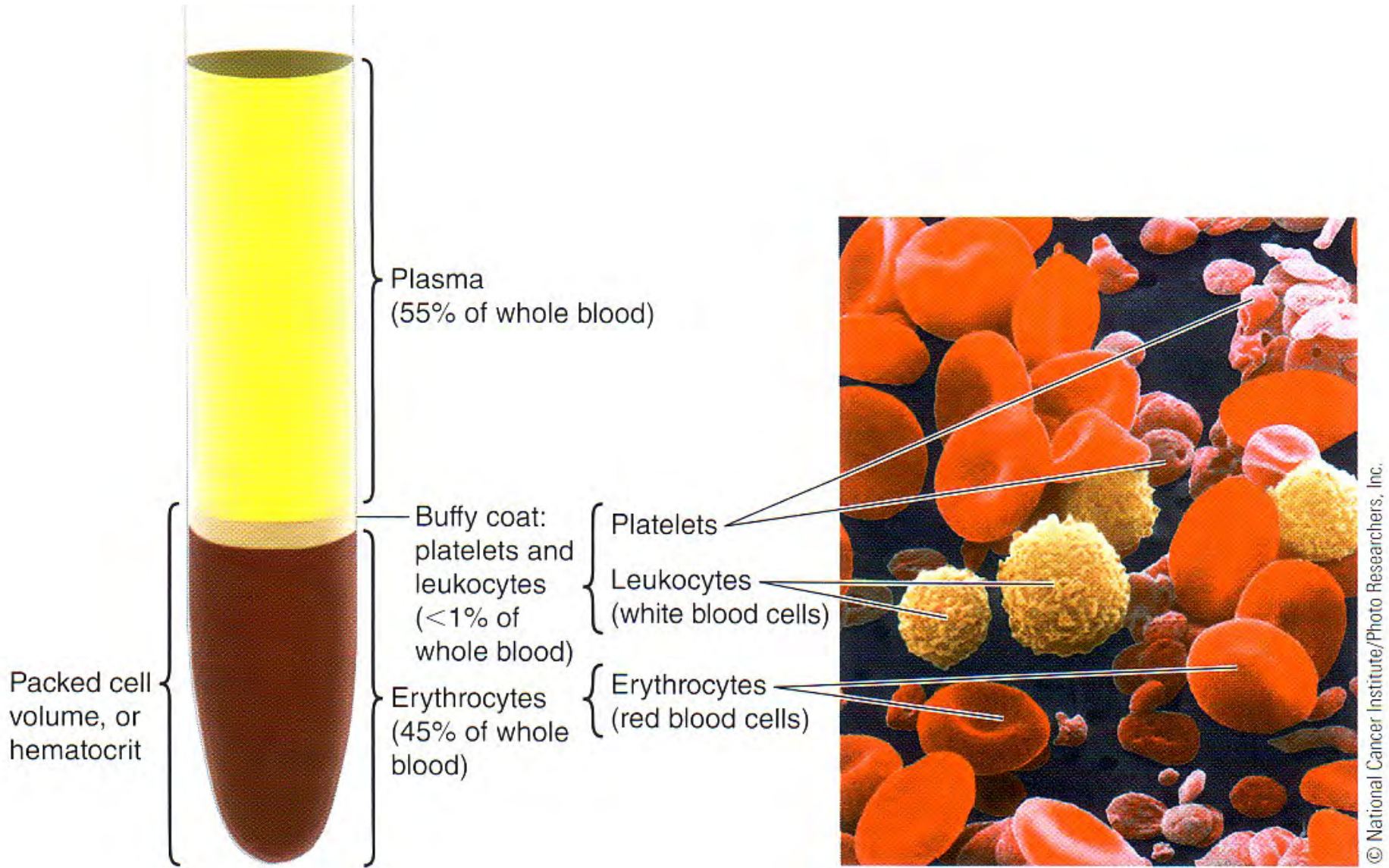


Cuff pressure is greater than 120 mm Hg.  
No blood flows through vessel.  
No sound is heard.

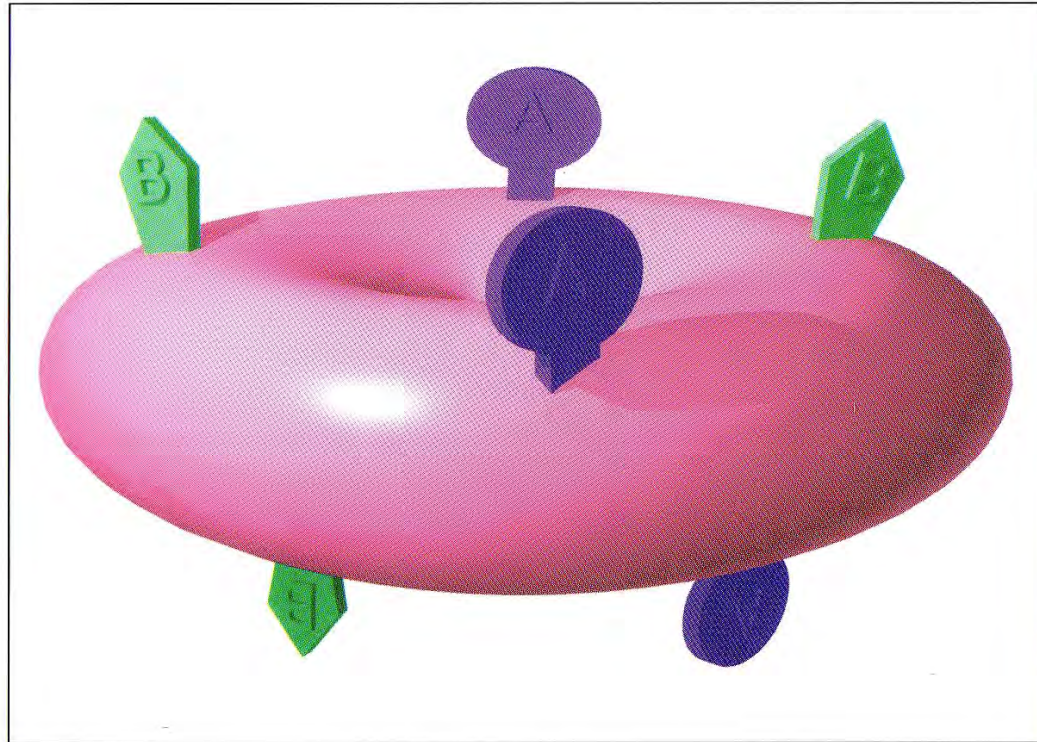
Cuff pressure is between 120 and 80 mm Hg.  
Blood flow through vessel is turbulent whenever blood pressure exceeds cuff pressure.  
Intermittent sounds are heard as blood pressure fluctuates throughout cardiac cycle.

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)

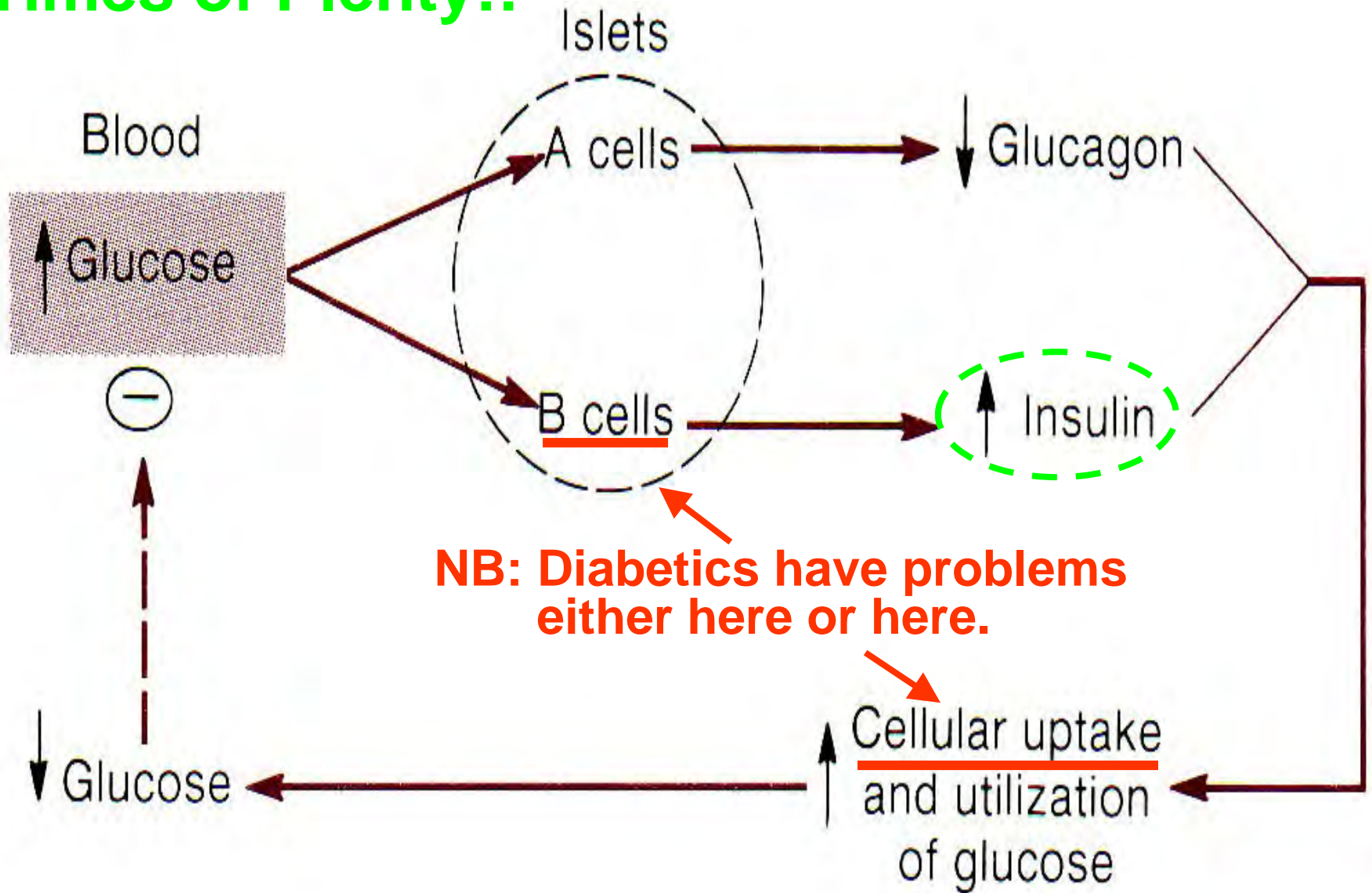
Glucose:  
Sugar in Blood



*Normal: 70-99*  
*Pre-Diabetes: 100-125*  
*Diabetes:  $\geq 126$  mg/dL*



# Times of Plenty!!

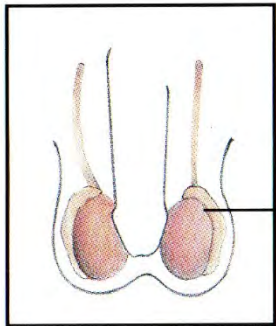


**NB: Diabetics have problems either here or here.**

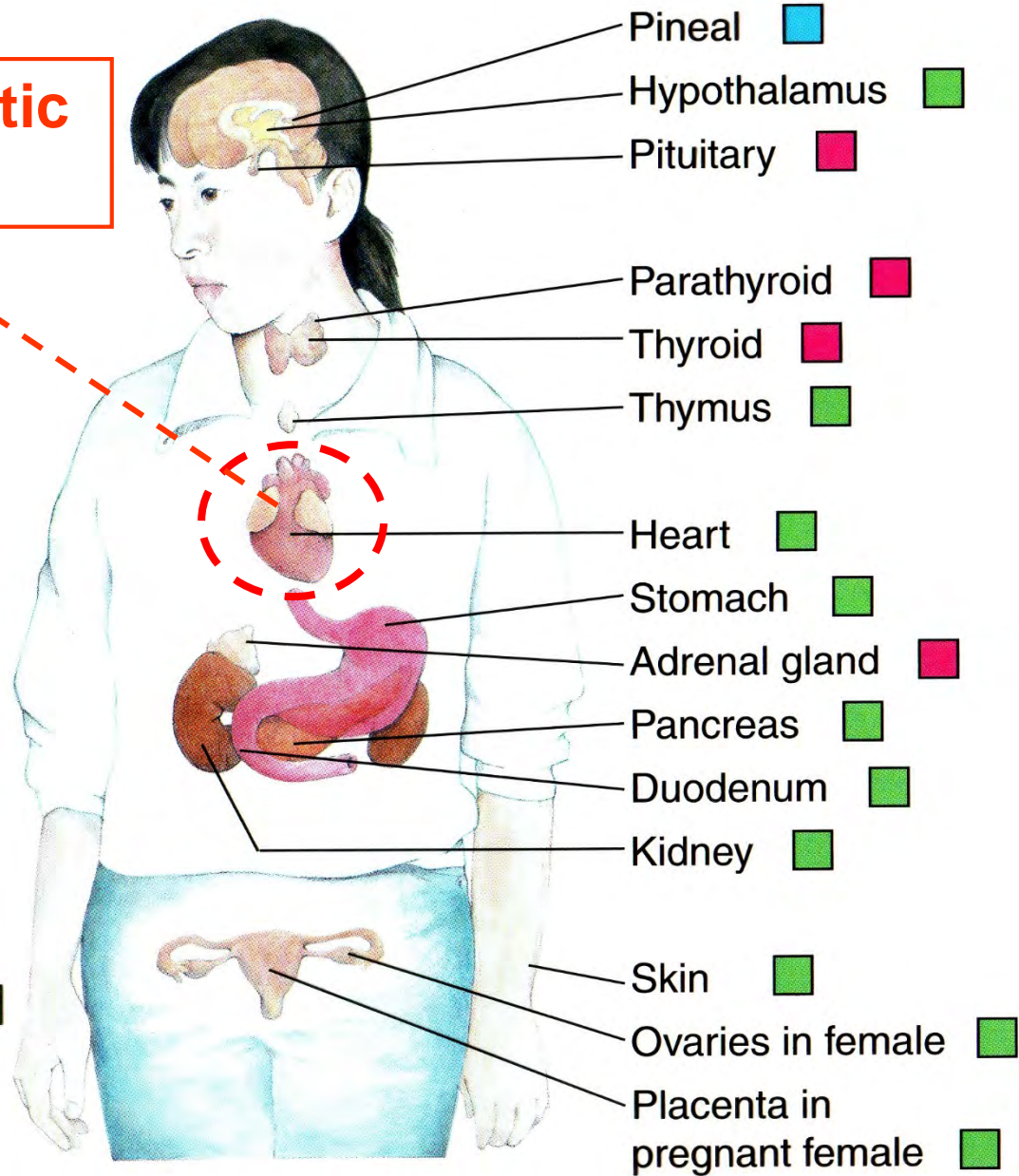
# Endocrine System

**ANP = Atrial Natriuretic Polypeptide**

- Solely endocrine function
- Mixed function
- Complete function uncertain

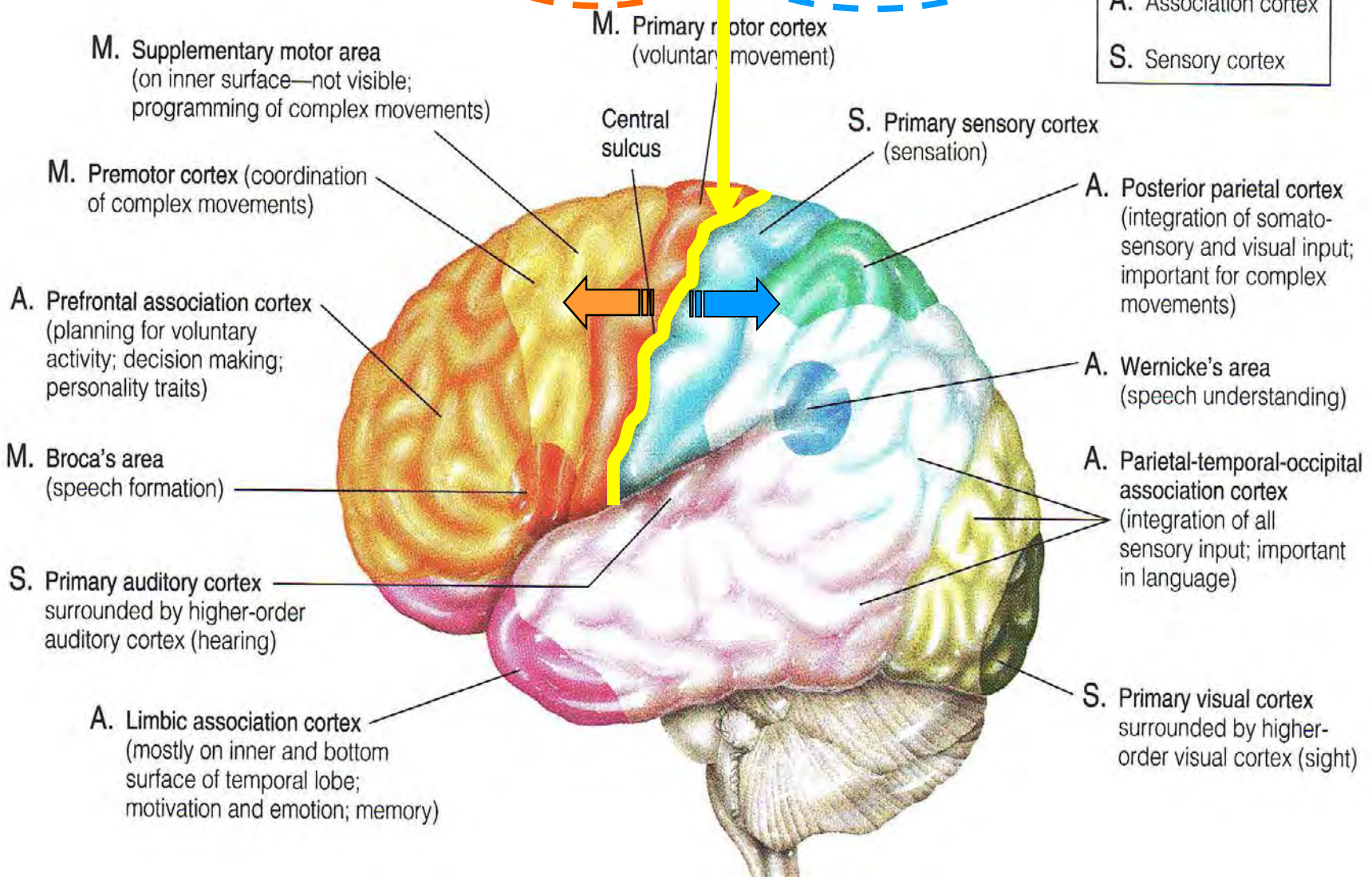


Testes in male ■

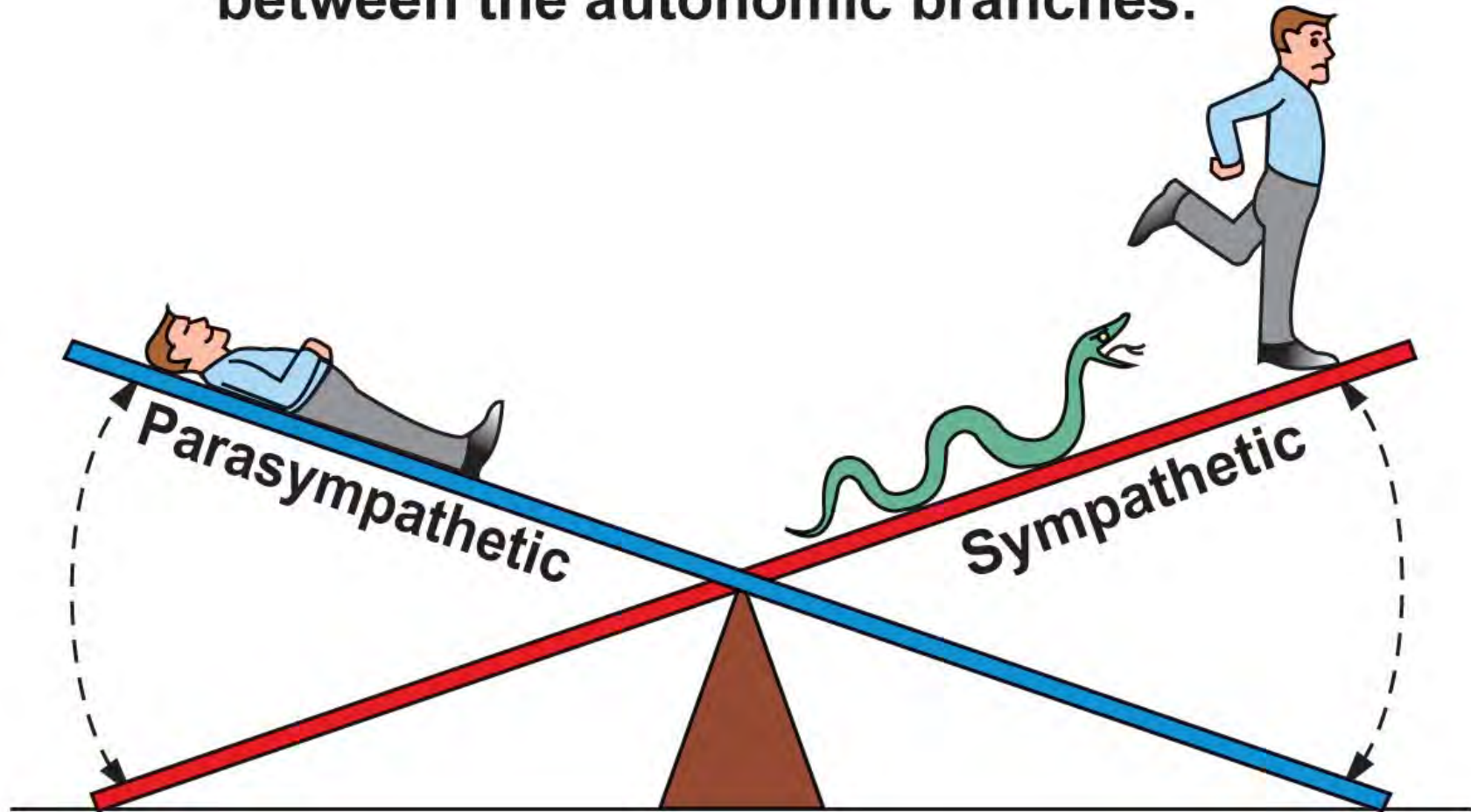




Key	
M.	Motor cortex
A.	Association cortex
S.	Sensory cortex



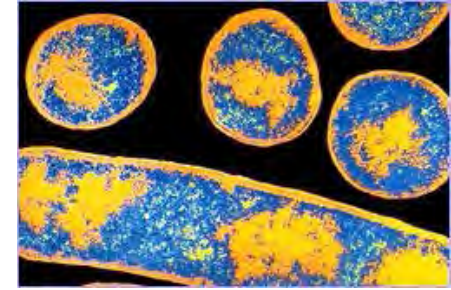
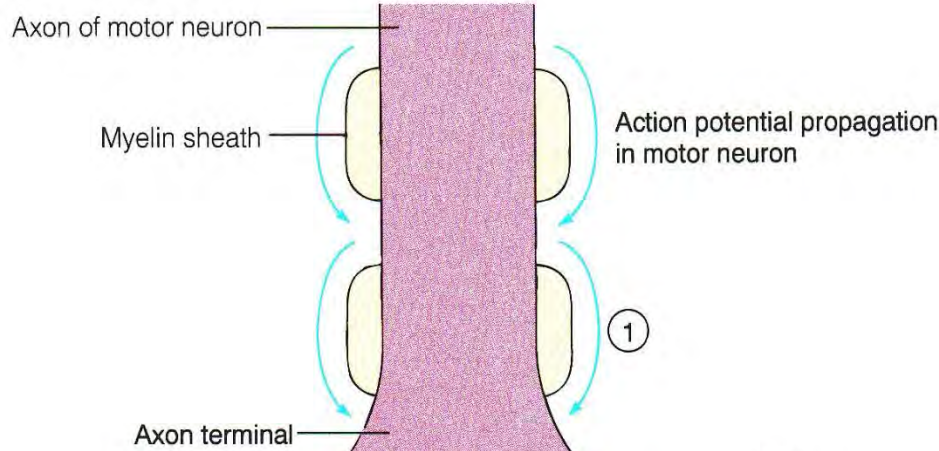
Homeostasis is a dynamic balance between the autonomic branches.



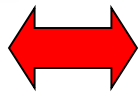
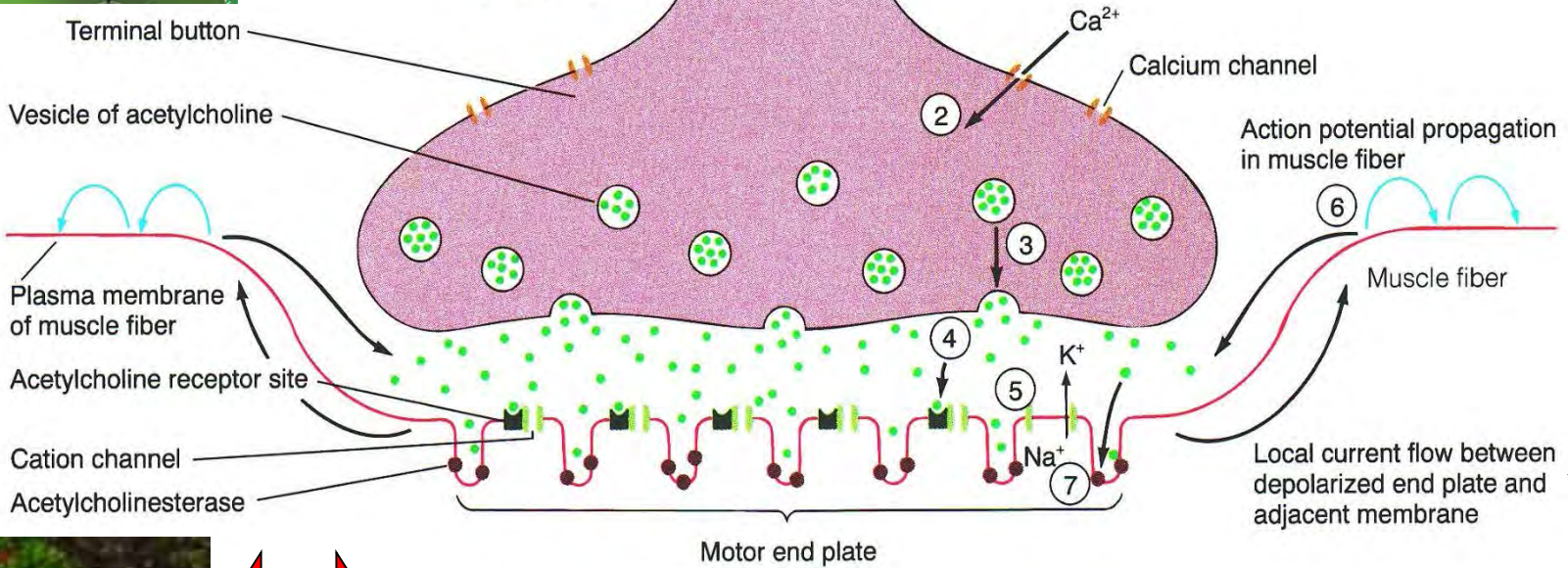
**Rest-and-digest:  
Parasympathetic  
activity dominates.**

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

↑ 3



~~3~~

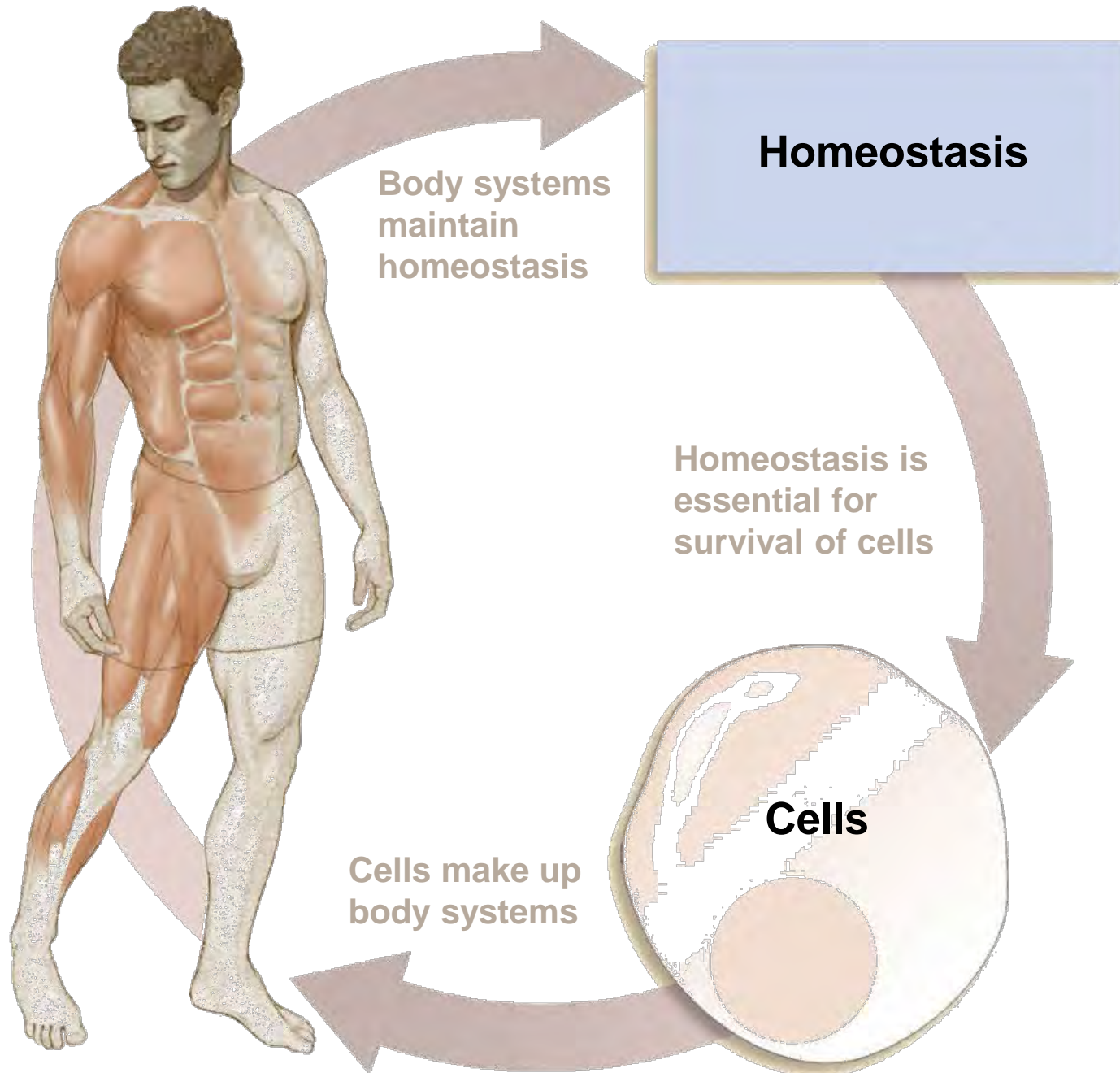


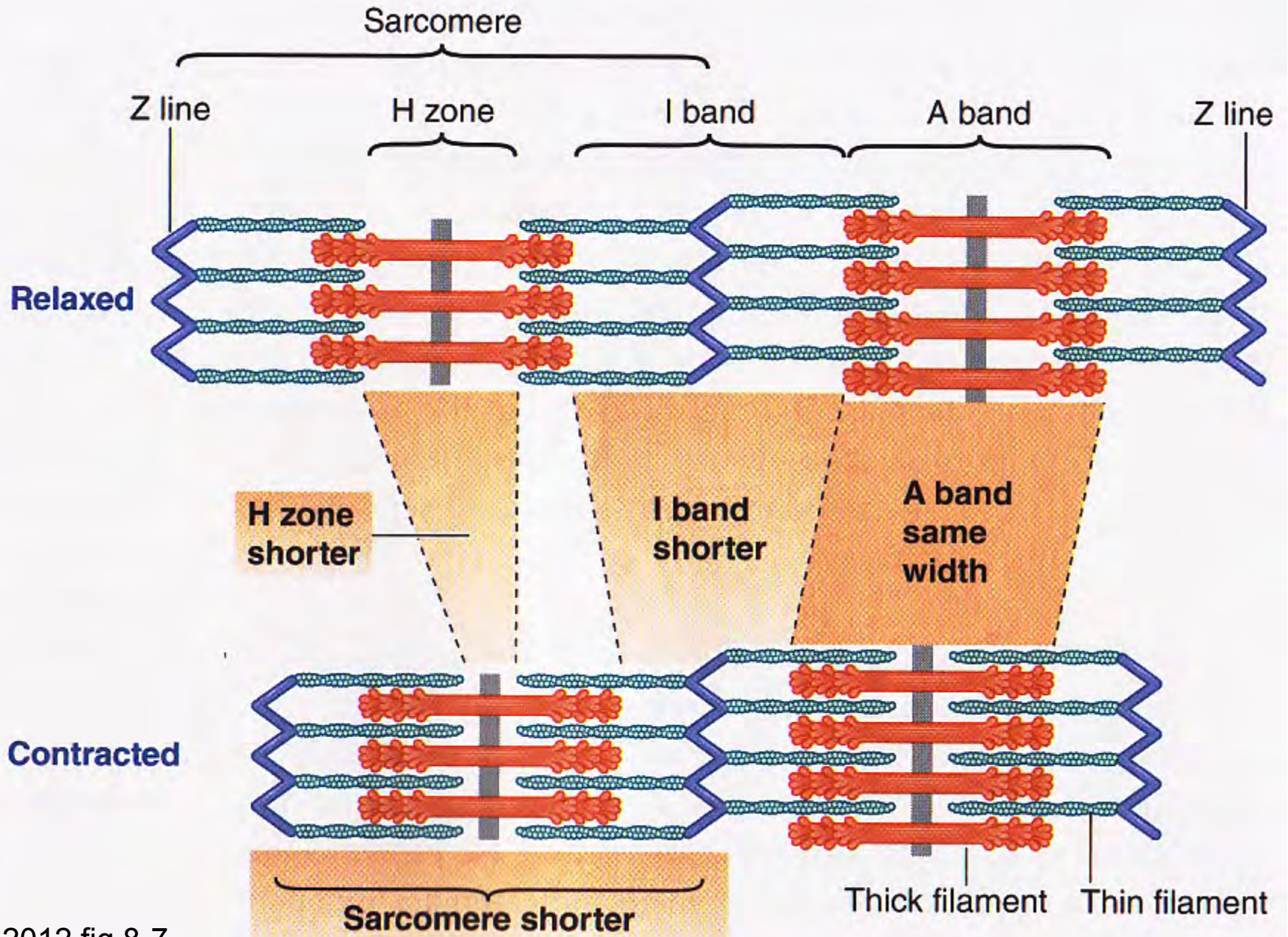
4



~~7~~

# Muscular System





LS 2012 fig 8-7



## Atrophy

*decrease in size  
& strength*

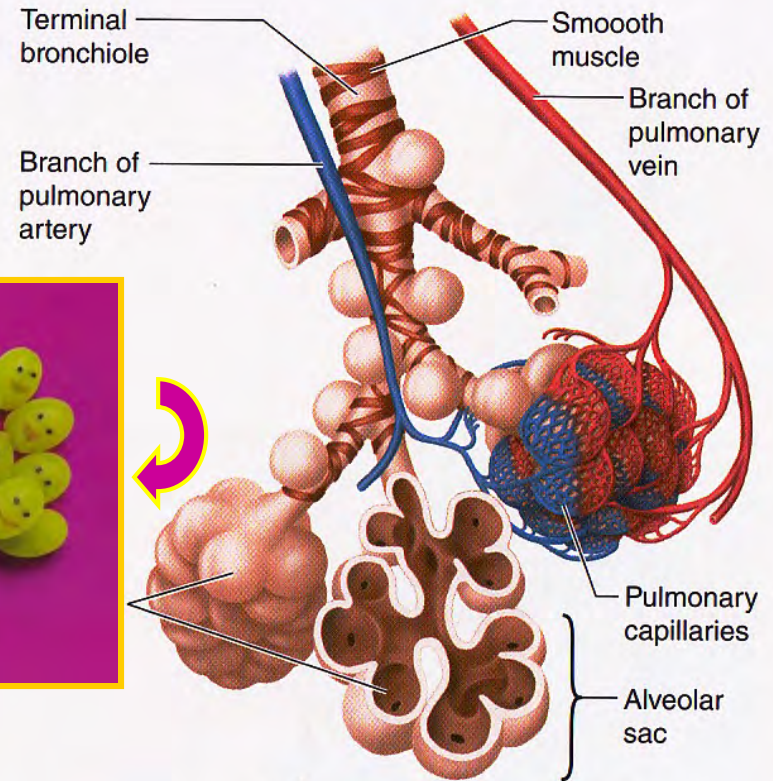
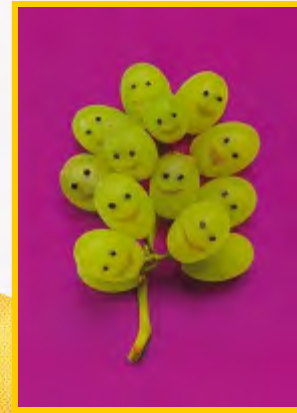
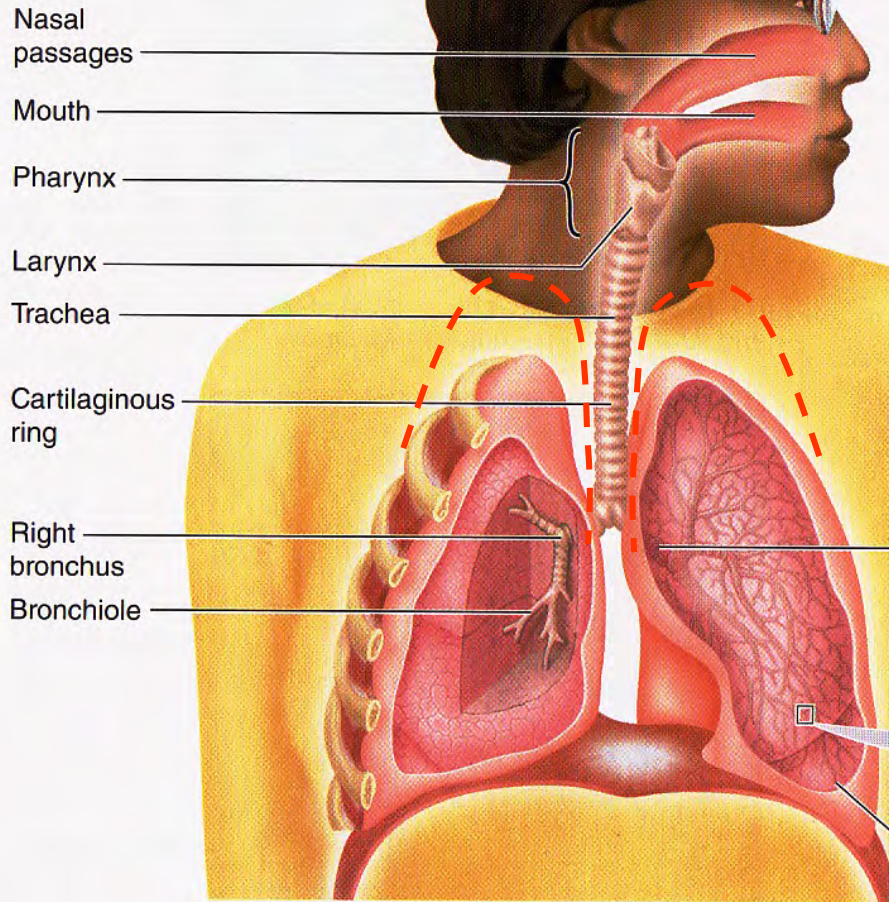
## Hypertrophy

*increase in size  
& strength*

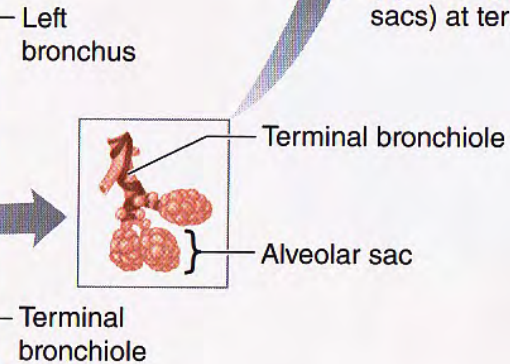


# Respiratory System Anatomy

***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**

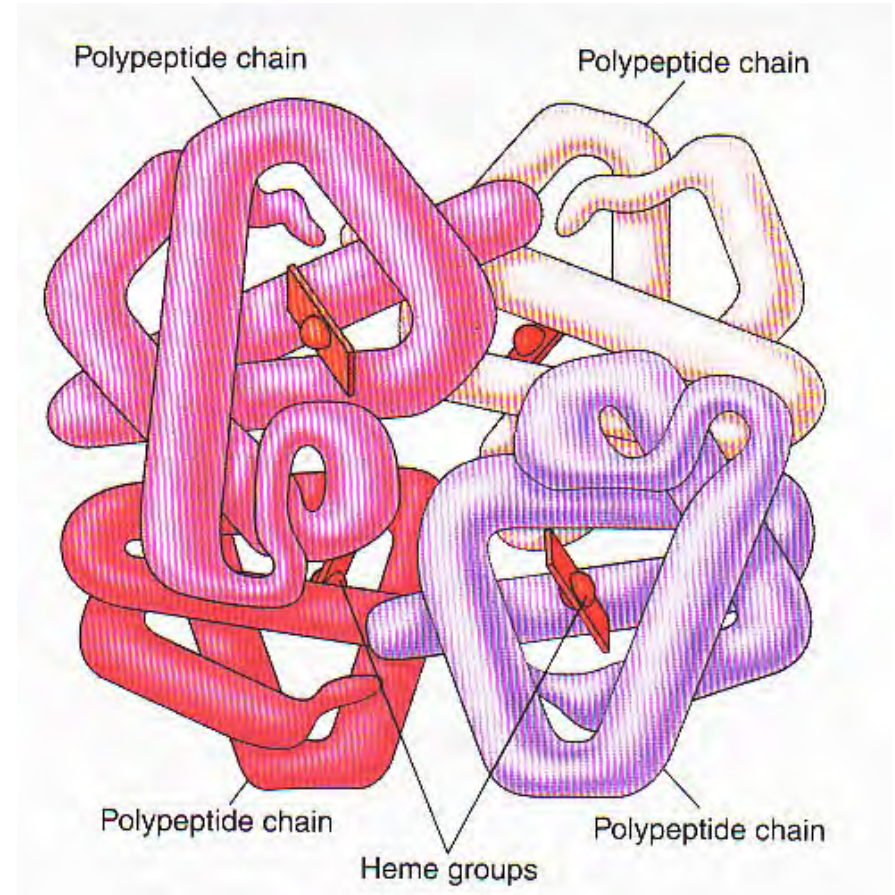
**WHY?**



**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

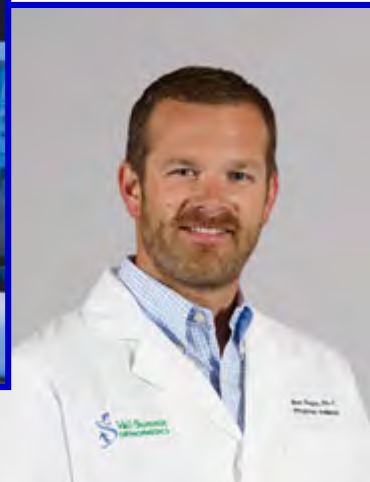


## **Procedures:**

Arthroscopy & microfracture

High Tibial Osteotomy (HTO)

Packing bone graft substitute



## **Blocks/Medications:**

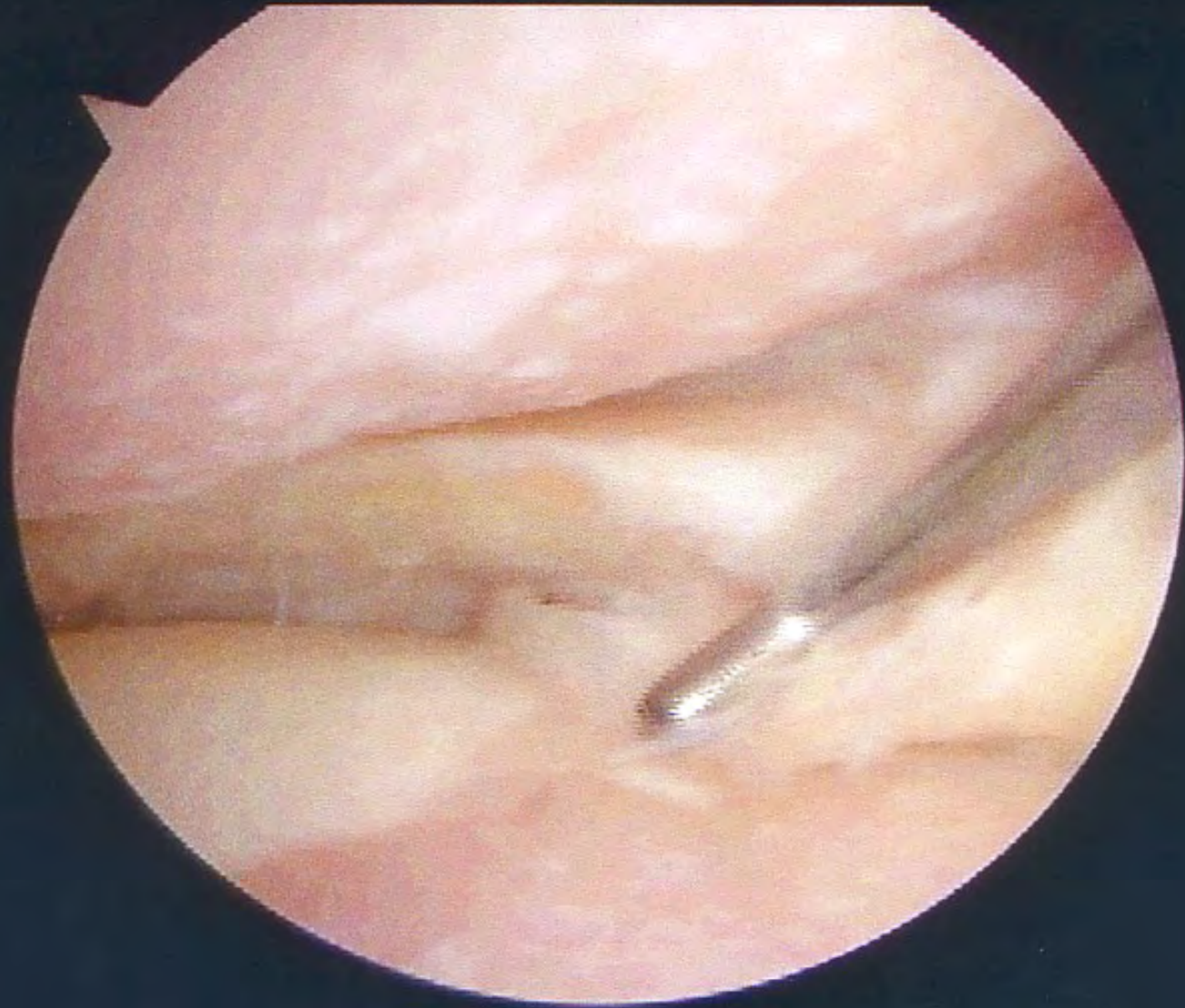
Femoral n. block

General anesthesia

IV Morphine, Oral Oxycotin + Oxycodone,

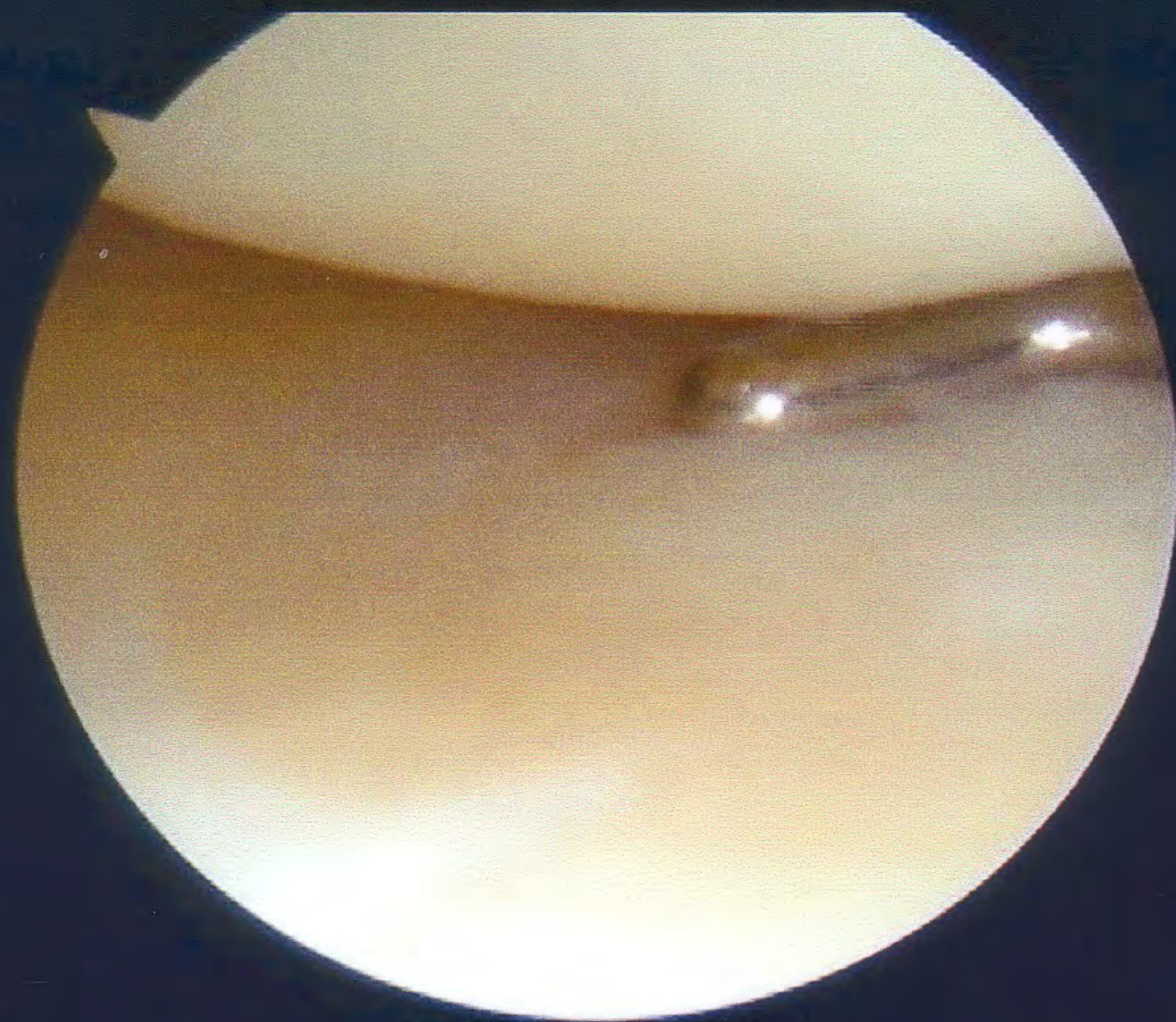
Tylenol, Injectable Lovenox (enoxaparin Na)

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

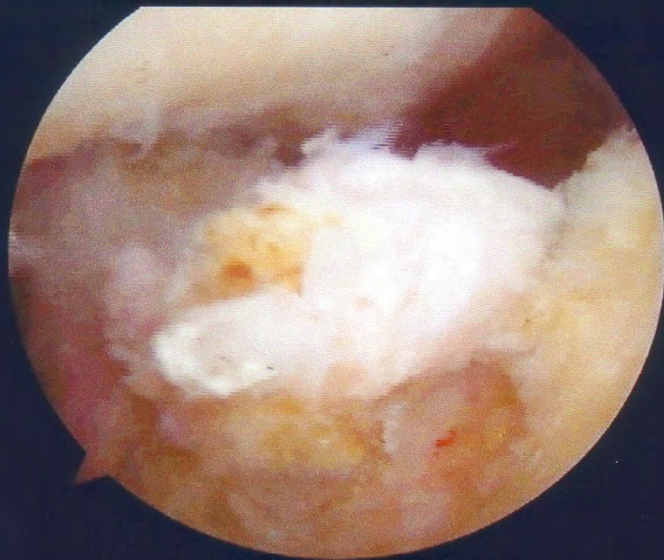


**R knee medial meniscus cleavage & tear**





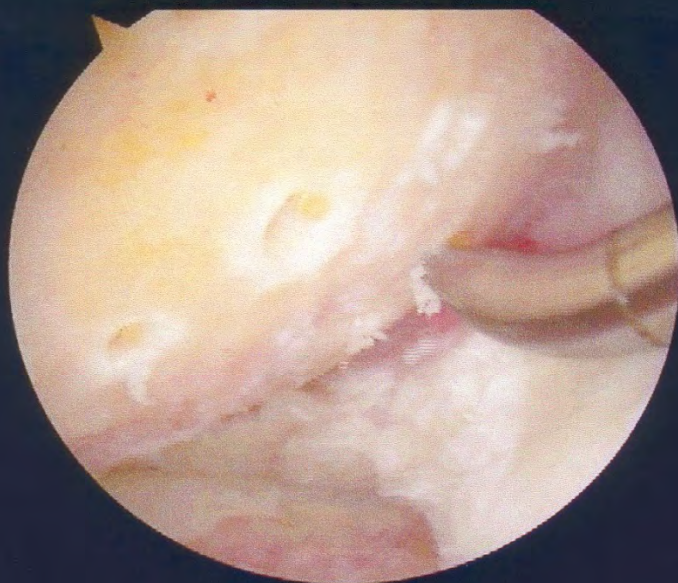
**R knee lateral compartment in good shape!**



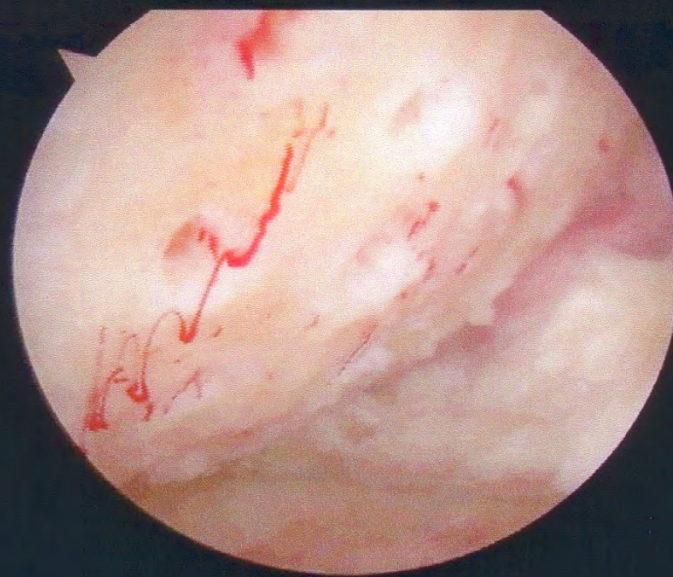
**1. Arthroscopy clean-up**



**2. Debridement complete**



**3. Microfracture with awl**



**4. Punctuate bleeding**

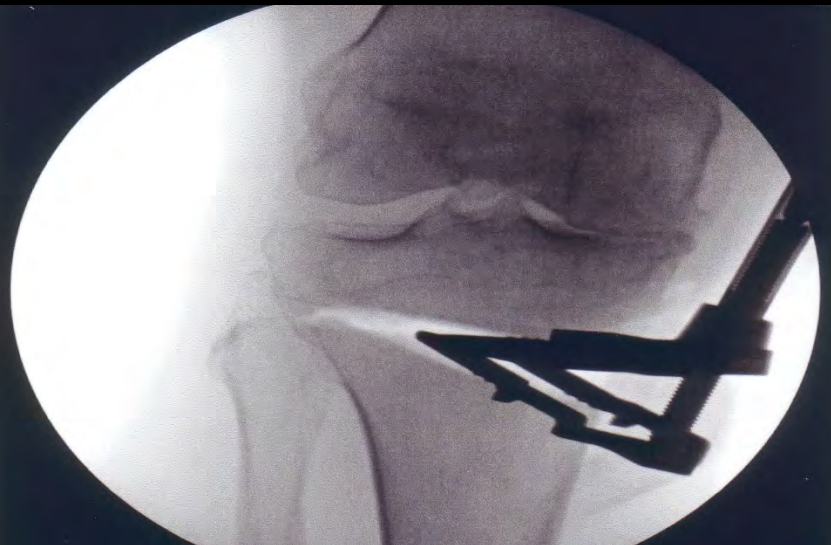


**Further bleeding to create superclot!**

# High-Tibial Osteotomy (HTO) to Realign the Joint



**1. Oscillating saw cut**



**2. R plate/scaffolding insert**



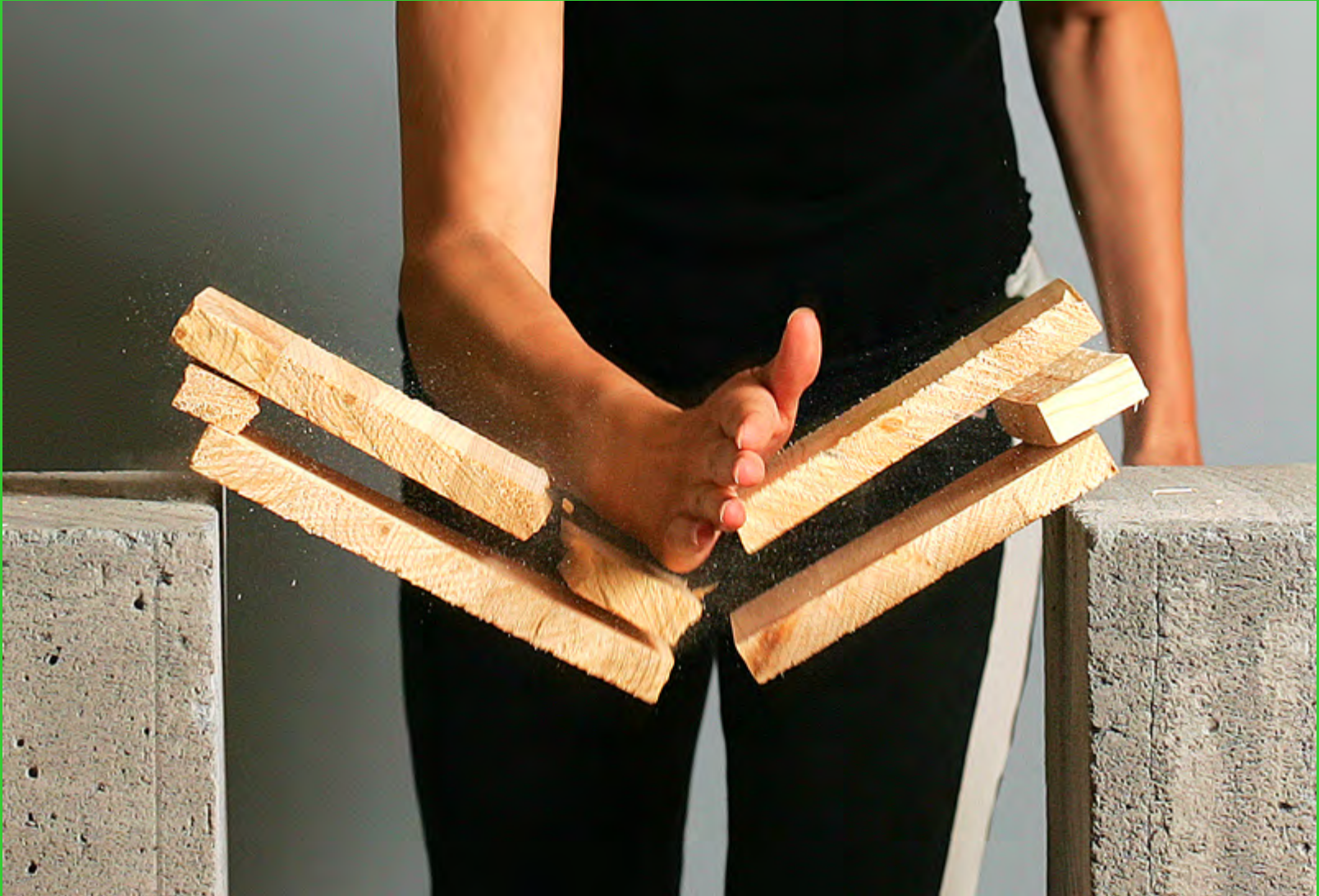
**3. Align, stabilize w/screws & pack defect**

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  $\equiv$  Torture Device**

***Break for discussion/questions!***



# Body Levels of Organization

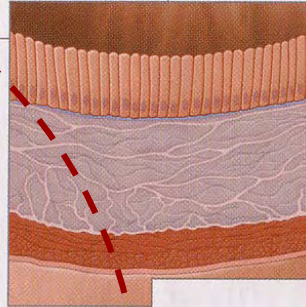
1. Molecular



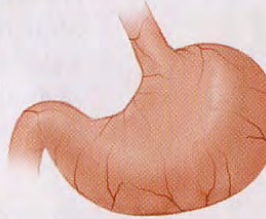
2. Cellular



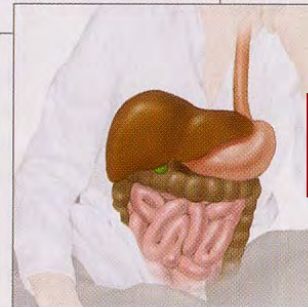
3. Tissue



4. Organ

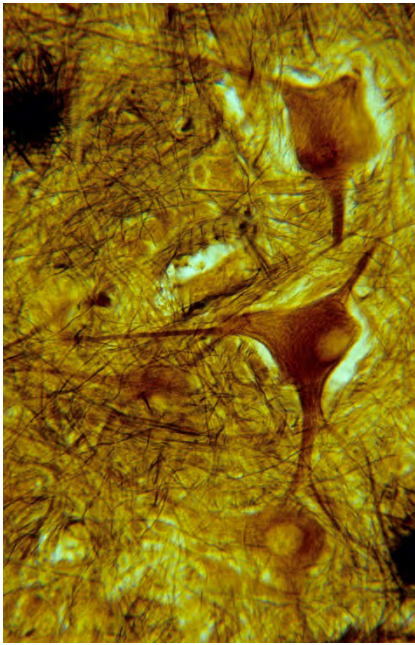


5. System

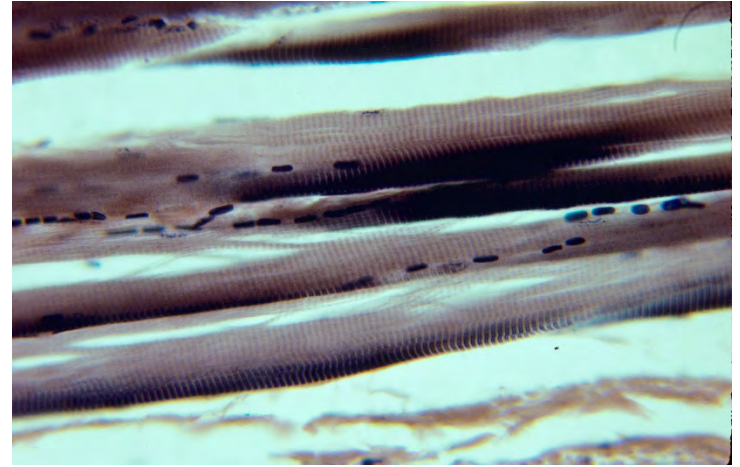


Entire Organism,  
like you & me!

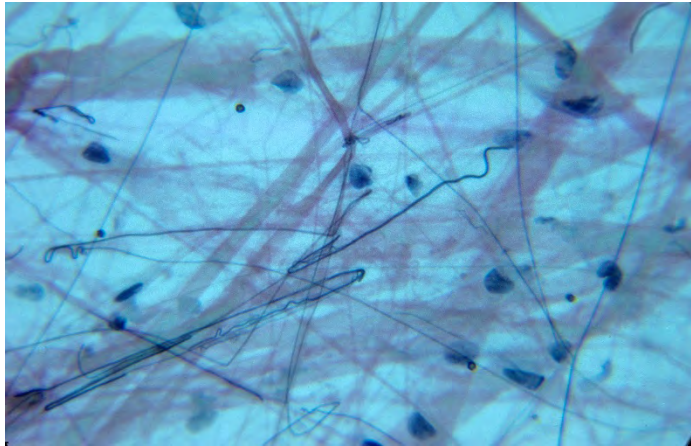




**Nerve conducts**



**Muscle contracts**



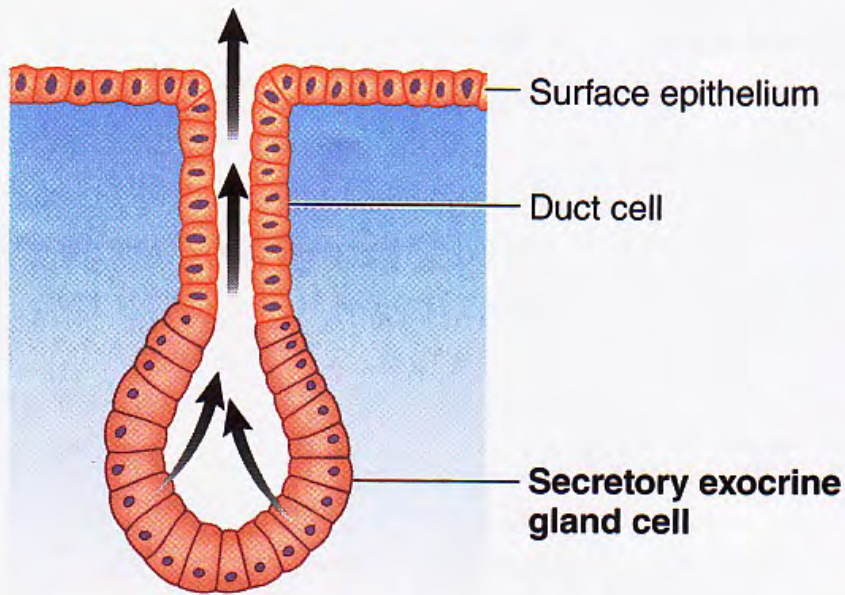
**Connective connects!!**



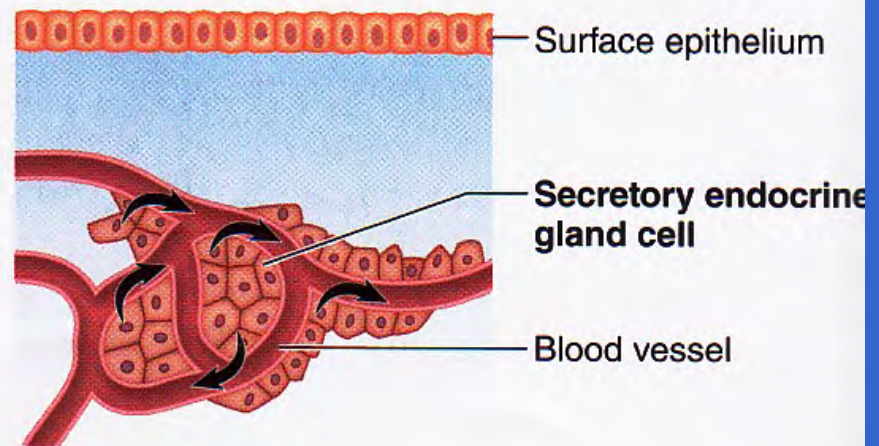
**Epithelial covers**



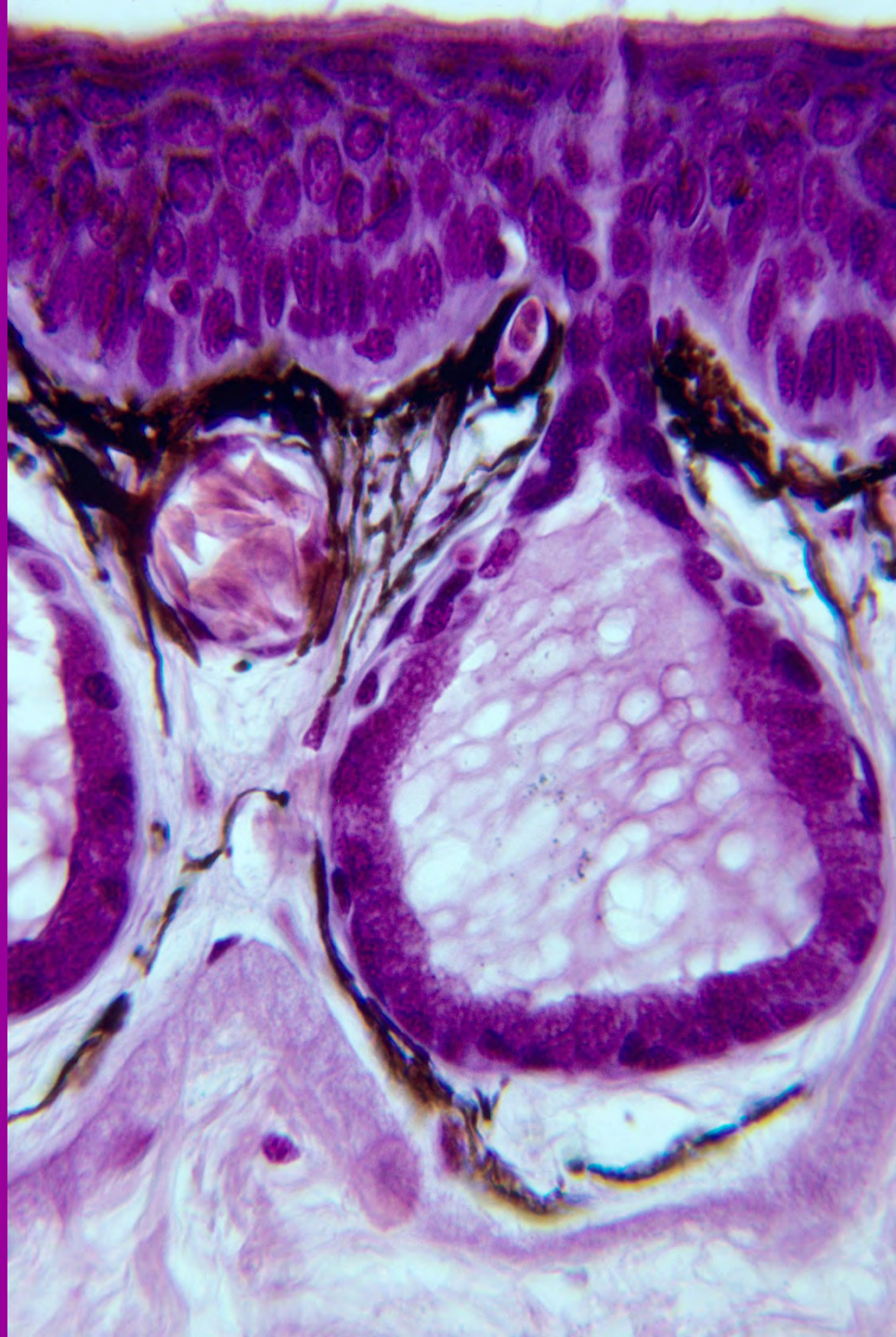
# ***Epithelial tissue gives rise to glands: (a) exocrine & (b) endocrine***



**(a) Exocrine gland**



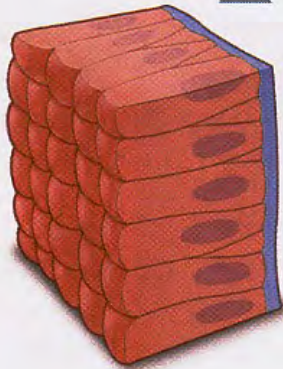
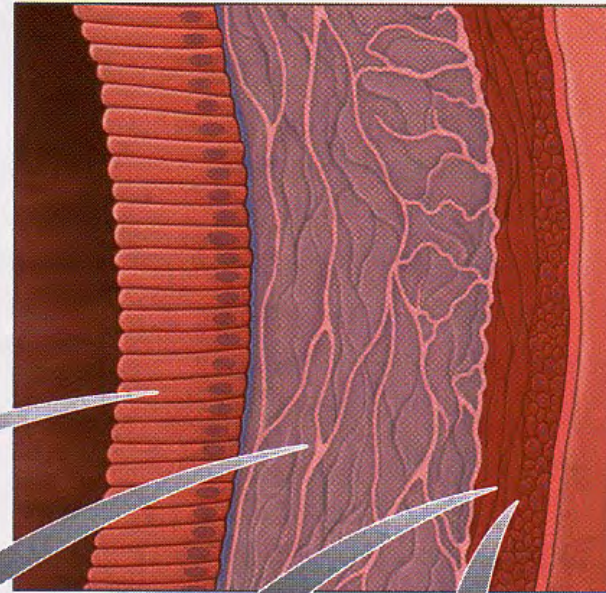
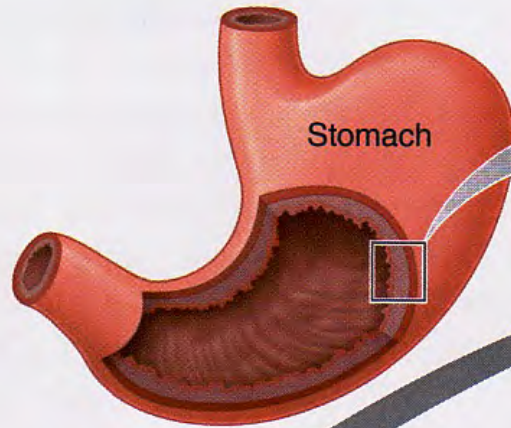
**(b) Endocrine gland**



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

# Organs are made up $\geq 2$ tissue types

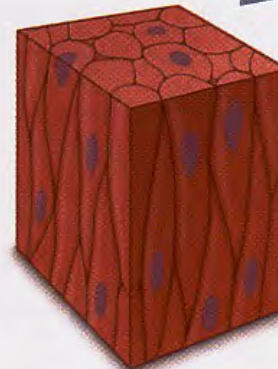
**Organ:**  
Body structure that integrates different tissues and carries out a specific function



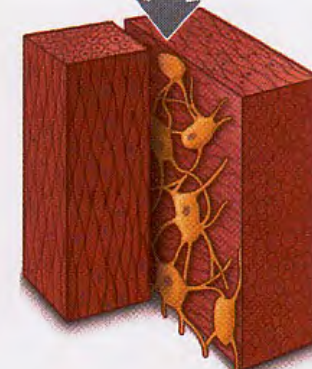
**Epithelial tissue**  
protection, secretion,  
absorption



**Connective tissue**  
structural support

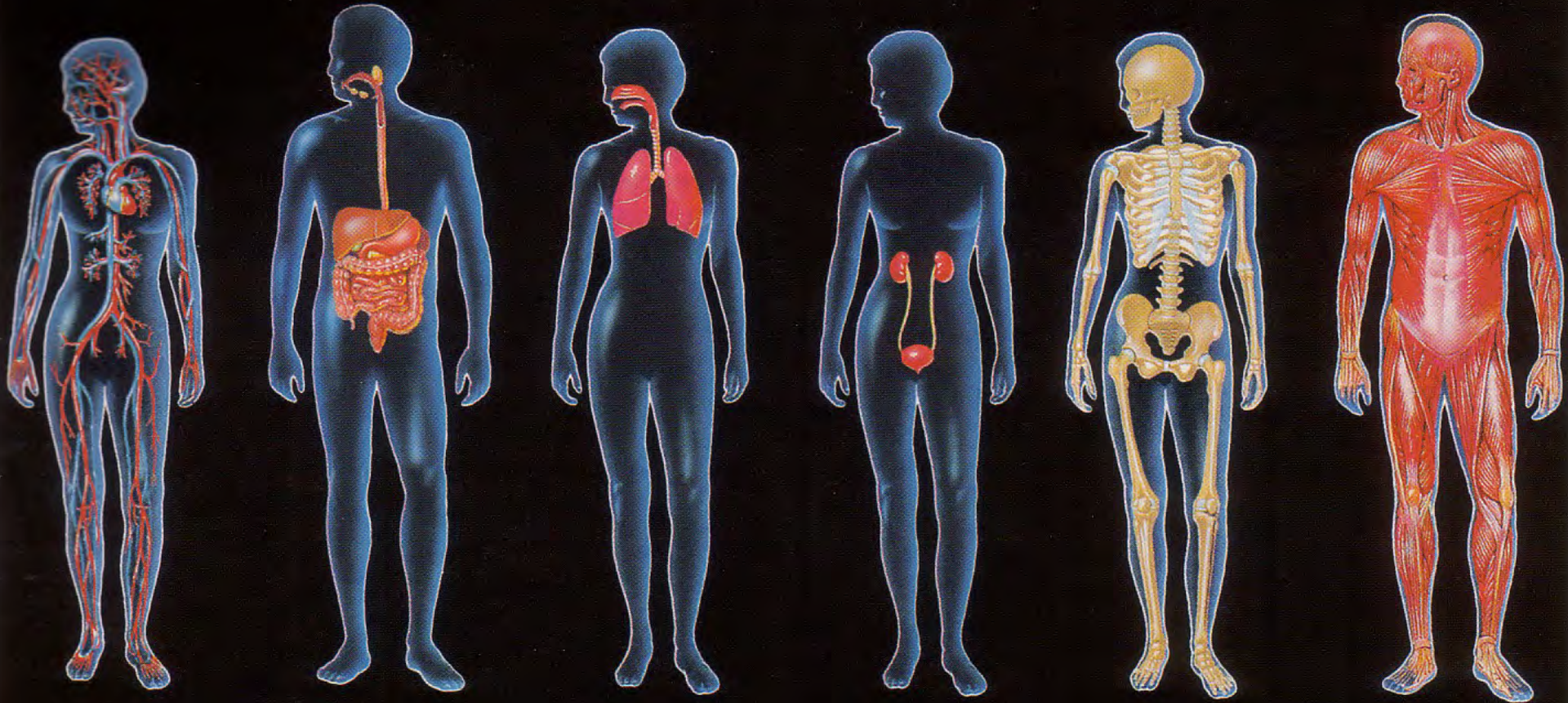


**Muscle tissue**  
movement

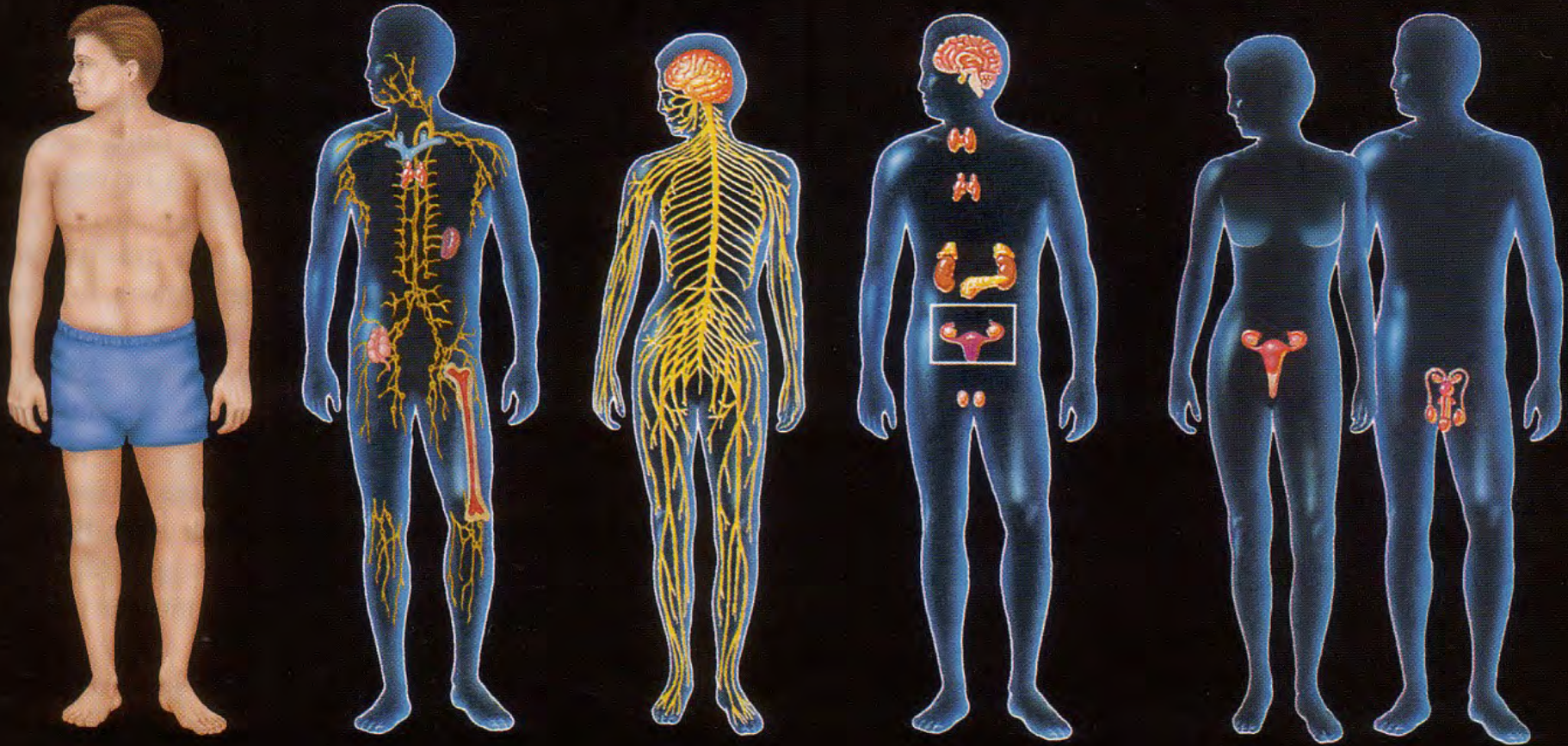


**Nervous tissue**  
communication,  
coordination,  
control

# *Which body systems?*



# *Which body systems?*



# *Why study human physiology?*







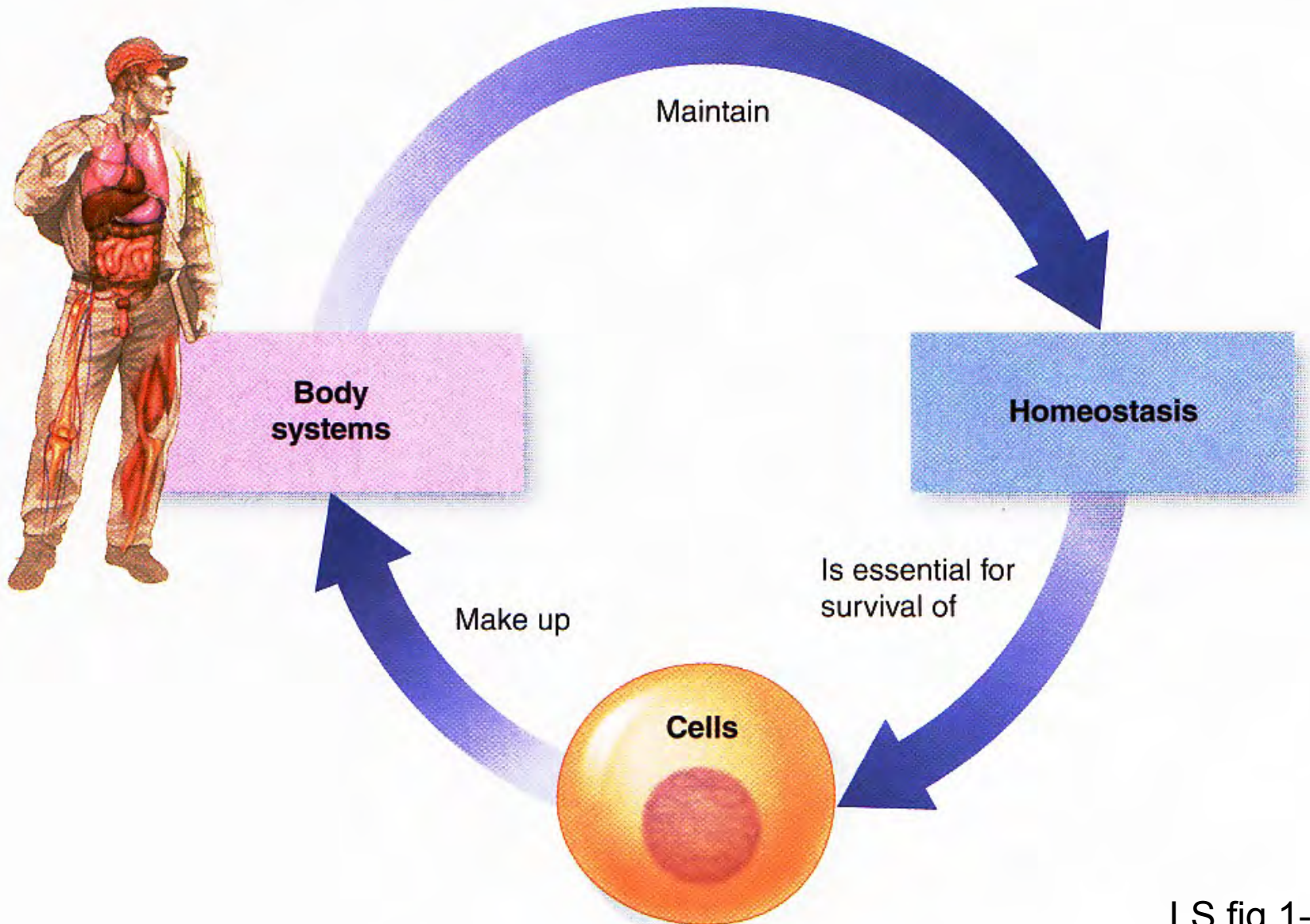


***KNOWLEDGE IS POWER!!!***



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

# Homeostasis is essential for cell survival!

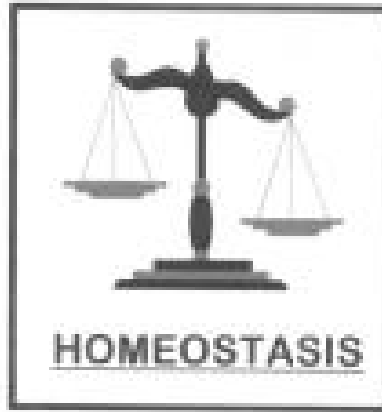


***Maintenance of a relative constancy in the Internal environment = ECF = fluid outside of cells***

**milieu  
interieur?**



**Claude Bernard**

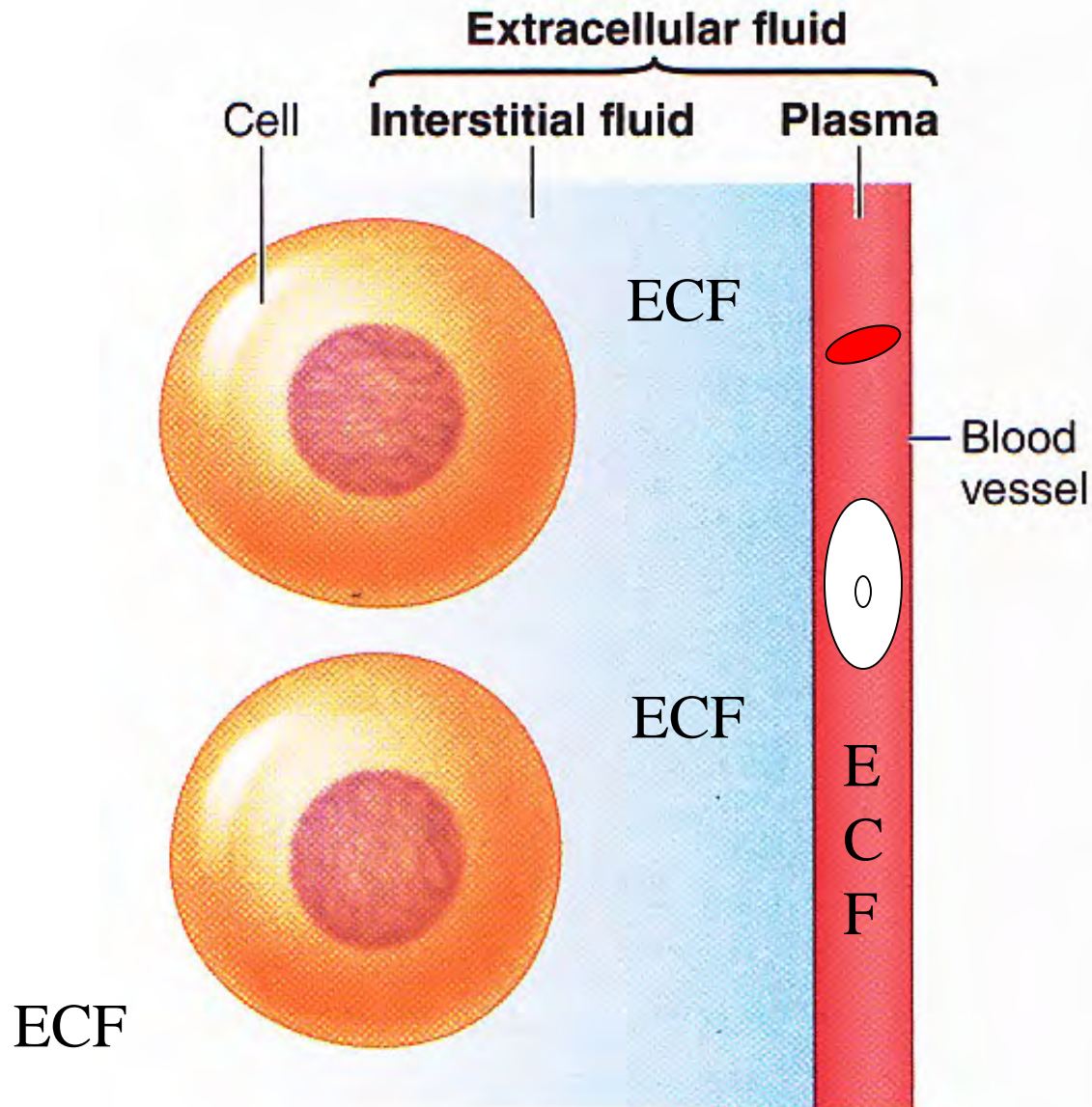


**100 trillion  
cells working  
intimately**

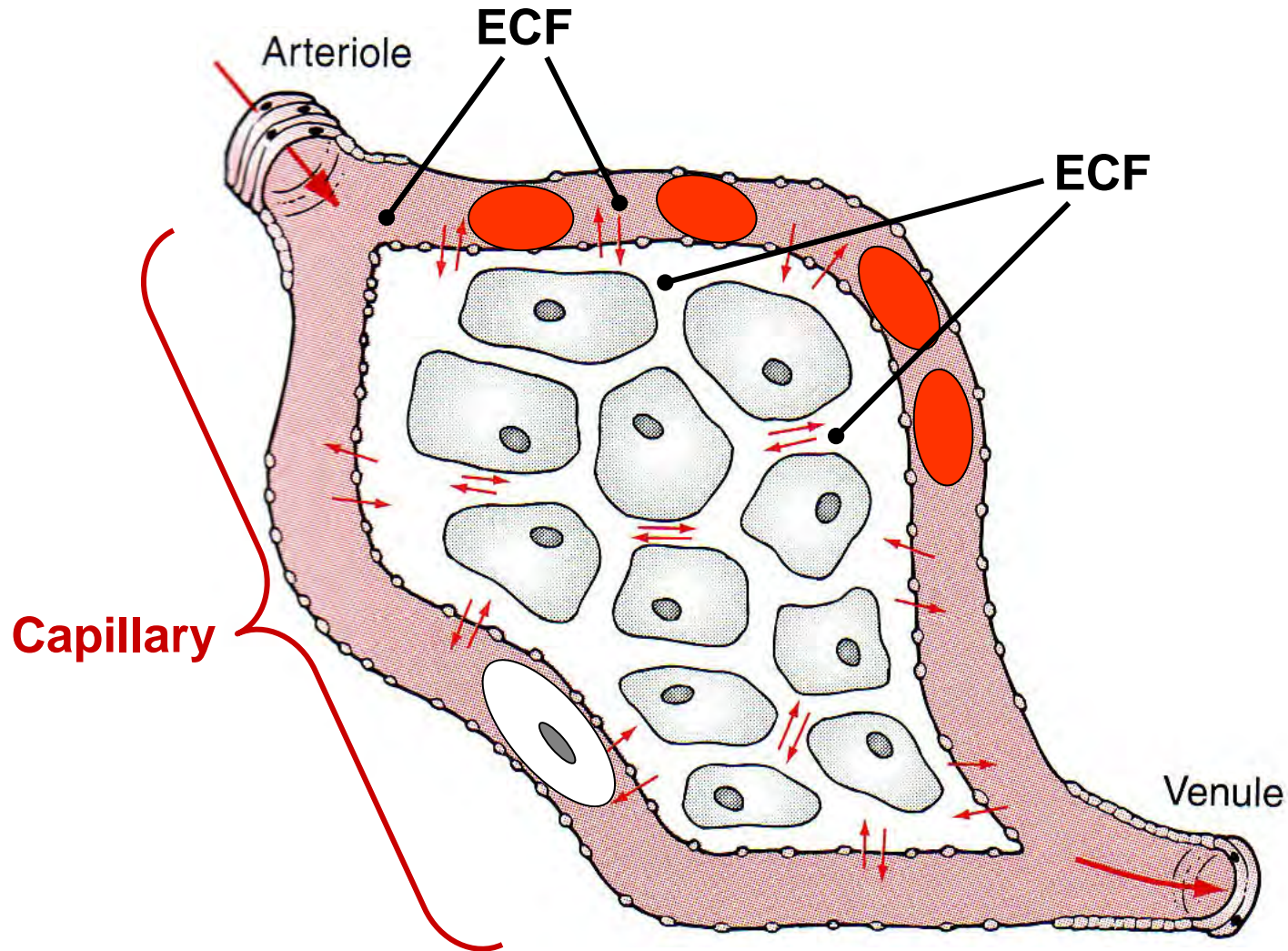


**Walter B. Cannon**

# Where is extracellular fluid?

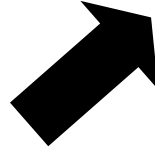


# Where is extracellular fluid?

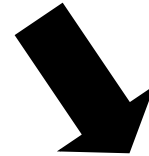


As long as between/outside cells, ECF everywhere?

**ECF = Extracellular**

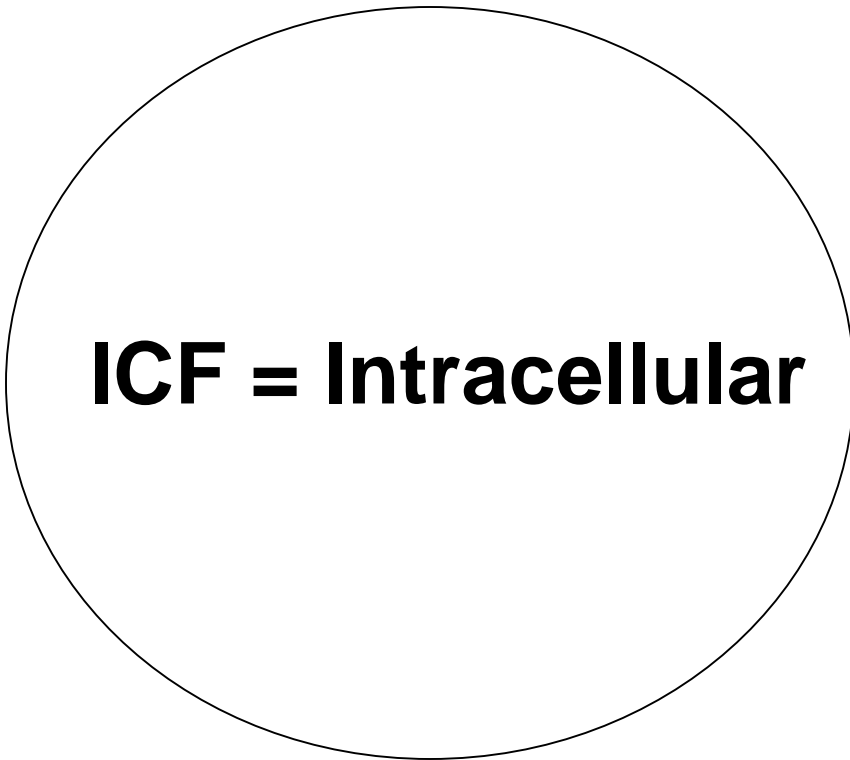


**Plasma**  
(within CV System)



**Interstitium**  
(eg, between  
muscle cells)

**ICF = Intracellular**



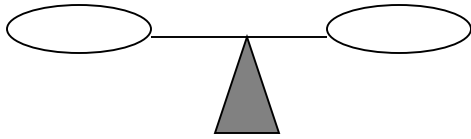
HOMEOKINESIS?



# Metabolic

ANA-

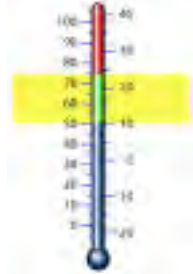
CATA-



# H<sub>2</sub>O



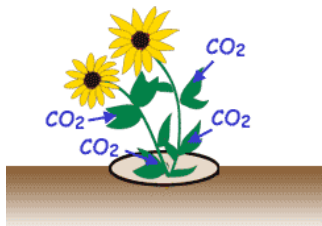
# T<sub>o</sub>C



## Dr. Evonuk's 6 Balances

# O<sub>2</sub>/CO<sub>2</sub>

Carbon Dioxide



# Ion<sup>+/-</sup>



Captain Calcium



# pH

Bicarbonate and pH Balance

