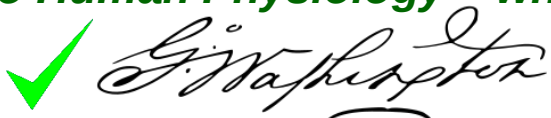
...Welcome to Human Physiology – what makes us tick!

BI 121 Lecture 1



I. *Announcements*: Please check & sign attendance roster. Not on list? See Pat during break/> class. *Lab 1 Histology* tomorrow in 130 HUE: 12 n & 1 pm sections. Much fun!!

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

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

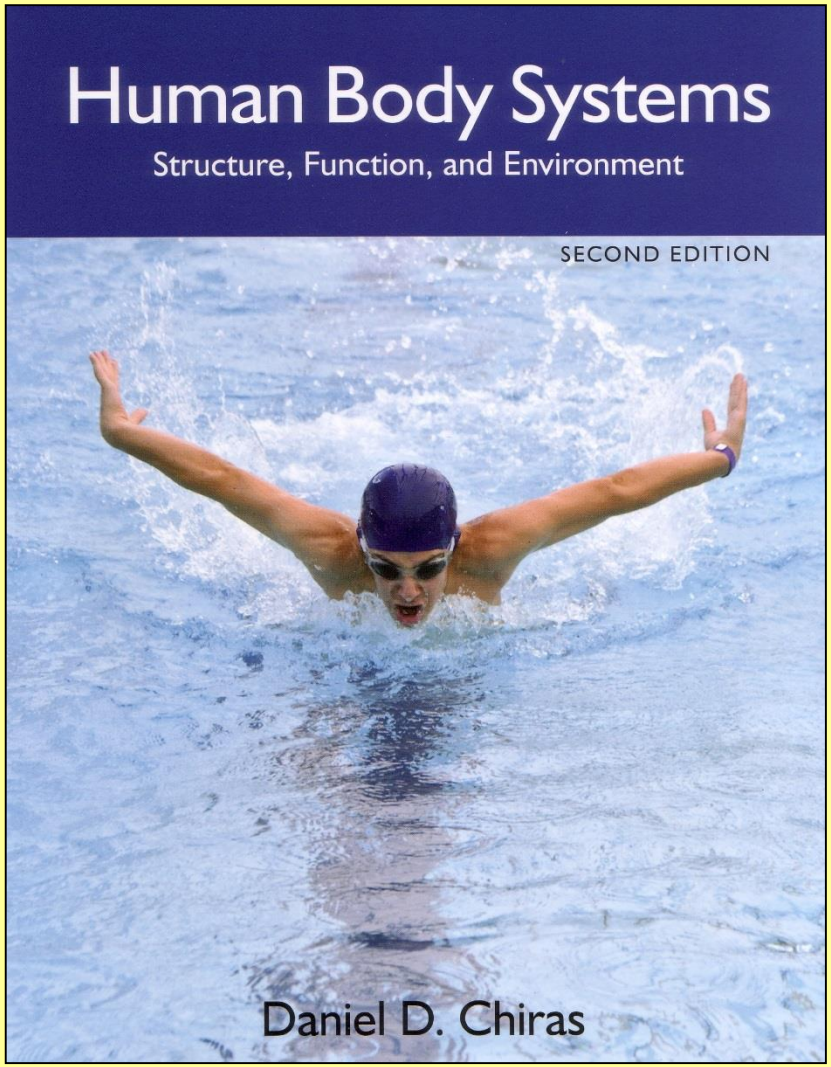
- **A. What? cf: Anatomy LS p 1**
- **B. Where?Body Levels of Organization LS pp1-6, DC pp1-5**
- **C. How? Different Study Approaches LS p 1**
- **D. Why? Security+Decision-Making Power LS p xxi, DC p v**

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/



DC

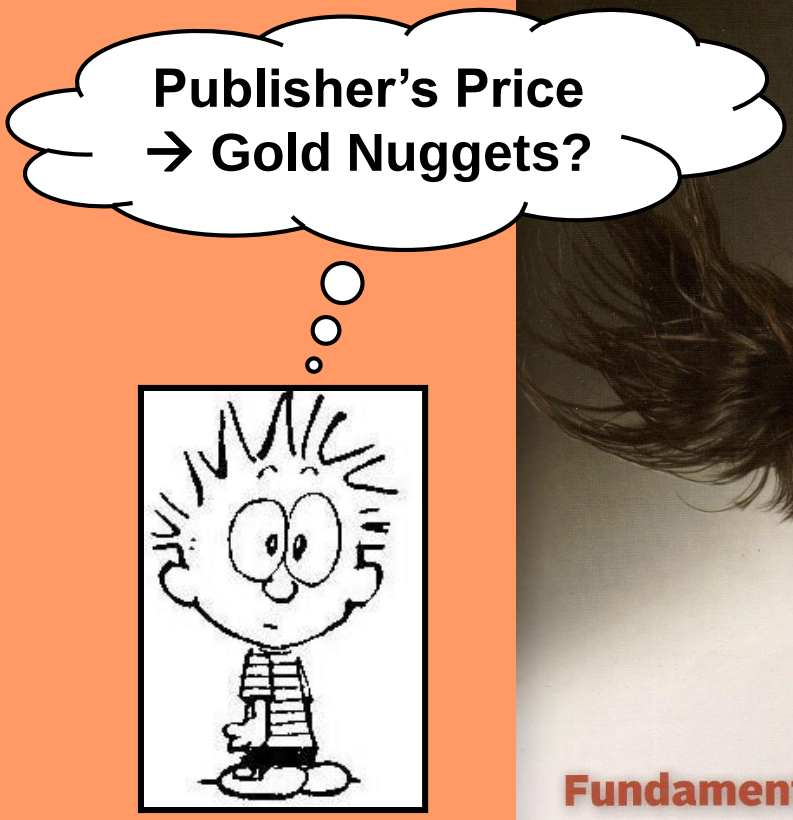
2013 2nd ed $41.25 Used $31.00

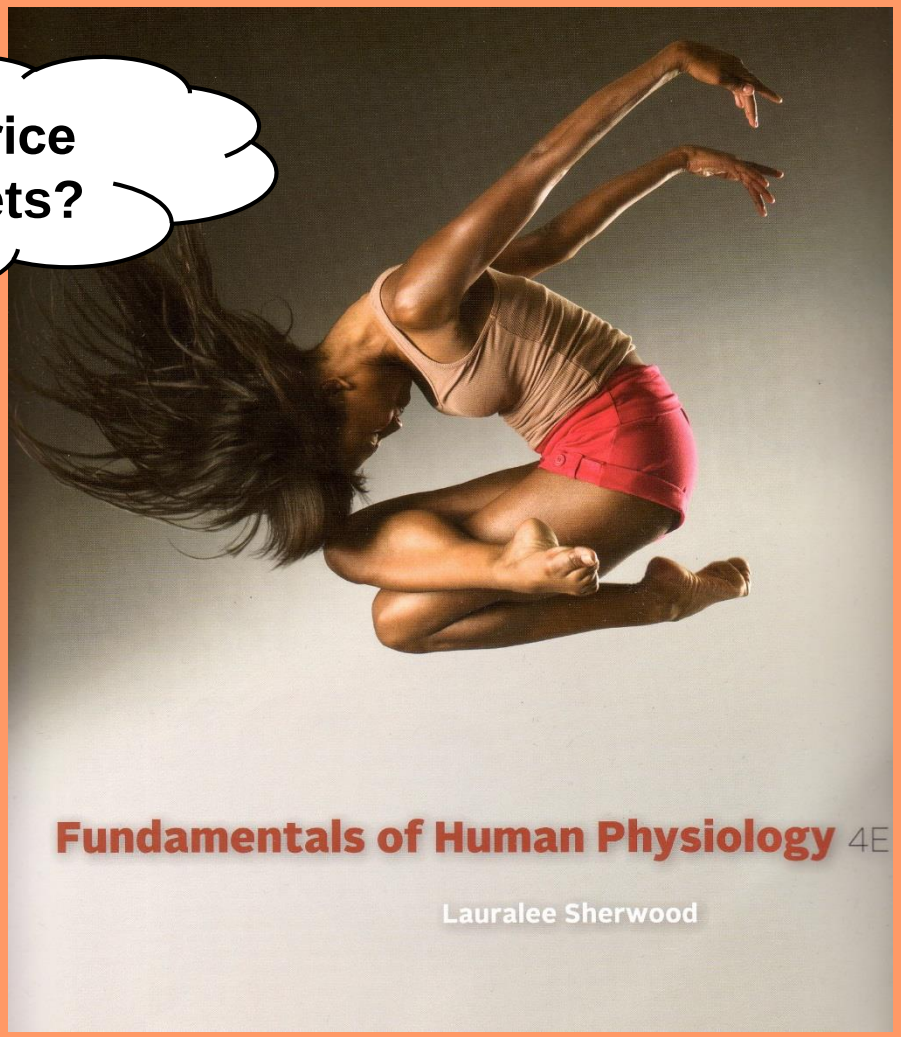
Introduction to Human Physiology
Department of Biology, BI 121
Laboratory Manual
University of Oregon
Eugene, OR 97403
Summer 2019

LM

Lab Notebook $ 9.95

BI 121 Optional Source @ Amazon.com or Smith Family Bookstore?



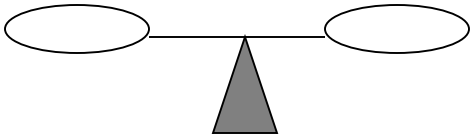


LS 2012

New $266.95! Used $15.99 - $73.12 Rental $31.49 E-Book $20.99

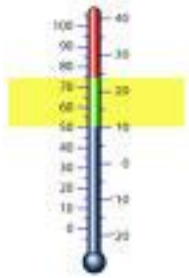
Metabolic

ANA- CATA-



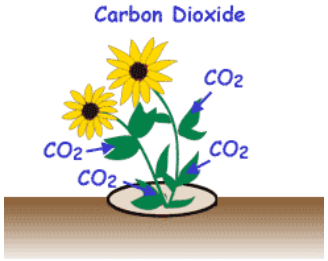
H_2O

T°C



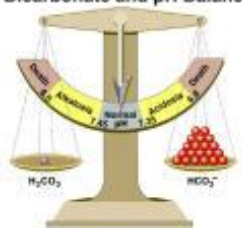
Dr. Evonuk's 6 Balances

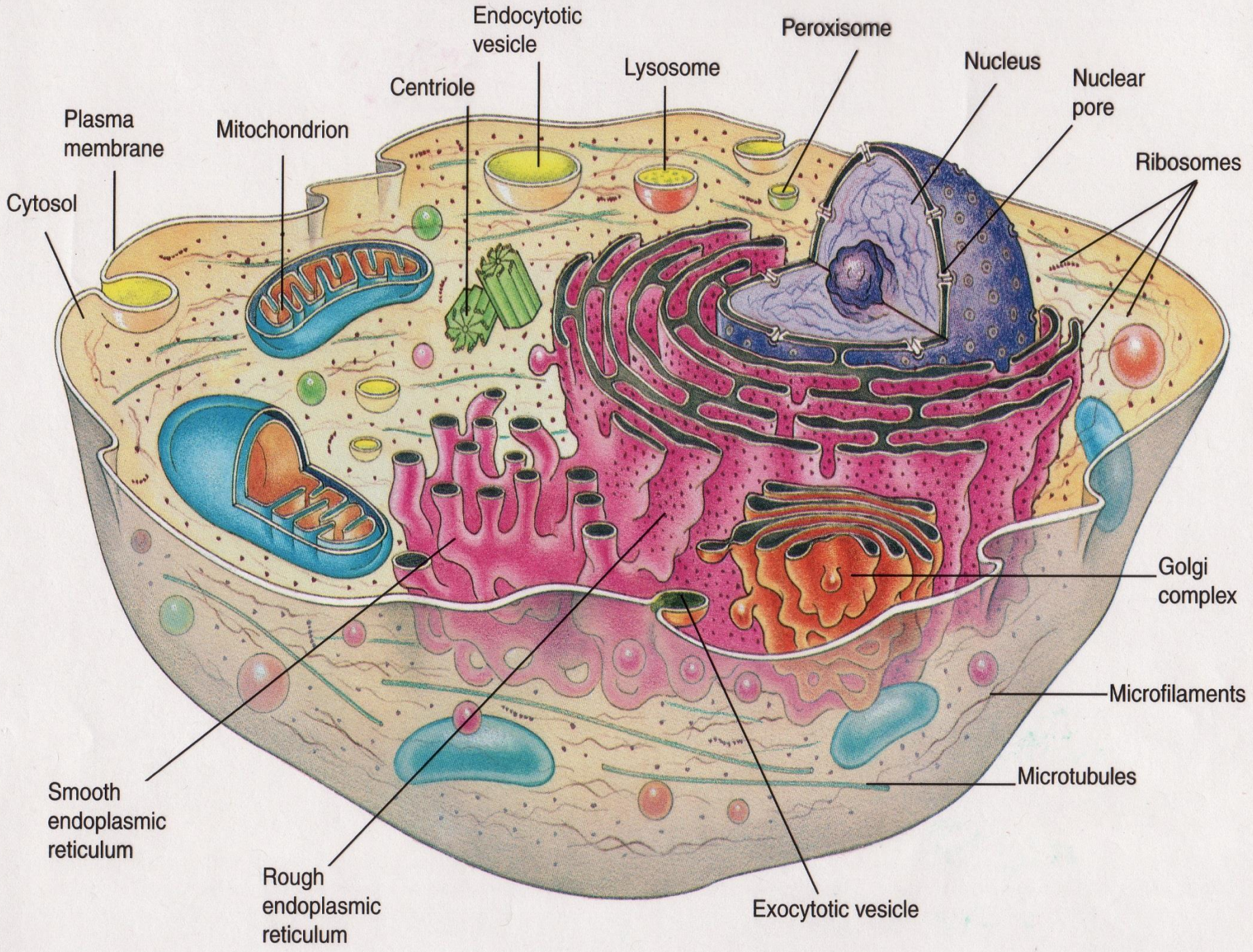
O_2/CO_2



$Ion^{+/-}$

pH




Endocytotic vesicle
Peroxisome
Lysosome
Nucleus
Nuclear pore
Centriole
Plasma membrane
Mitochondrion
Ribosomes
Cytosol
Golgi complex
Microfilaments
Microtubules
Smooth endoplasmic reticulum
Rough endoplasmic reticulum
Exocytotic vesicle

Mitochondria: Energy Organelles

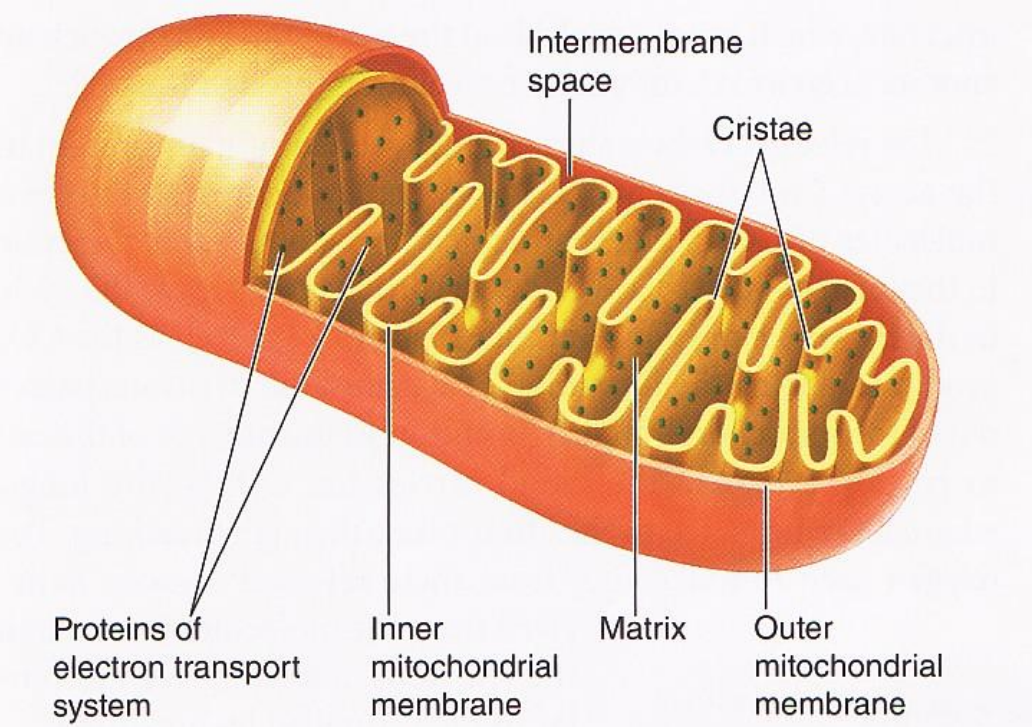
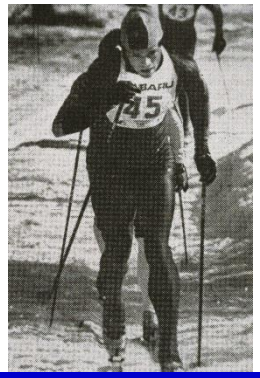
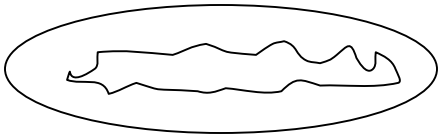


fig 2-8 LS 2012



AEROBIC w/O_2

ANAEROBIC

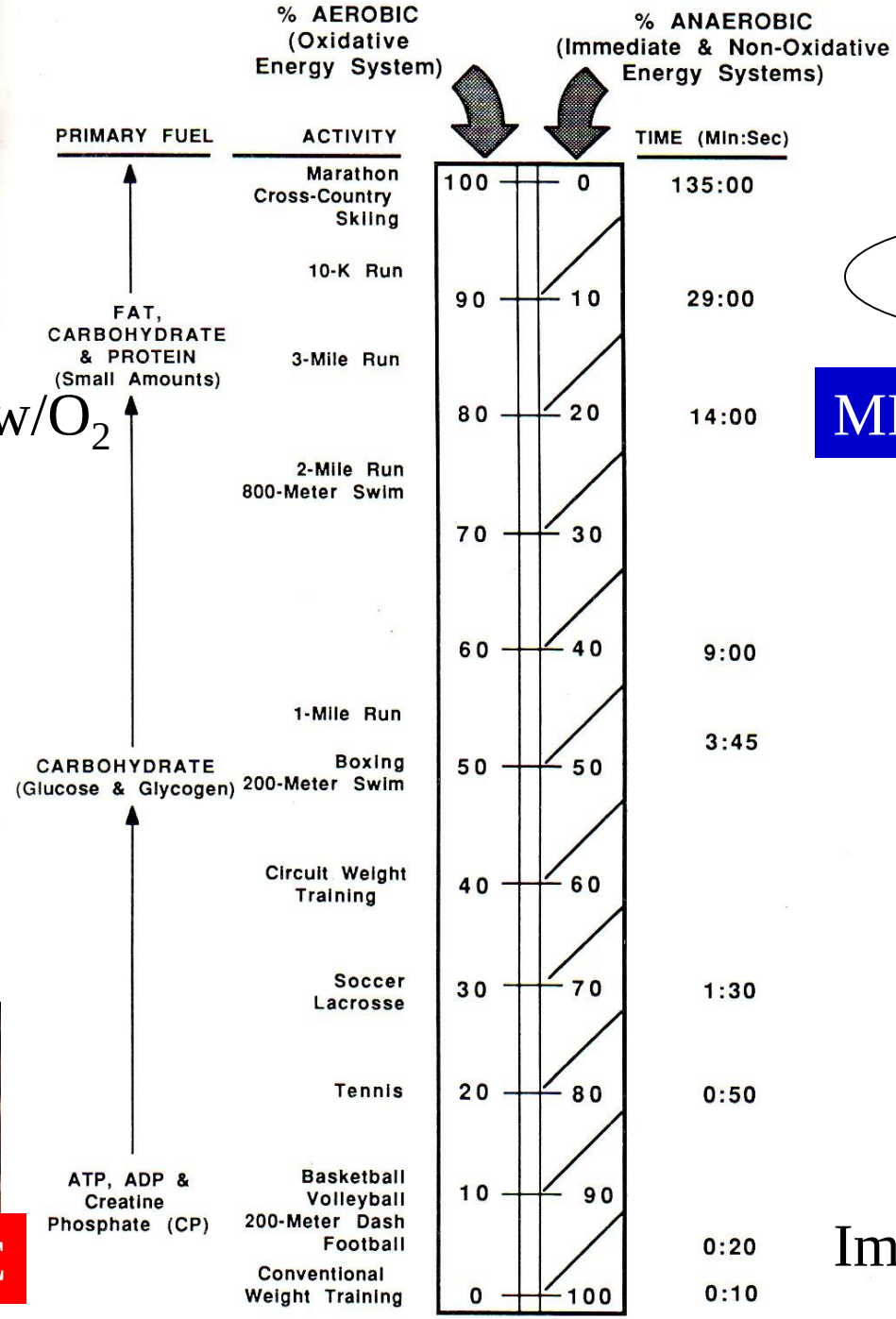


MITOCHONDRIA

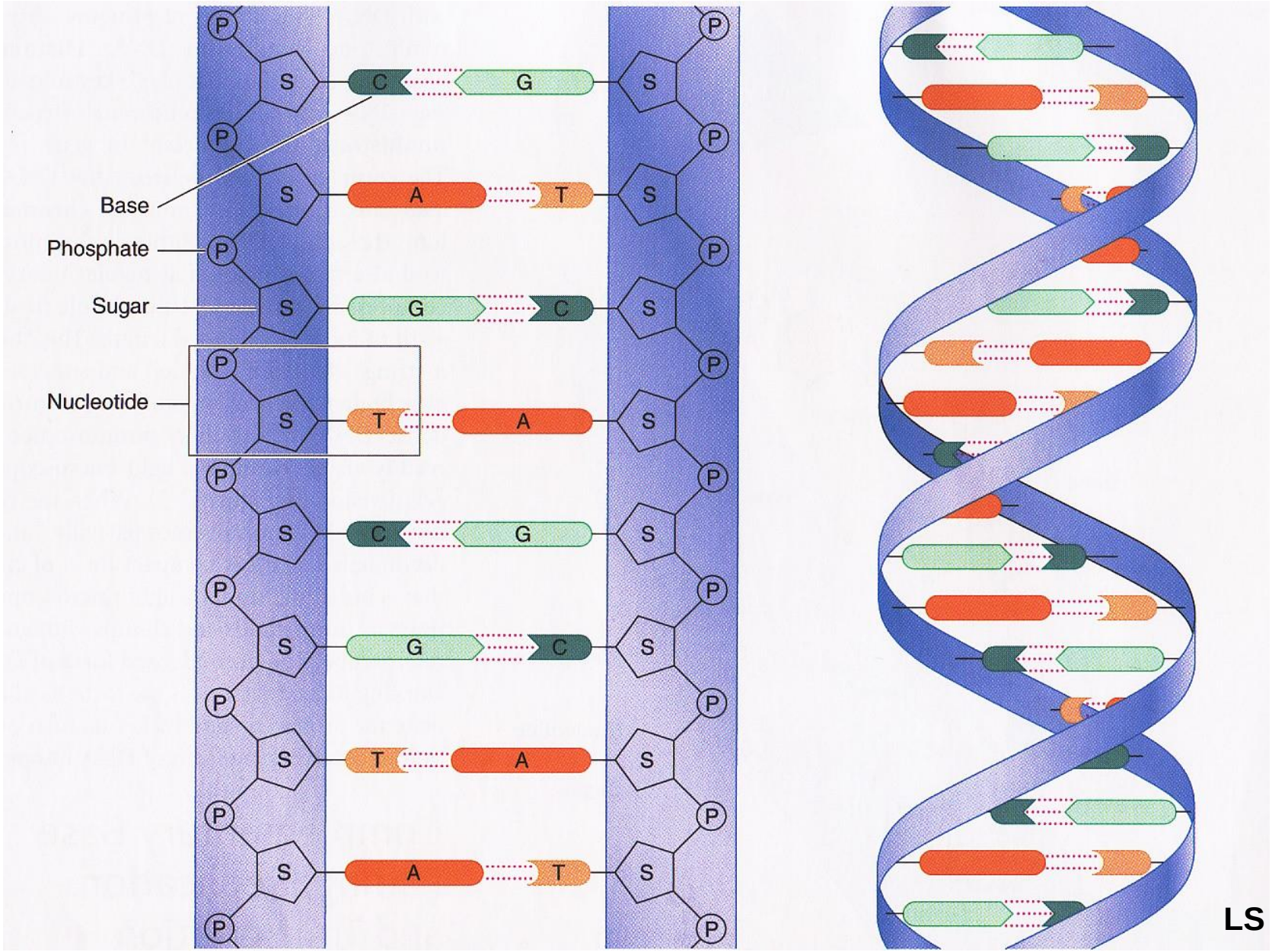
CYTOSOL

Glycolysis

Immediate/ATP-PC



What does DNA look like? Double-helix!!



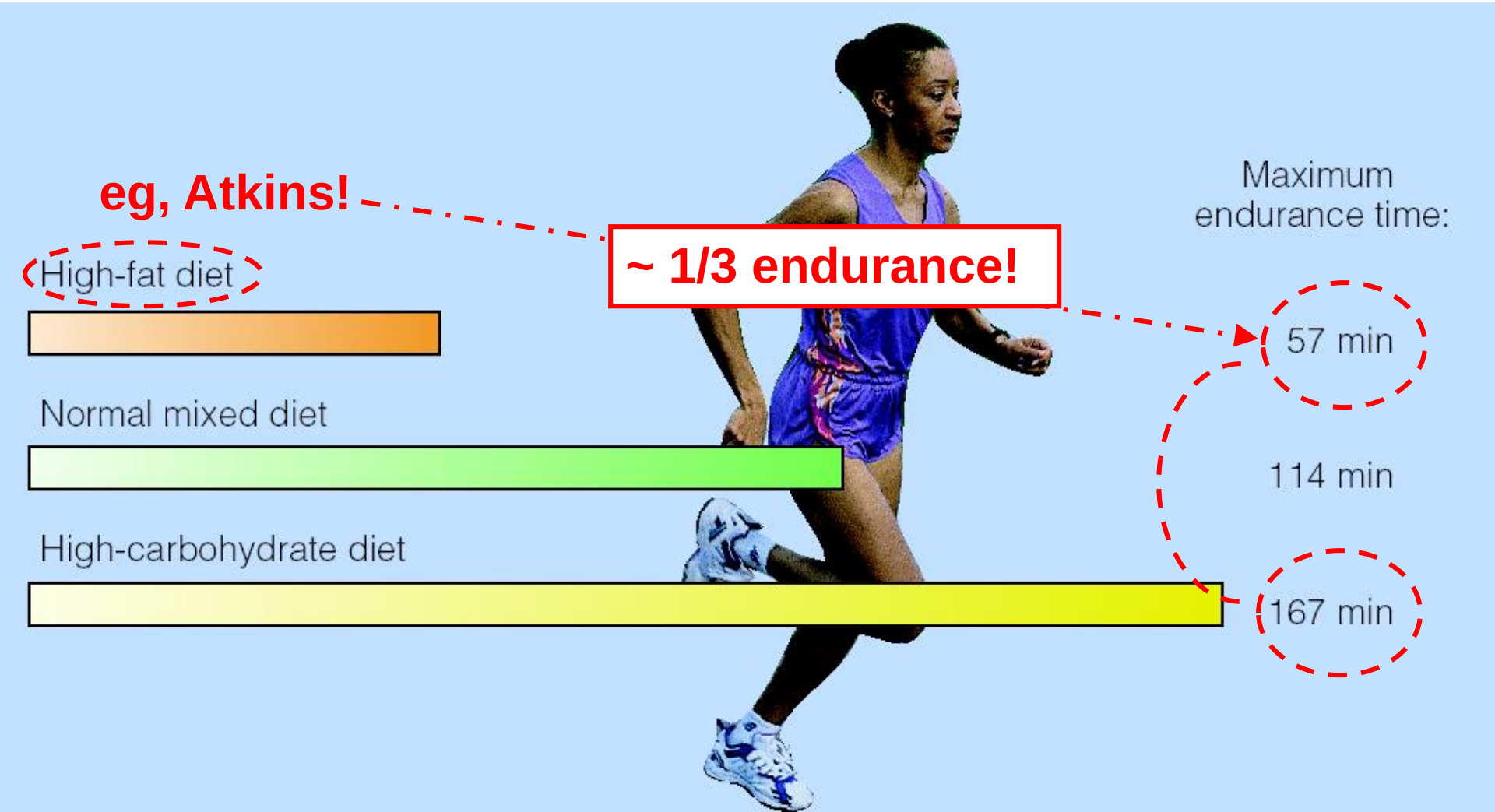
LS fig C-2

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

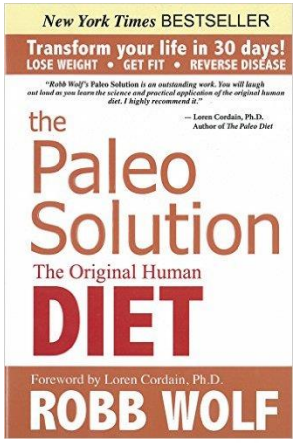
DietController Software for Personal Nutrition Analyses!

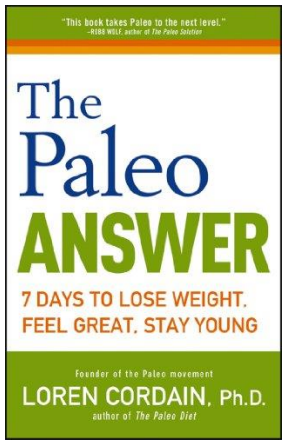
No purchase necessary!
On computers in lab!

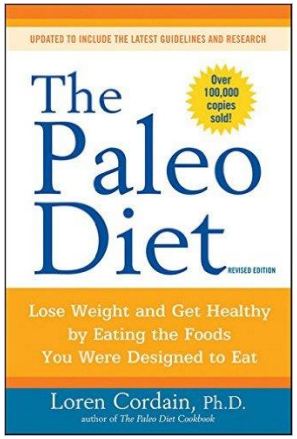
Dietary Composition & Physical Endurance



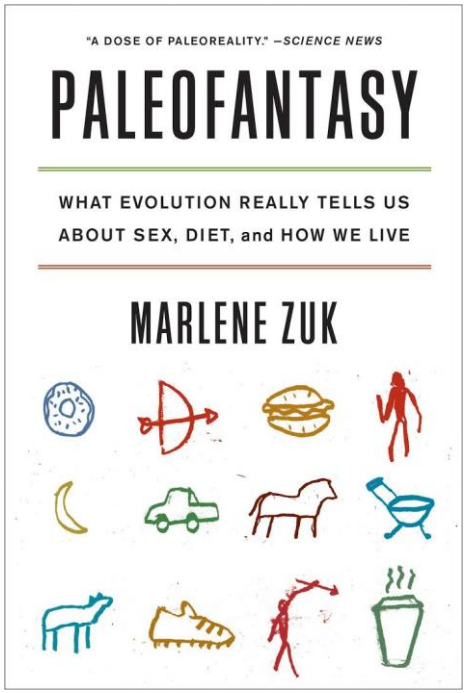
Pondering Paleo?





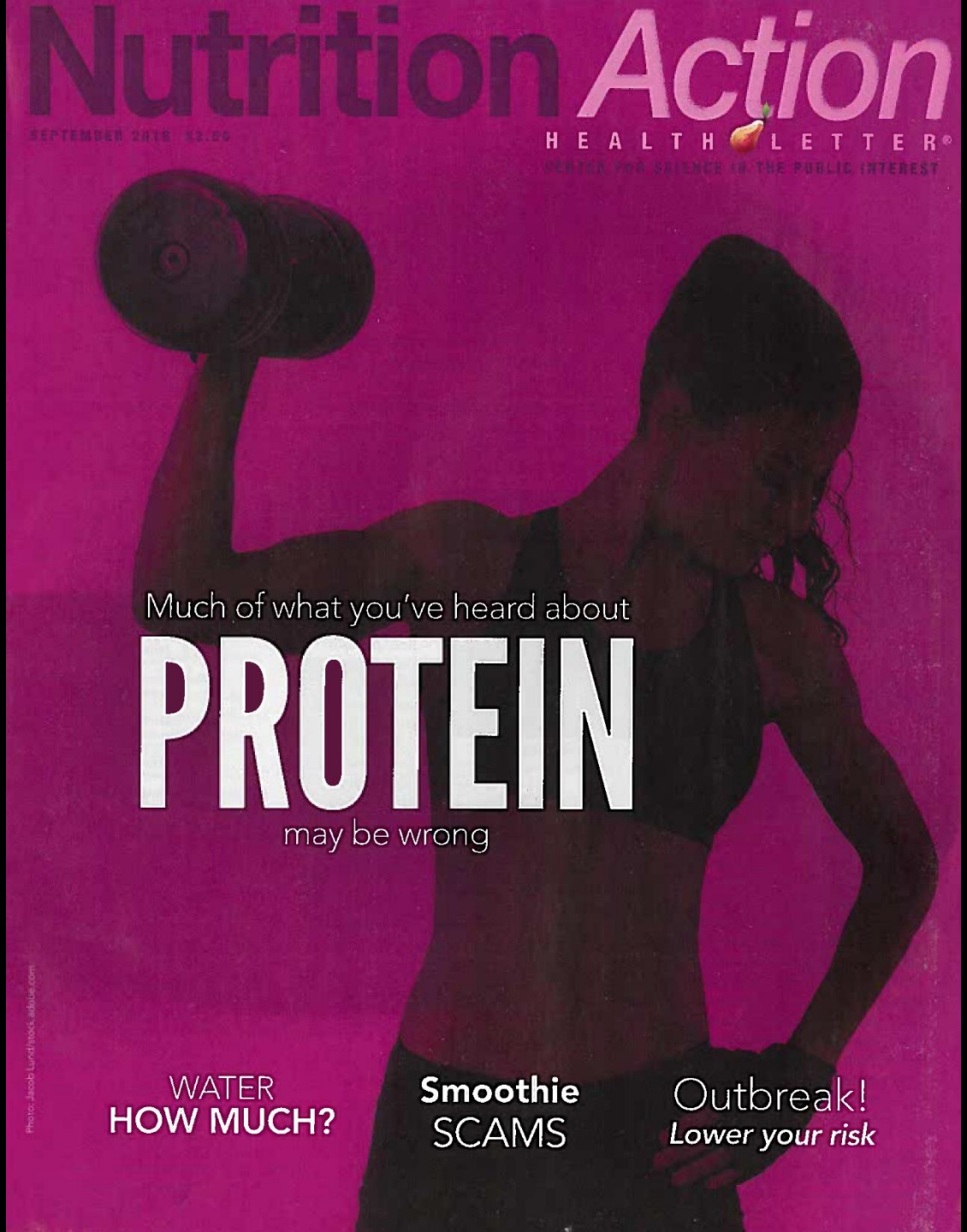


Evolutionary Biologist
Behavioral Ecologist
U Minnesota



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

Nutrition Action
HEALTH LETTER®
CENTER FOR SCIENCE IN THE PUBLIC INTEREST



Much of what you've heard about

PROTEIN

may be wrong

WATER
HOW MUCH?

Smoothie
SCAMS

Outbreak!
Lower your risk

Photo: Jacob Lund/istock, adobe.com

The World's Longest-Lived People!

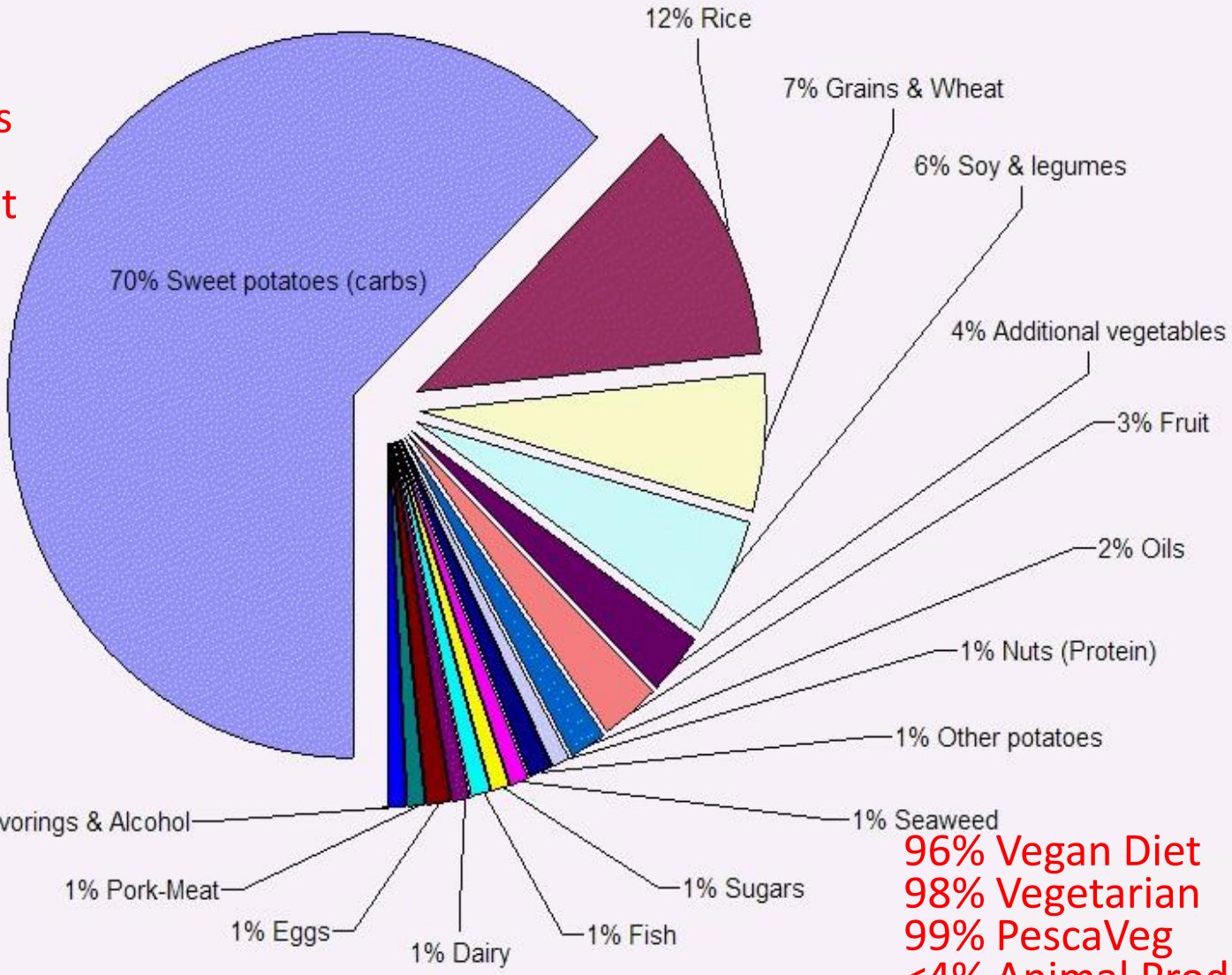
Blue Zones!

https://www.cbsnews.com/news/blue-zones-do-people-who-live-in-certain-areas-live-longer/, Aug 2013.

Buettner, D. *National Geographic*, Nov 2005.

M Poulain & Coworkers. *Experimental Gerontology*, Sep 2004

OKINAWA LONGEVITY DIET



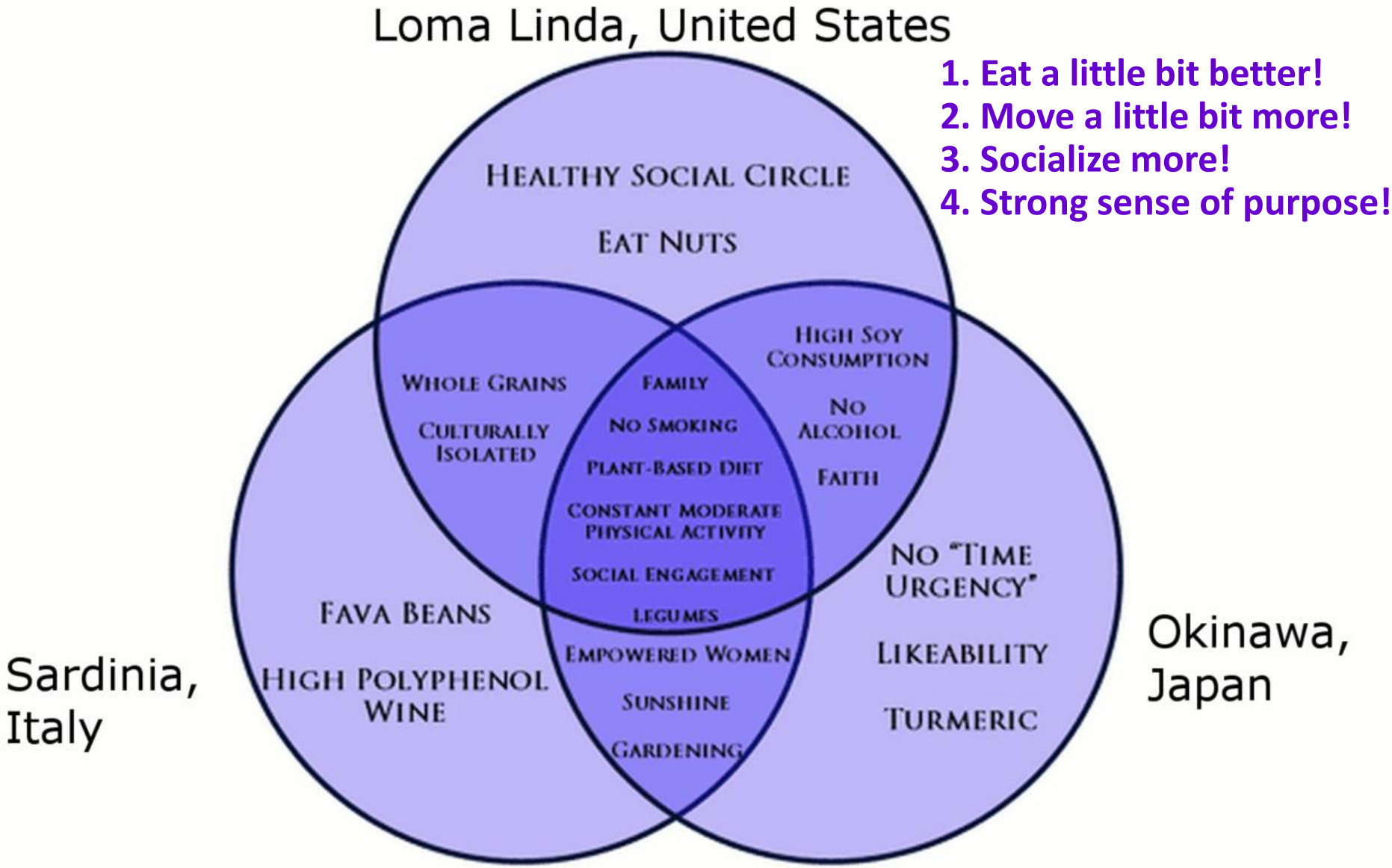
70% Sweet Potatoes
12% Rice
7% Grains & Wheat
6% Soy & legumes
4% Additional vegetables
3% Fruit
2% Oils
1% Nuts (Protein)
1% Other potatoes
1% Seaweed
1% Sugars
1% Fish
1% Dairy
1% Eggs
1% Pork-Meat
1% Flavorings & Alcohol

85% Carbohydrates
9% Protein
6% Fat
85-10-5
1785 Calories

96% Vegan Diet
98% Vegetarian
99% PescaVeg
<4% Animal Prod
<1% Fish
<1% Meat-Pork

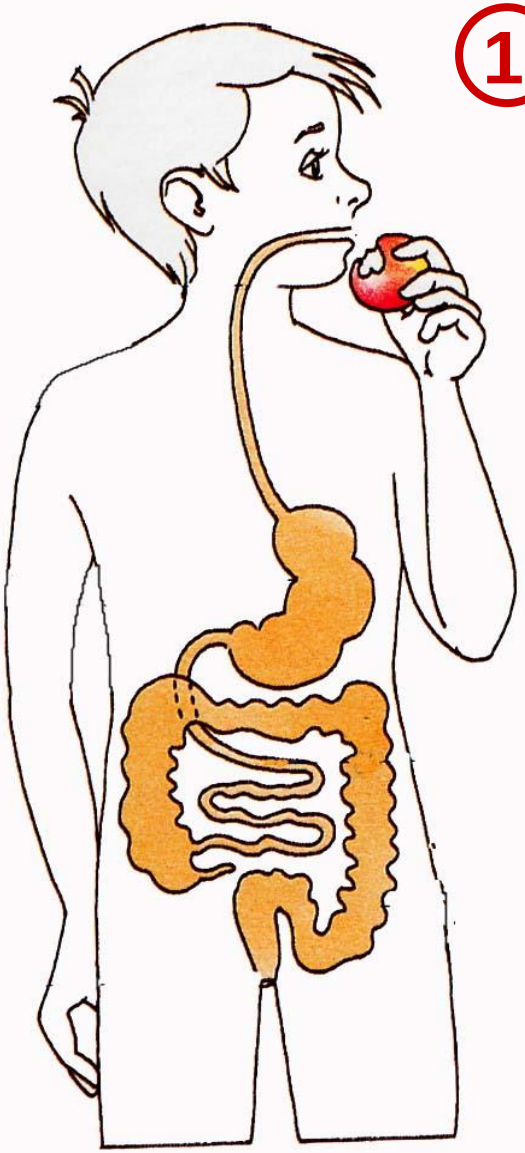
SCIENTIFIC STUDY: "The Diet of the World's Longest-Lived People and Its Potential Impact on Morbidity and Life Span"
JOURNAL: Annals of the Academy of Sciences - Volume 1114: 434–455 (2007).

Note: These are the Actual Food Measurements of the Centenarians, not the diet of All island Okinawans or the ones who died, but the ones who lived.



https://en.wikipedia.org/wiki/Blue_Zone
https://www.bluezonesproject.com/
http://www.sciencedirect.com/science/article/pii/S0531556504002141

Digestion Steps

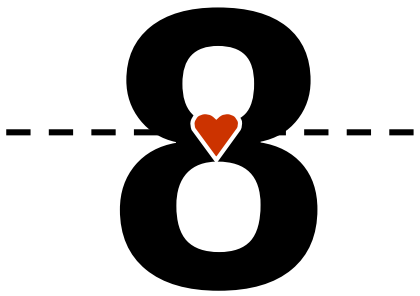


1. Ingestion
2. Mechanical Digestion
3. Chemical Digestion
4. Peristalsis
5. Absorption
6. Storage
7. Defecation

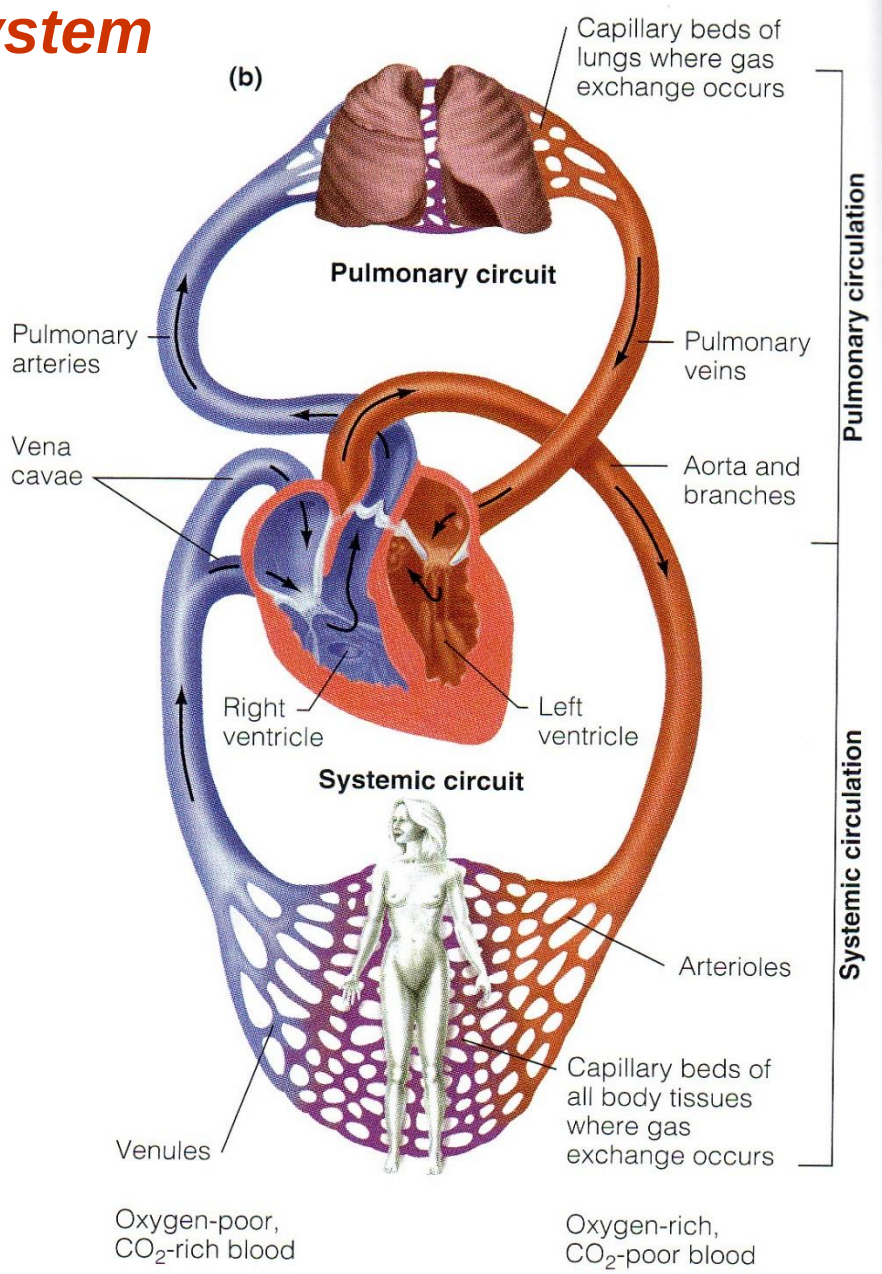
SOURCE: Dr. Eugene Evonuk, 1989. *cf*: L Sherwood, 2012 pp 437-8.

Cardiovascular System
Figure-8 Loop

Pulmonary

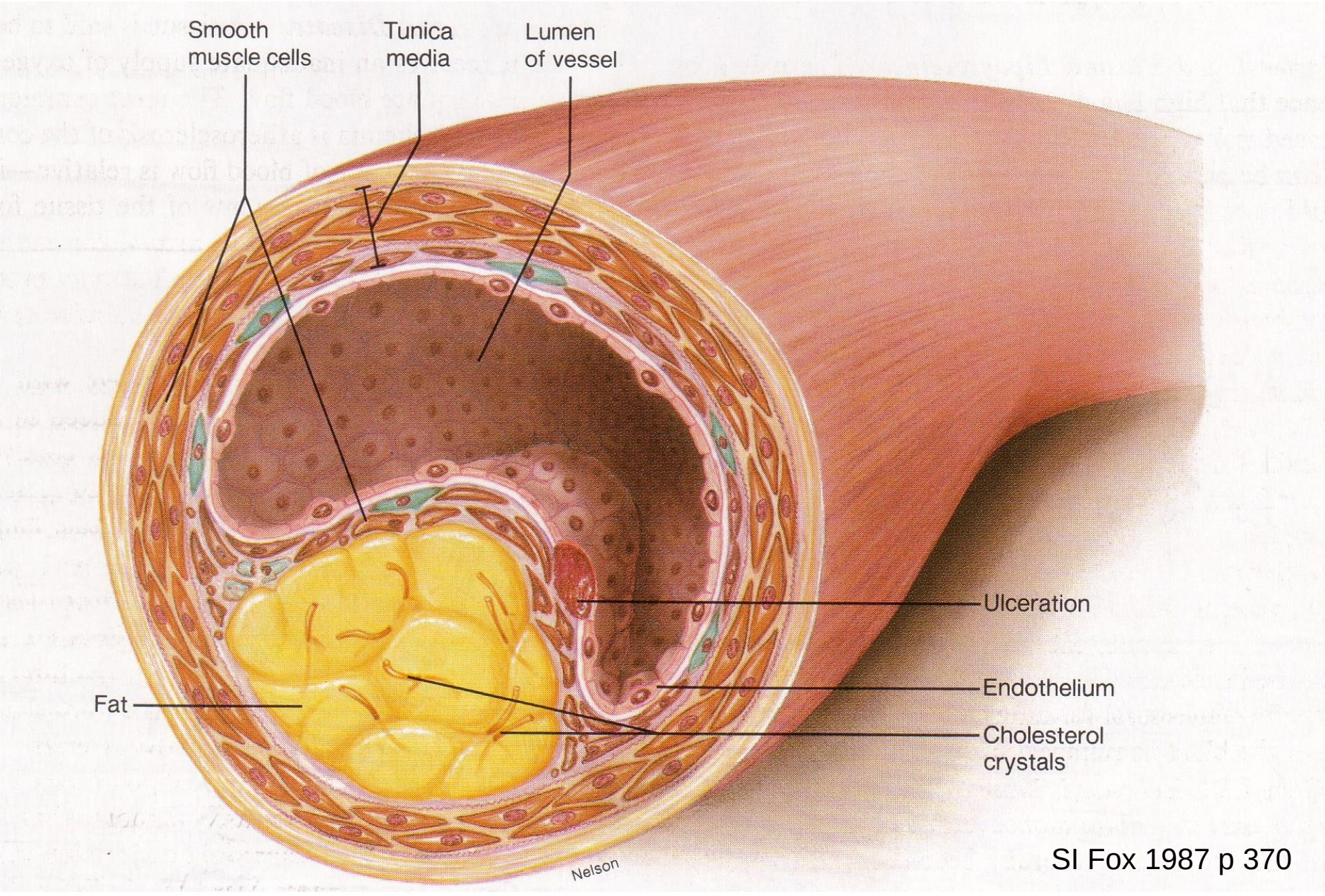


Systemic



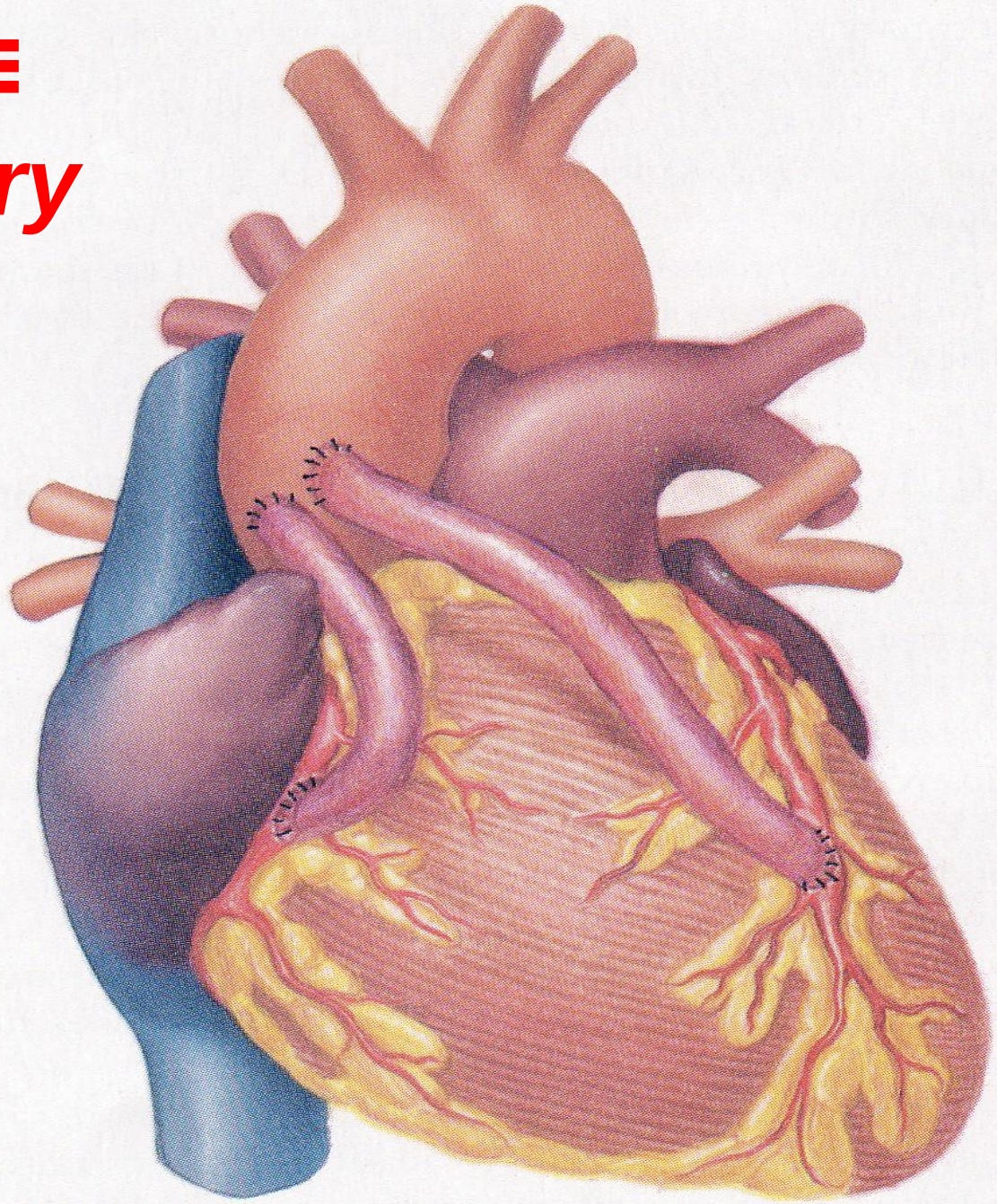
DC 2003

Atherosclerosis developing within vessel walls!

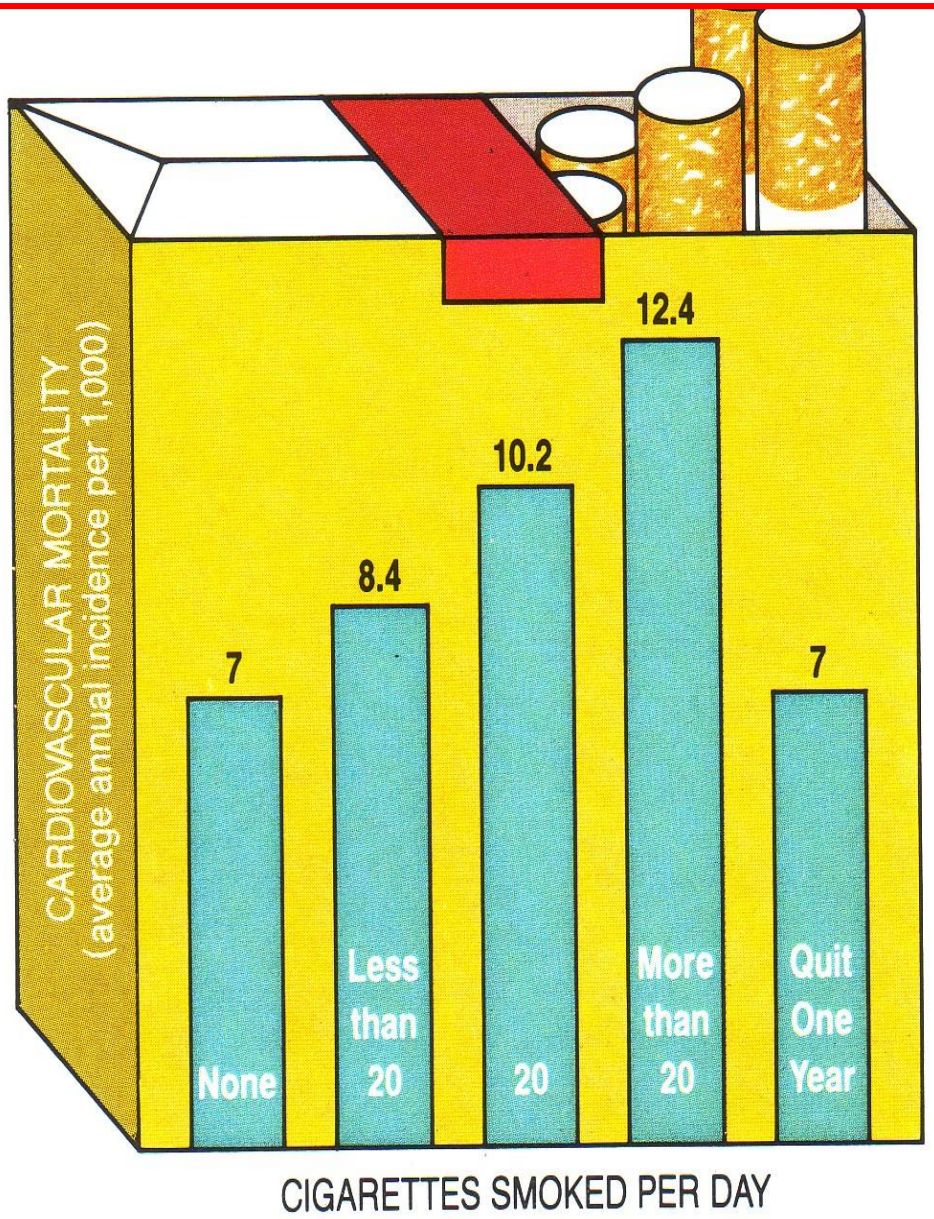


SI Fox 1987 p 370

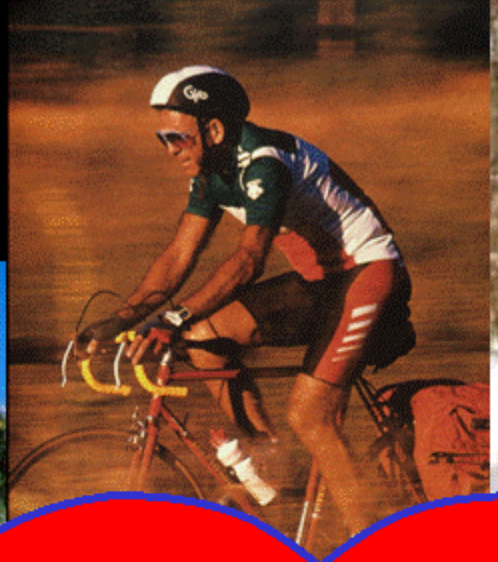
***CABG* ≡**
Coronary
Artery
Bypass
Graft



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



How much aerobic?



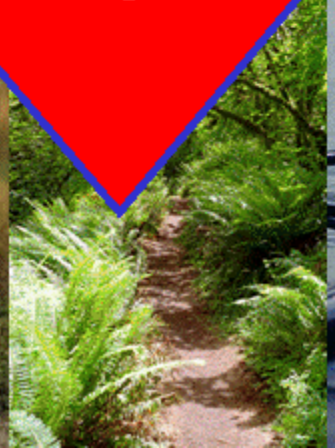
Continuous exercise

≥ 50% muscle mass

≥ Conversational pace

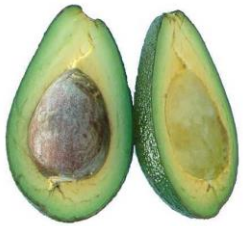
20-60 min/session

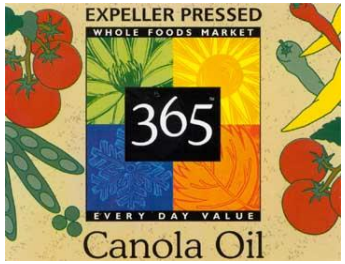
3-5 days/wk

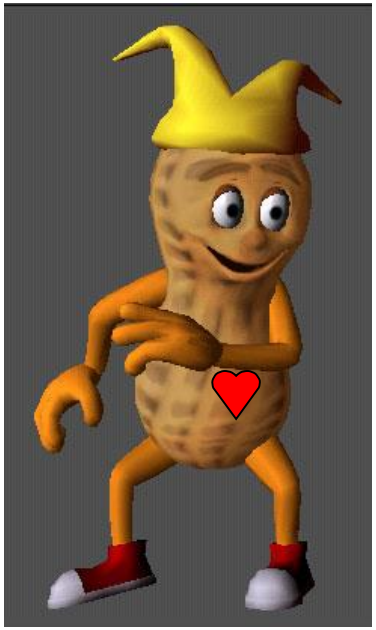


Healthy Oils to Minimize Atherosclerosis

HAPOC?







Alice Waters, p. 8 | How food marketers snag us, p. 10 | 10 foods to try, p. 13

Nutrition Action HEALTH LETTER®
OCTOBER 2011 $2.50
CENTER FOR SCIENCE IN THE PUBLIC INTEREST

Eat Real, America!

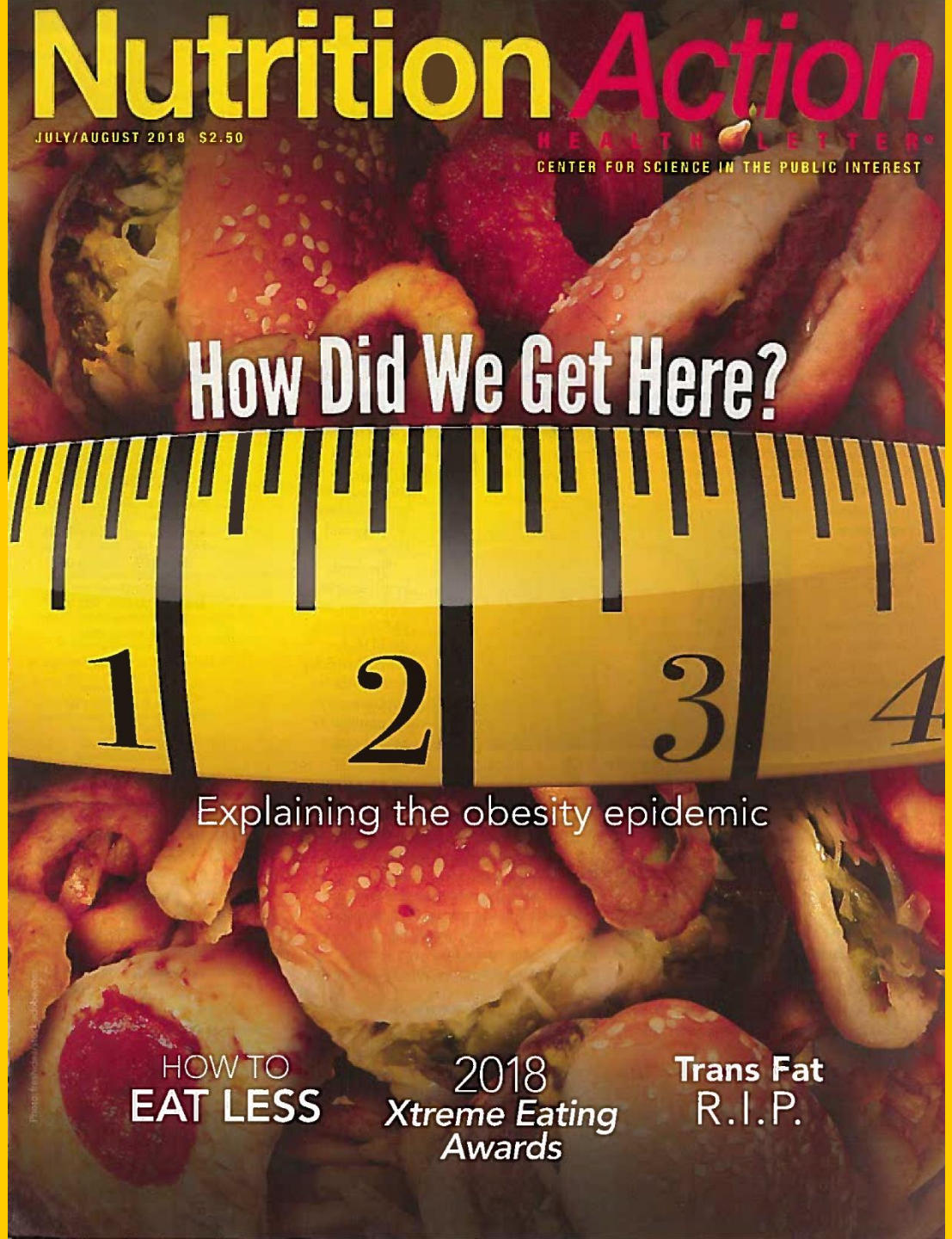
"With the right food choices, physical activity, and not smoking, we could prevent about 80 percent of heart disease, about 90 percent of diabetes, and 70 percent of stroke," says Walter Willett, chair of the nutrition department at the Harvard School of Public Health in Boston. "Those are the three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

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

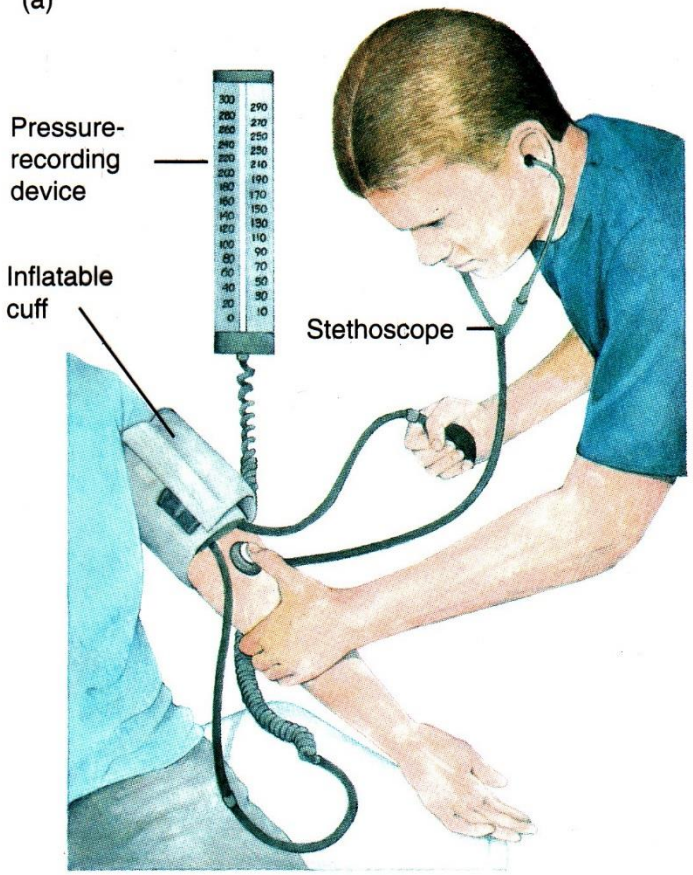
Here's why—and how—to eat real.

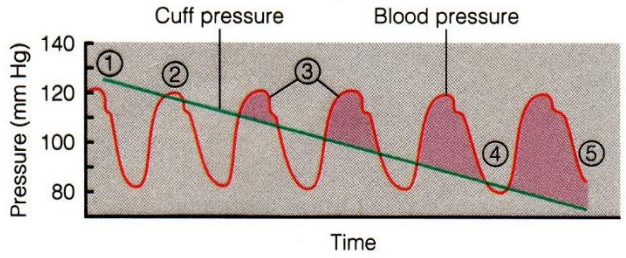
Continued on page 3.

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


Nutrition Action
HEALTHLETTER
JULY/AUGUST 2018 $2.50
CENTER FOR SCIENCE IN THE PUBLIC INTEREST
How Did We Get Here?
Explaining the obesity epidemic
HOW TO
EAT LESS
2018
Xtreme Eating
Awards
Trans Fat
R.I.P.

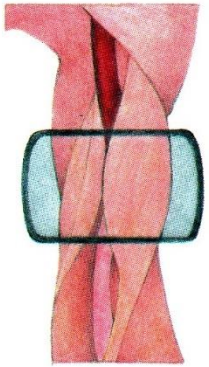
(a)





(b)

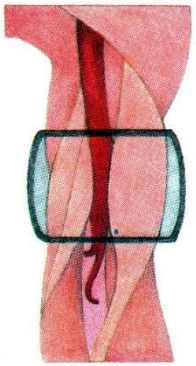
(c) When blood pressure is 120/80:



Cuff pressure is greater than 120 mm Hg.

No blood flows through vessel.

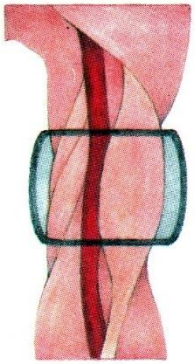
No sound is heard.



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.

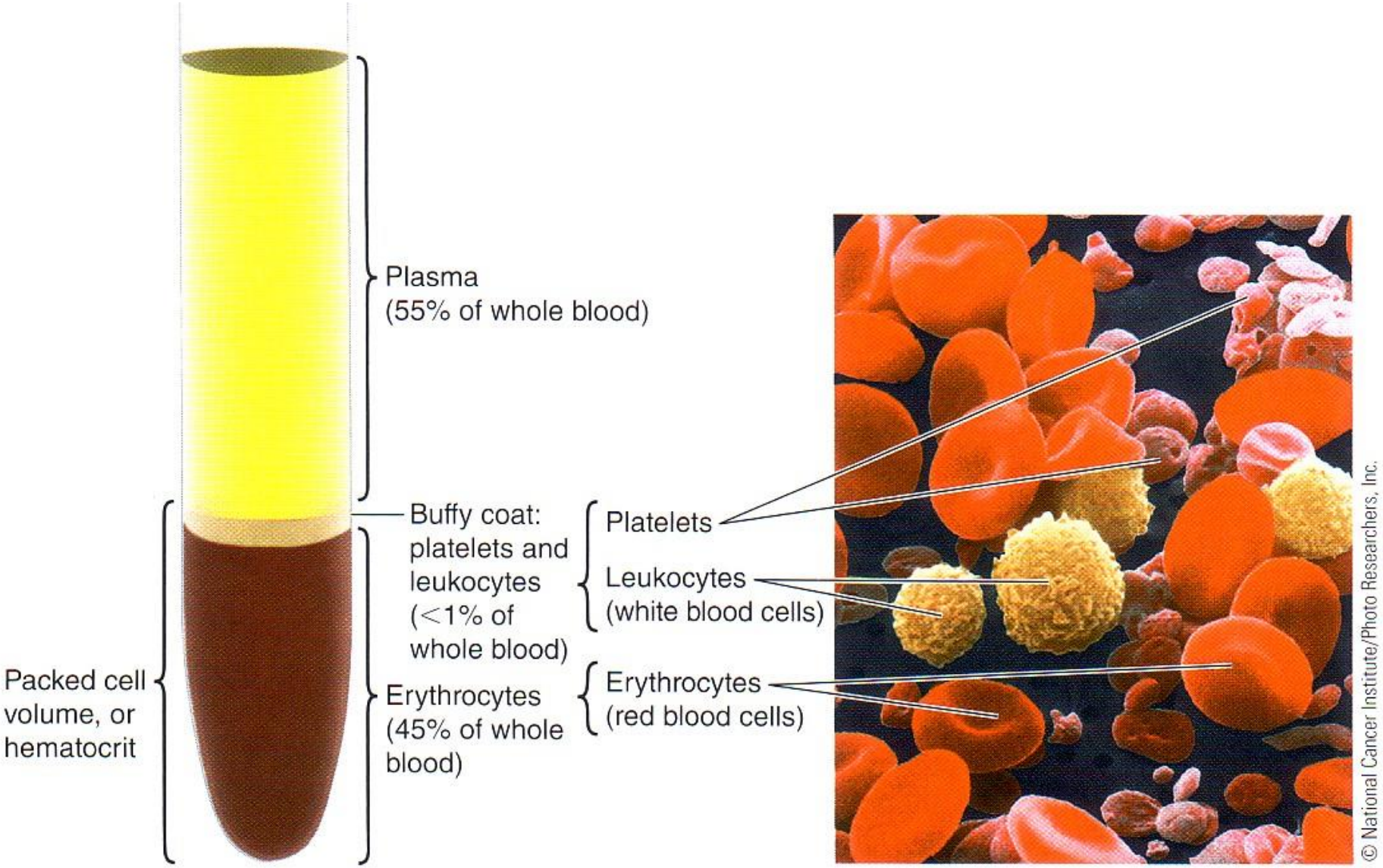


Cuff pressure is less than 80 mm Hg.

Blood flows through vessel in smooth, laminar fashion.

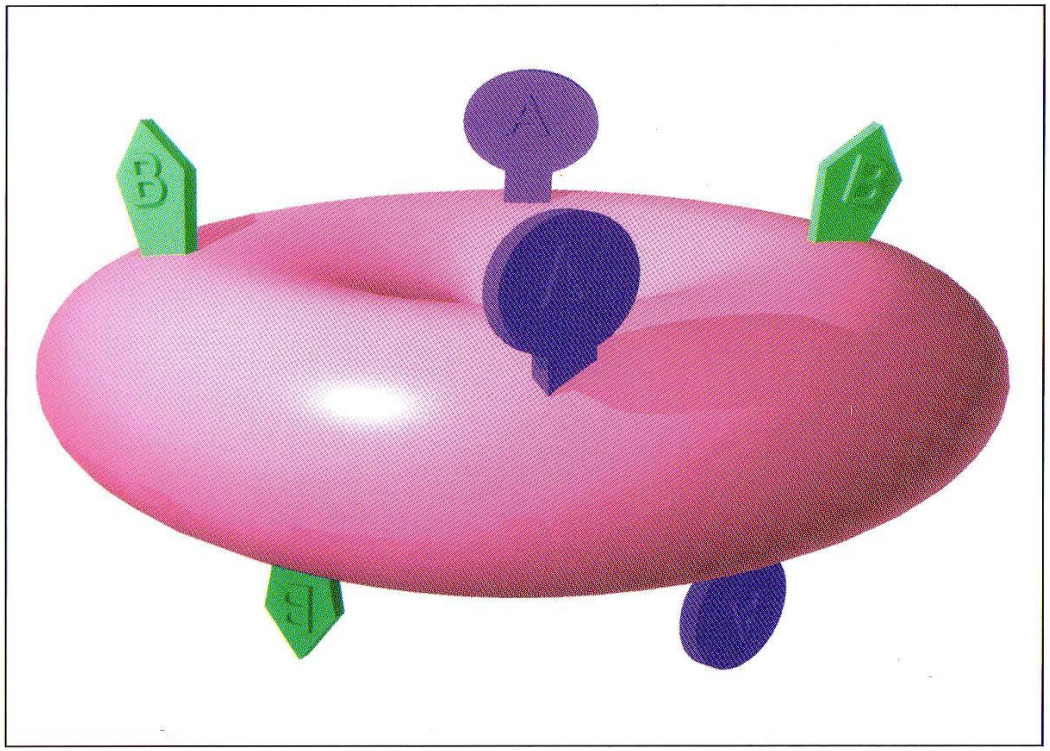
No sound is heard.

What's in Blood? Plasma & Blood Cells



LS 2012 fig 11-1

AB



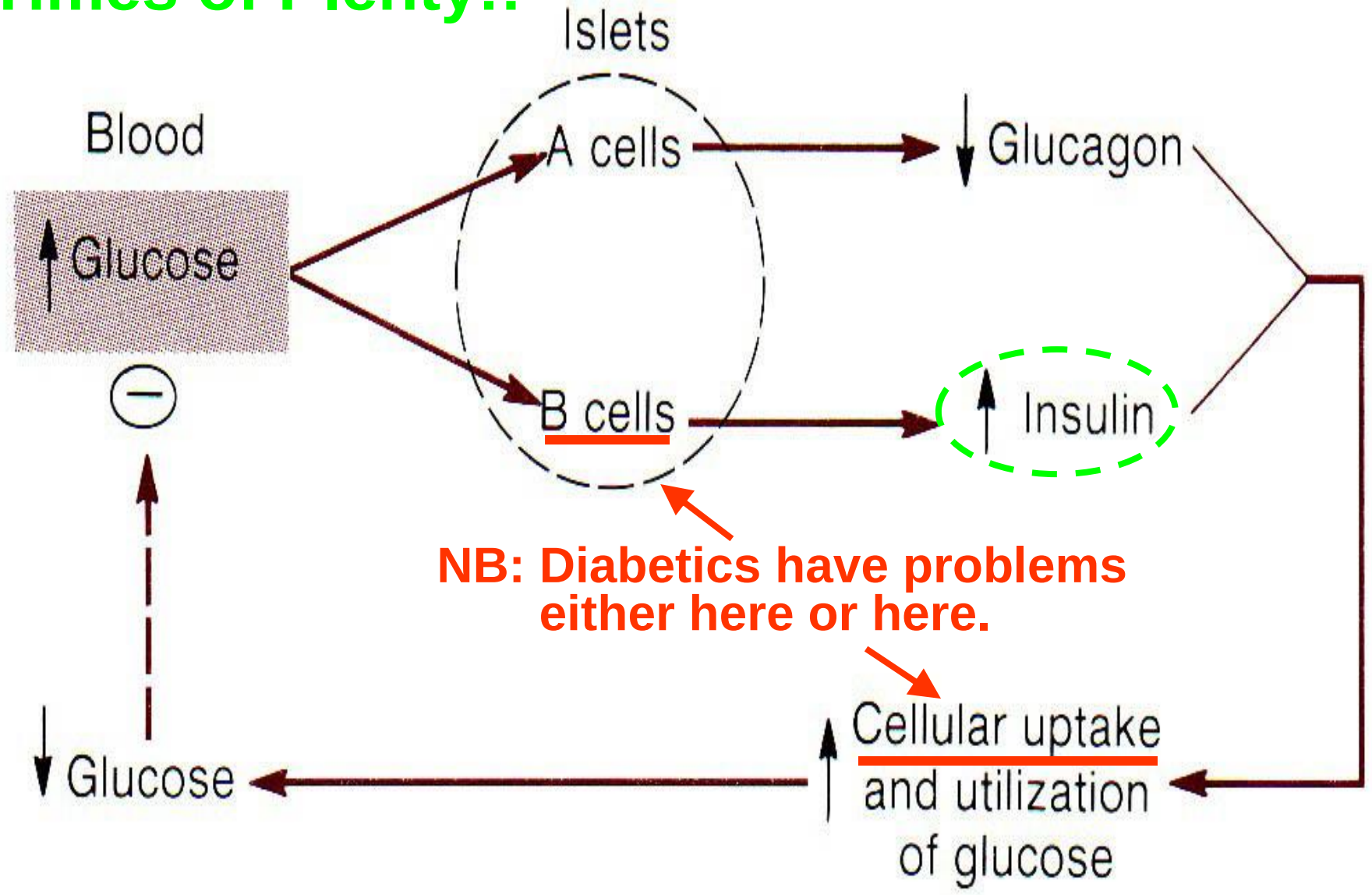
A & B Antigens

(Agglutinogens)

Glucose:
Sugar in Blood

Normal: 70-99
Pre-Diabetes: 100-125
Diabetes: ≥ 126 mg/dL

Times of Plenty!!



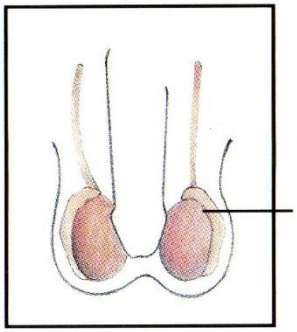
Fox 1987

Store!

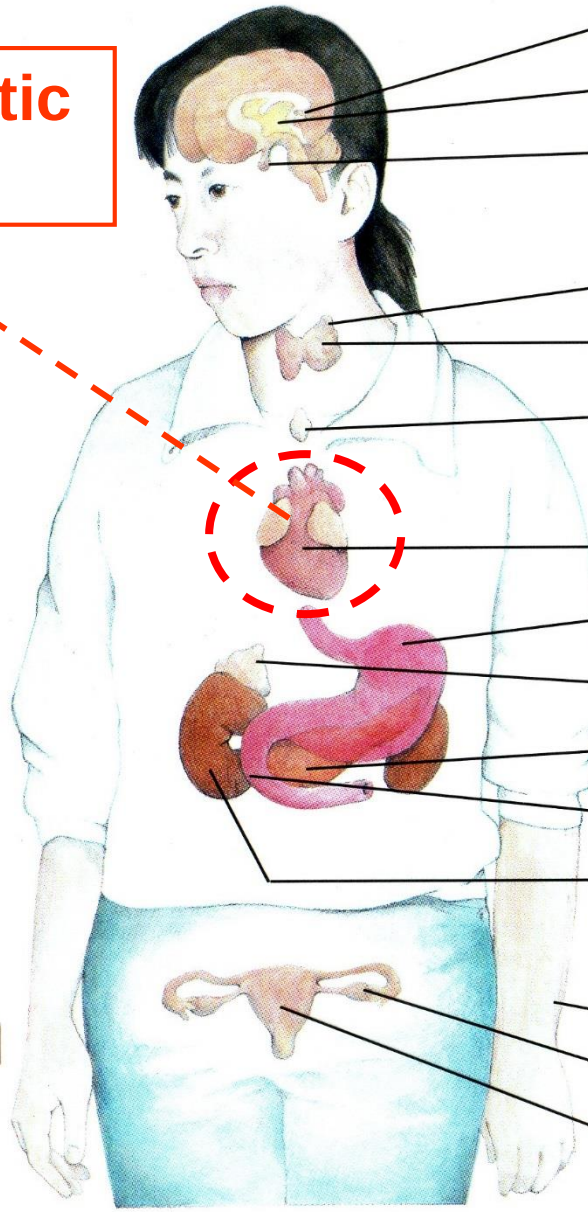
Endocrine System

ANP = Atrial Natriuretic Polypeptide

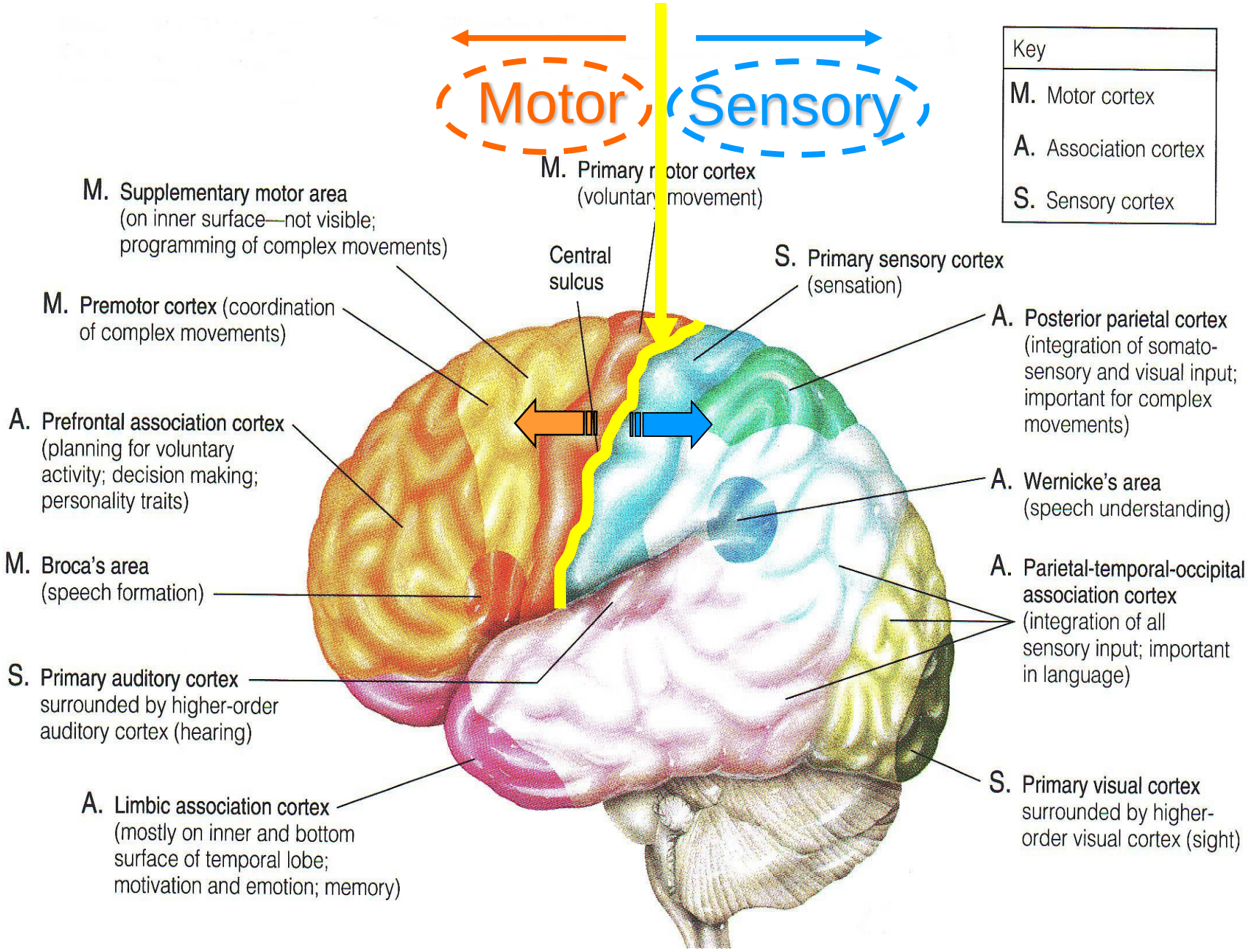
- Solely endocrine function
- Mixed function
- Complete function uncertain



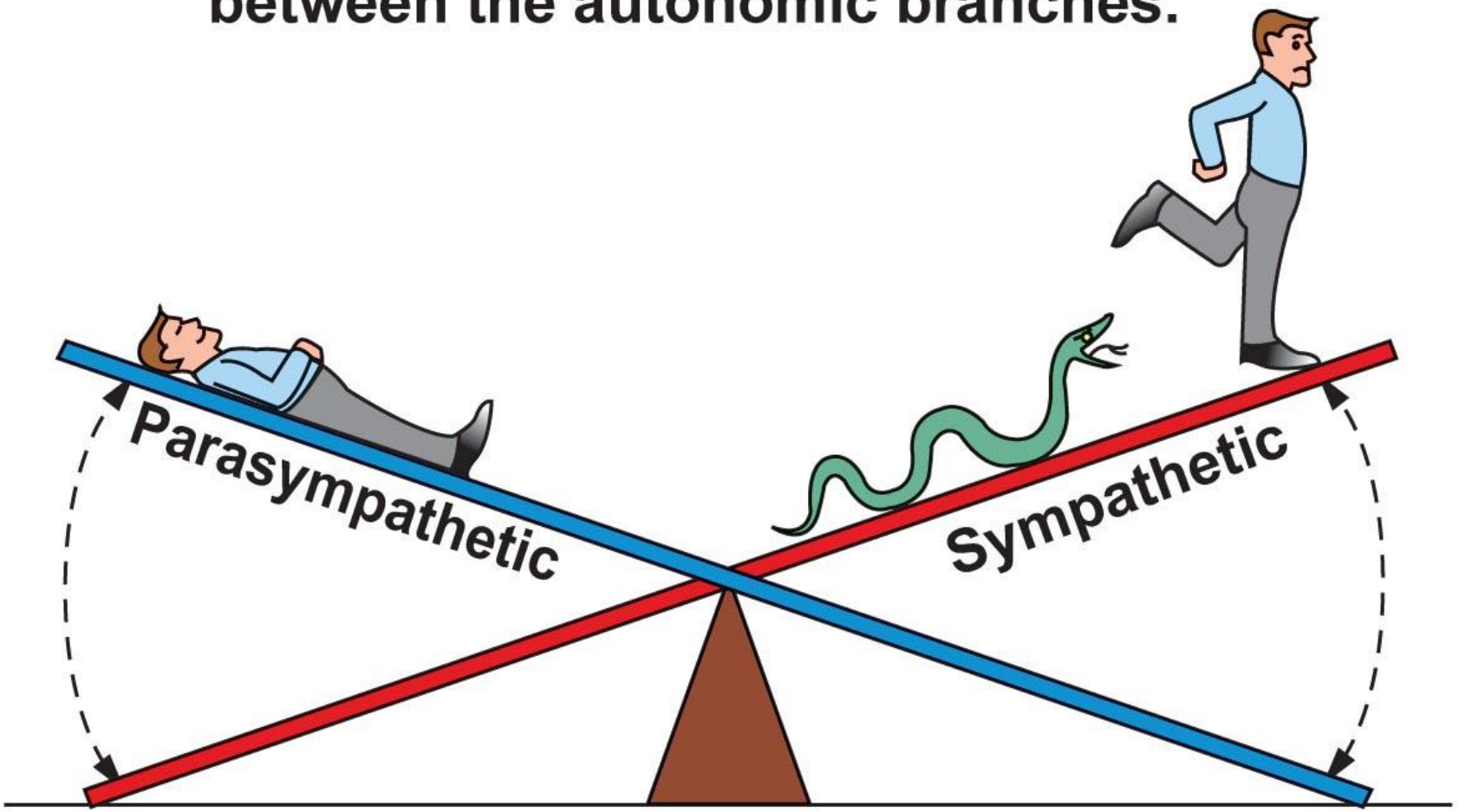
Testes in male



- Pineal
- Hypothalamus
- Pituitary
- Parathyroid
- Thyroid
- Thymus
- Heart
- Stomach
- Adrenal gland
- Pancreas
- Duodenum
- Kidney
- Skin
- Ovaries in female
- Placenta in pregnant female


Motor
Sensory
Key
M. Motor cortex
A. Association cortex
S. Sensory cortex
M. Primary motor cortex (voluntary movement)
M. Supplementary motor area (on inner surface—not visible; programming of complex movements)
Central sulcus
S. Primary sensory cortex (sensation)
M. Premotor cortex (coordination of complex movements)
A. Posterior parietal cortex (integration of somato-sensory and visual input; important for complex movements)
A. Prefrontal association cortex (planning for voluntary activity; decision making; personality traits)
A. Wernicke's area (speech understanding)
M. Broca's area (speech formation)
A. Parietal-temporal-occipital association cortex (integration of all sensory input; important in language)
S. Primary auditory cortex surrounded by higher-order auditory cortex (hearing)
S. Primary visual cortex surrounded by higher-order visual cortex (sight)
A. Limbic association cortex (mostly on inner and bottom surface of temporal lobe; motivation and emotion; memory)

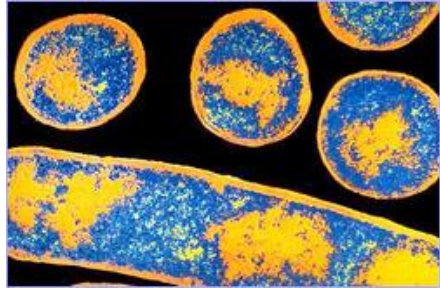
Homeostasis is a dynamic balance between the autonomic branches.



Rest-and-digest: Parasympathetic activity dominates.

Fight-or-flight: Sympathetic activity dominates.

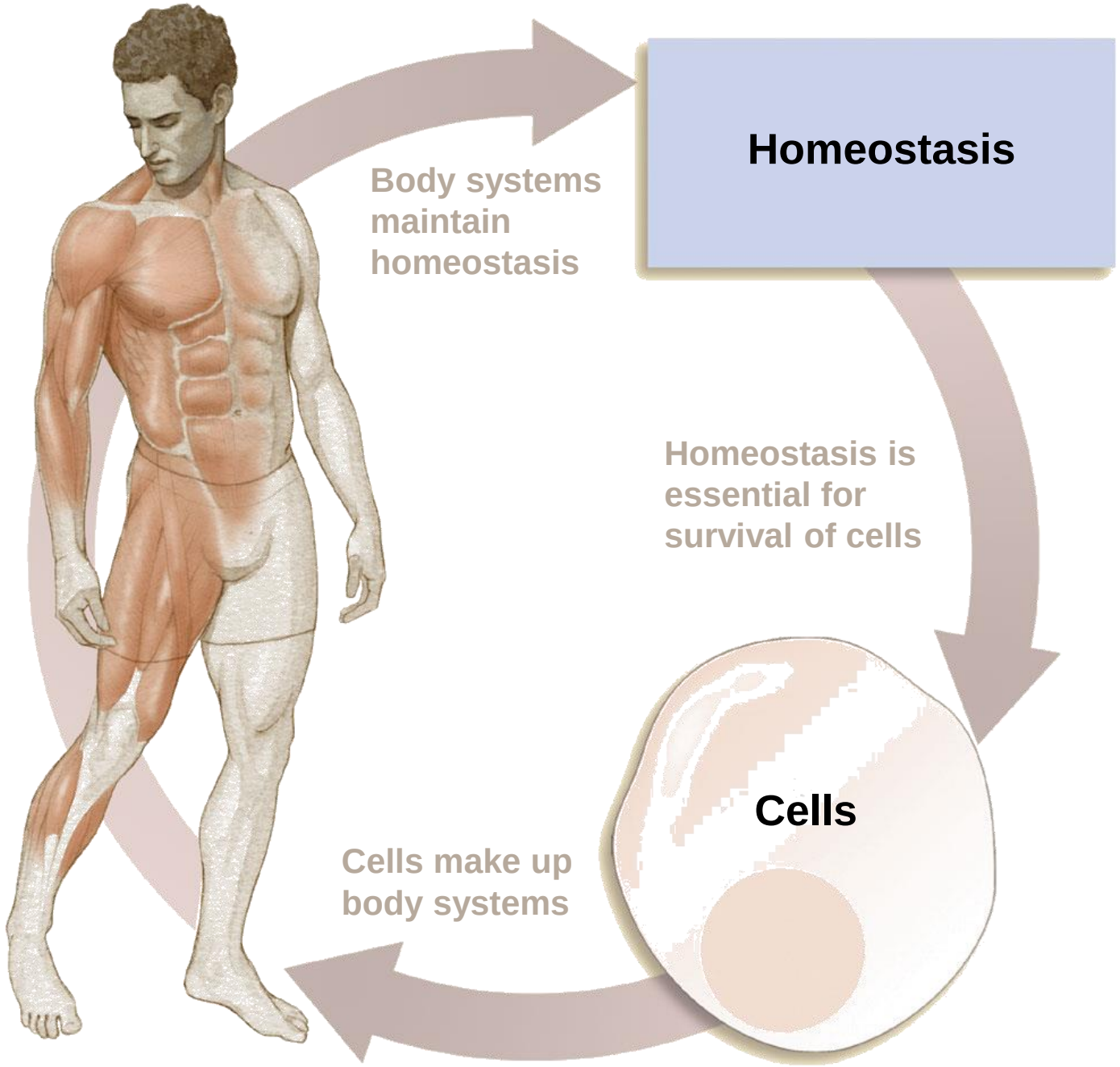
D Silverthorn 2010

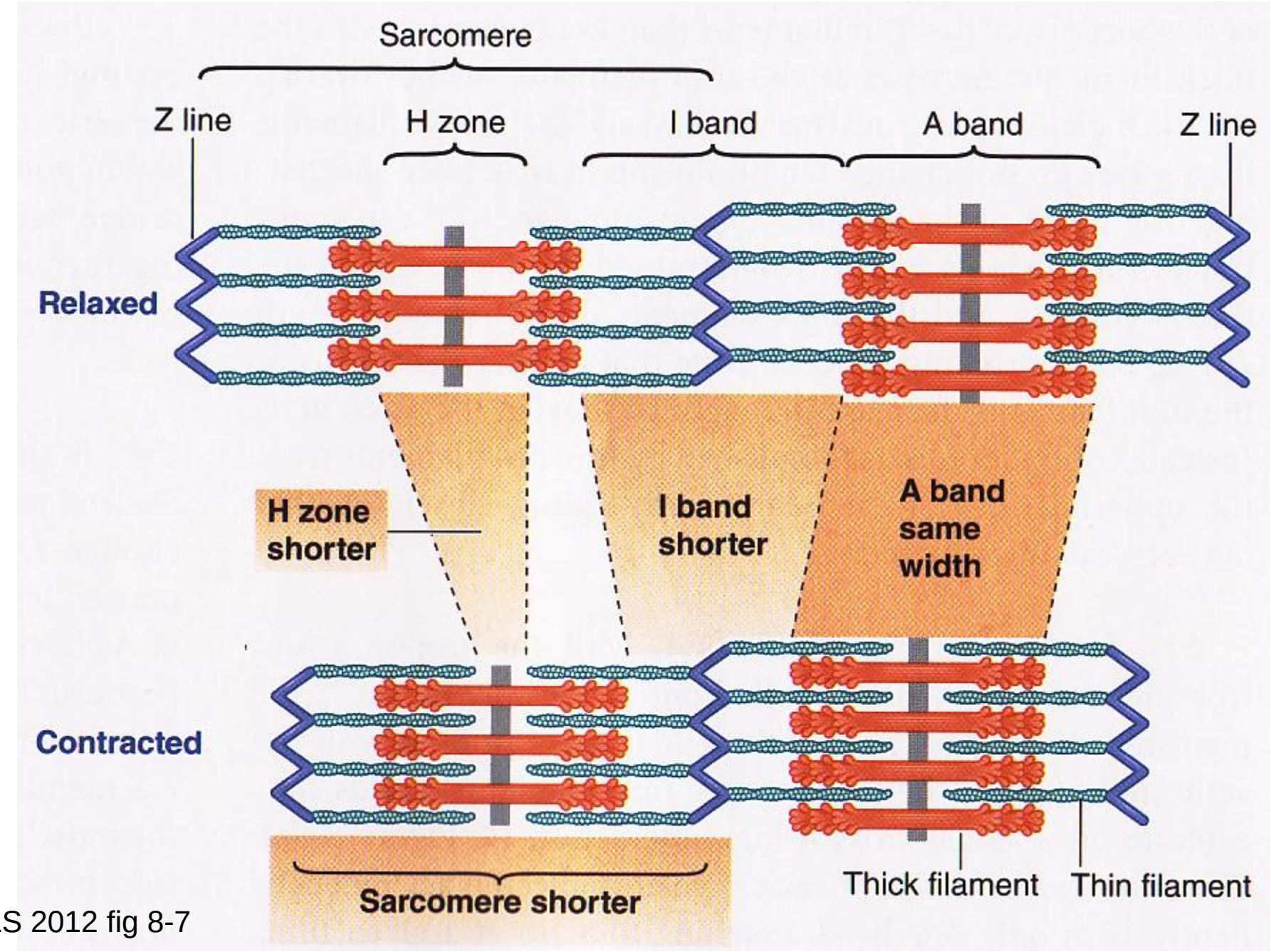



Campbell's
CLASSICS
BEAN
BACON

Axon of motor neuron
Myelin sheath
Action potential propagation in motor neuron
1
Axon terminal
Terminal button
Ca2+
Calcium channel
Vesicle of acetylcholine
2
Action potential propagation in muscle fiber
6
3
Muscle fiber
Plasma membrane of muscle fiber
4
K+
Acetylcholine receptor site
5
Na+
7
Cation channel
Acetylcholinesterase
Local current flow between depolarized end plate and adjacent membrane
Motor end plate
Contractile elements within muscle fiber

Muscular System





LS 2012 fig 8-7

Atrophy

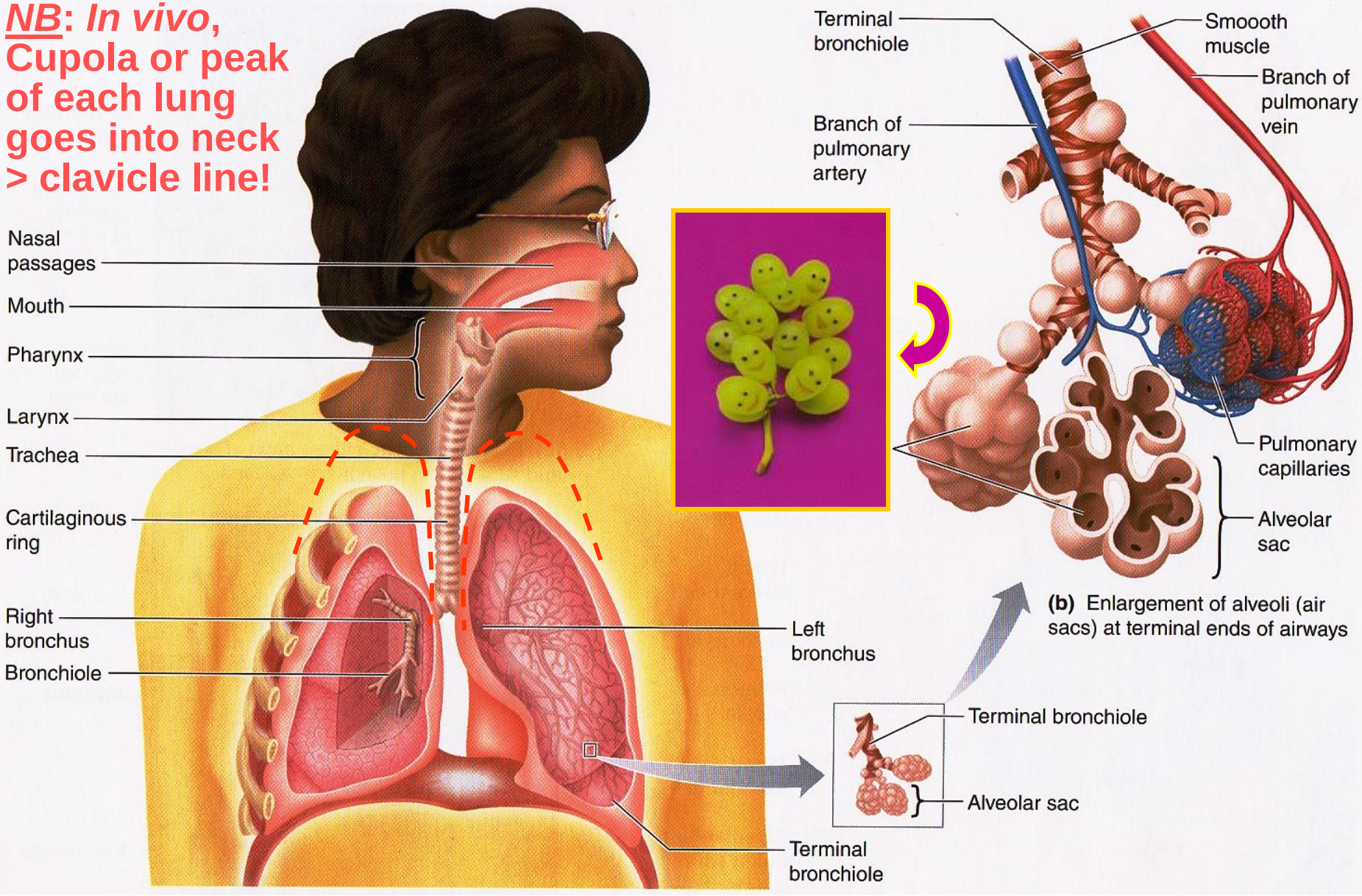
decrease in size & strength

Hypertrophy

increase in size & strength

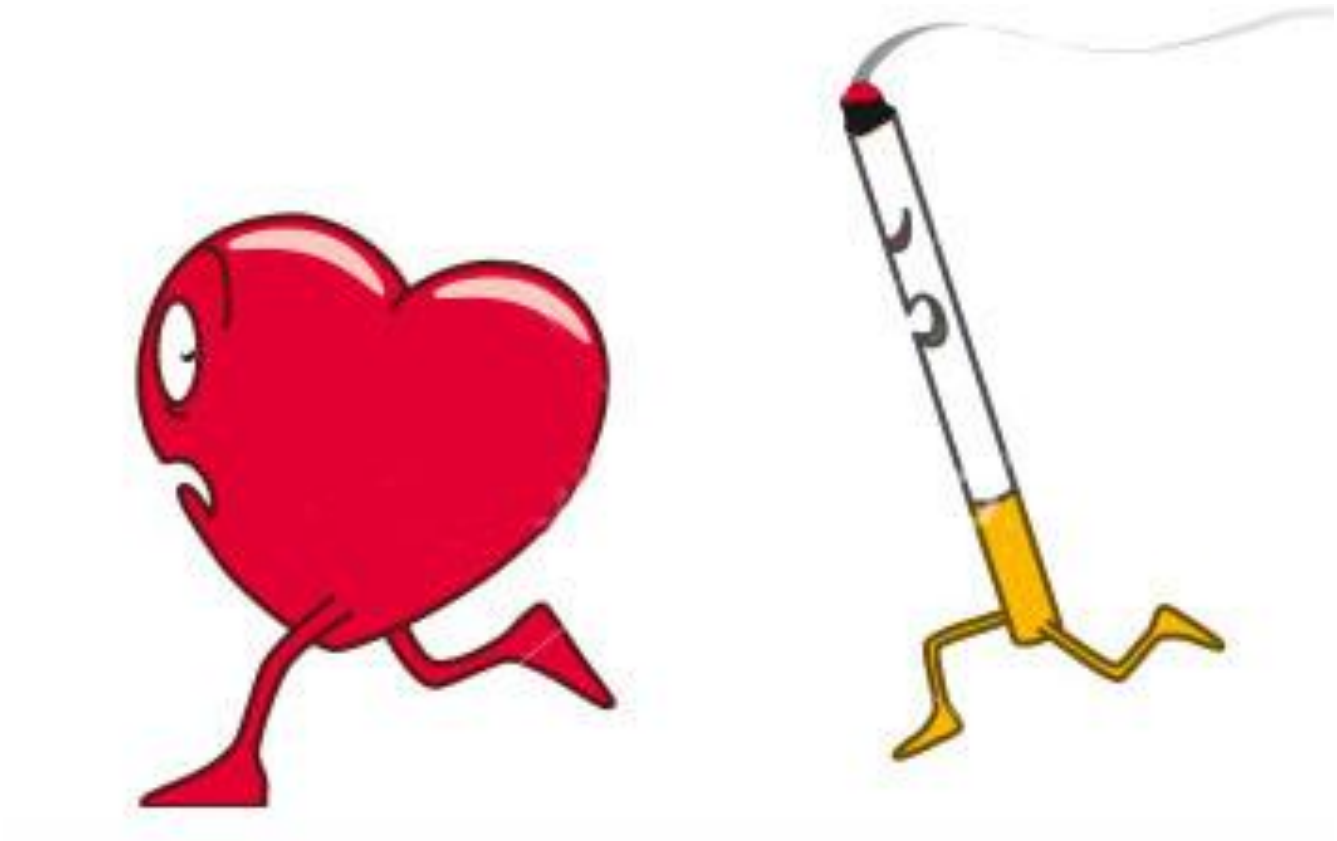
Respiratory System Anatomy

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



LS 2012 fig 12-2

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



ScienceNews
MAGAZINE OF THE SOCIETY FOR SCIENCE & THE PUBLIC

News: Health, Toxicology, Pollution

Health risks of e-cigarettes emerge

Vaping pollutes lungs with toxic chemicals and may even make antibiotic-resistant bacteria harder to kill

By JANET RALOFF 4:31PM, JUNE 3, 2014

https://www.sciencenews.org/article/health-risks-e-cigarettes-emerge

☞☺...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.

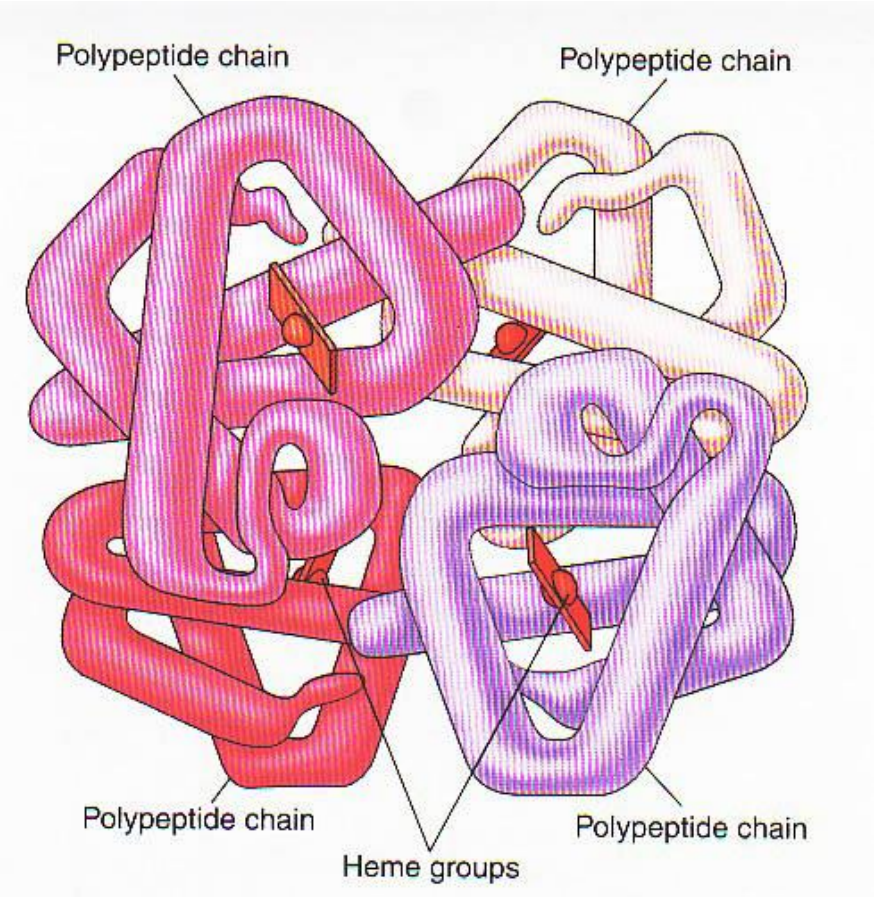
Science Teaching Reconsidered, National Academy Press, 1997.

Break for discussion/questions!

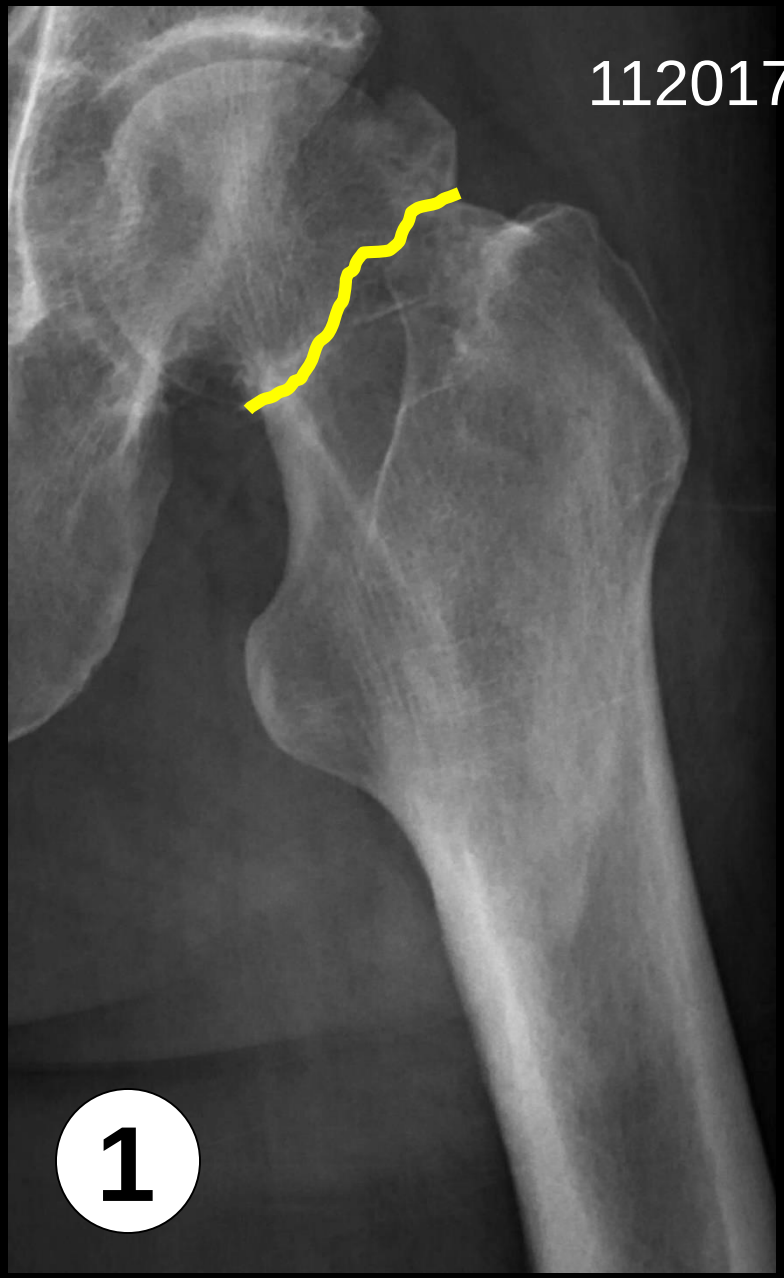
ANATOMY	vs	PHYSIOLOGY
STRUCTURE	vs	FUNCTION
WHAT?	vs	HOW?
WHERE?	vs	WHY?

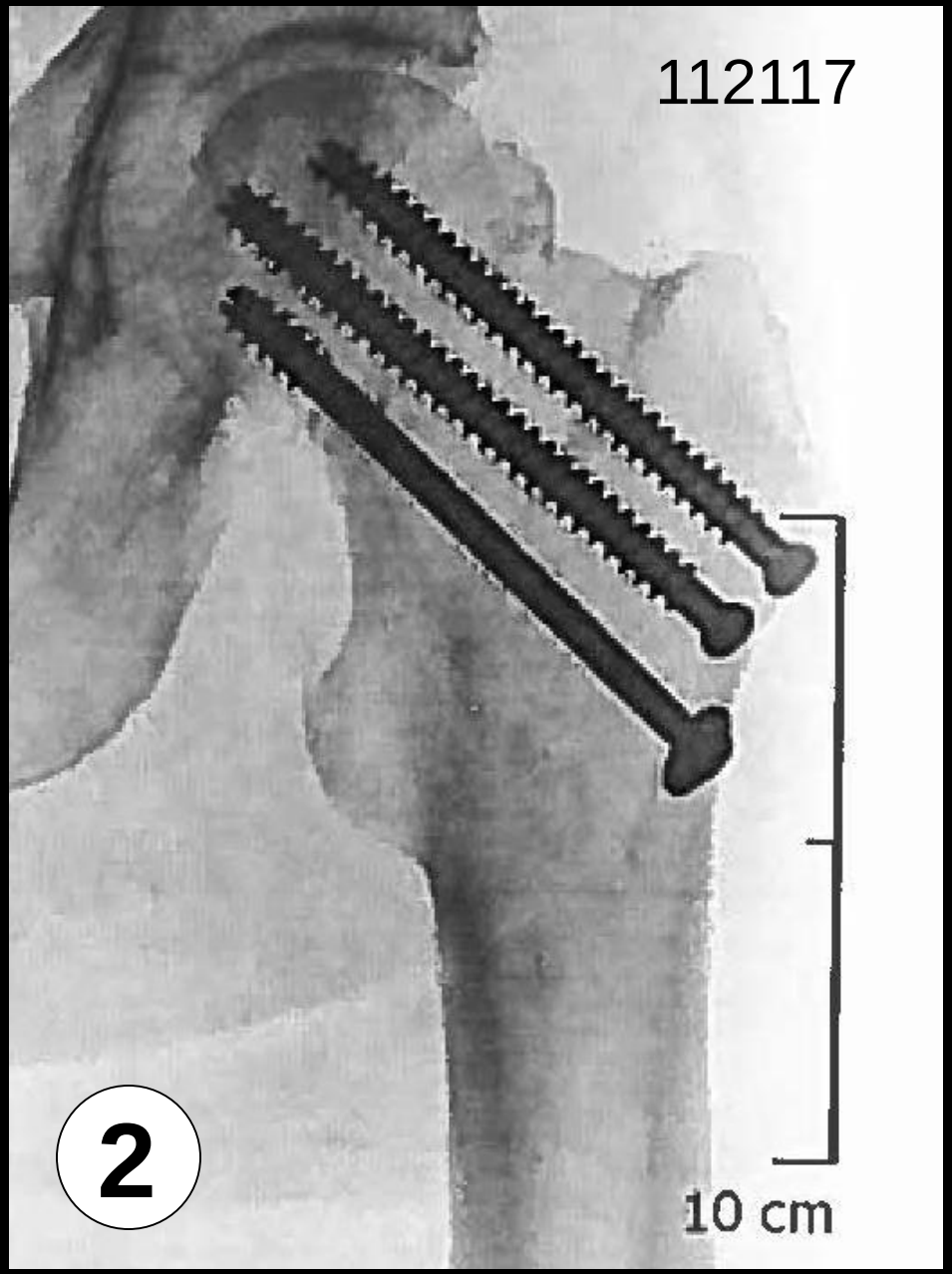
vs

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

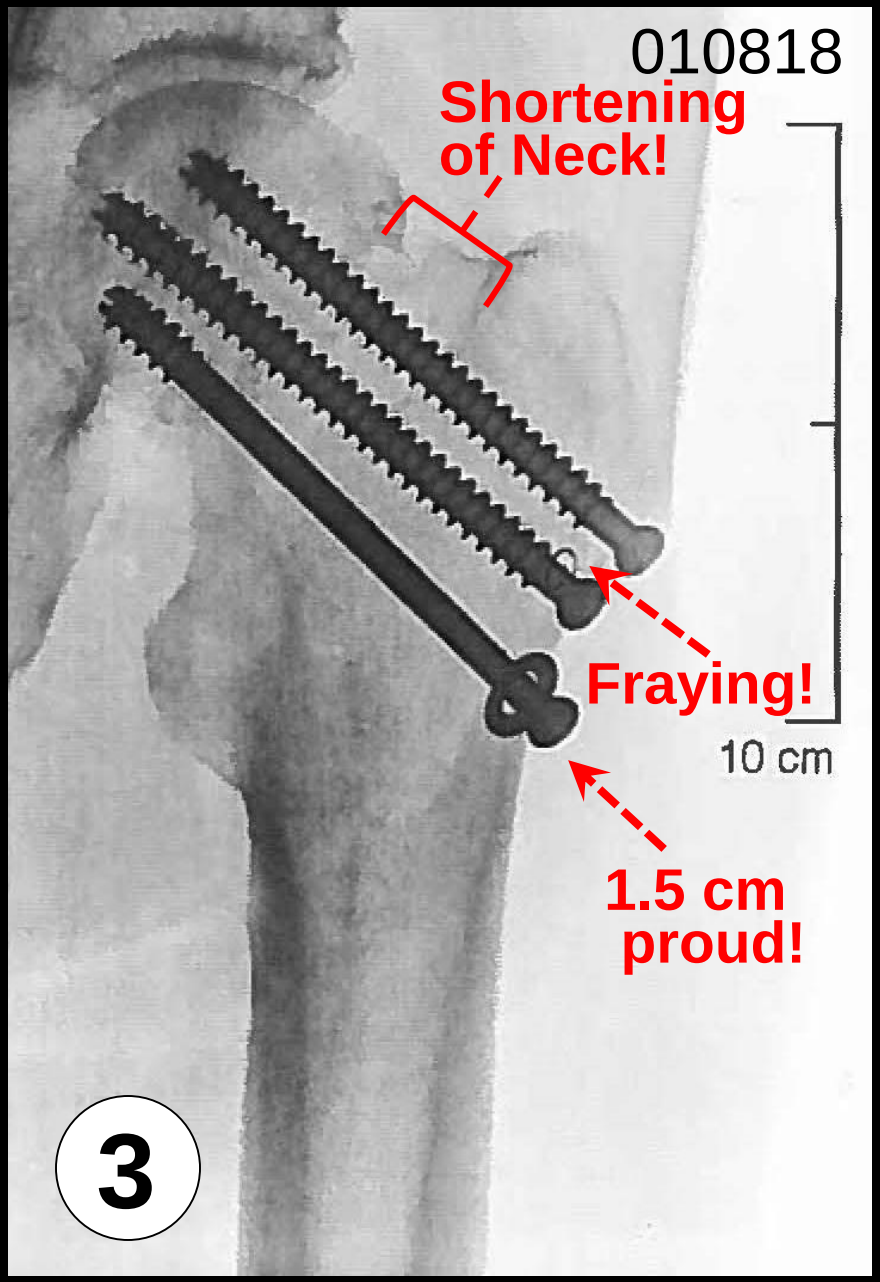


Structure-Function: L Hip Fracture & Fixation w/Screws

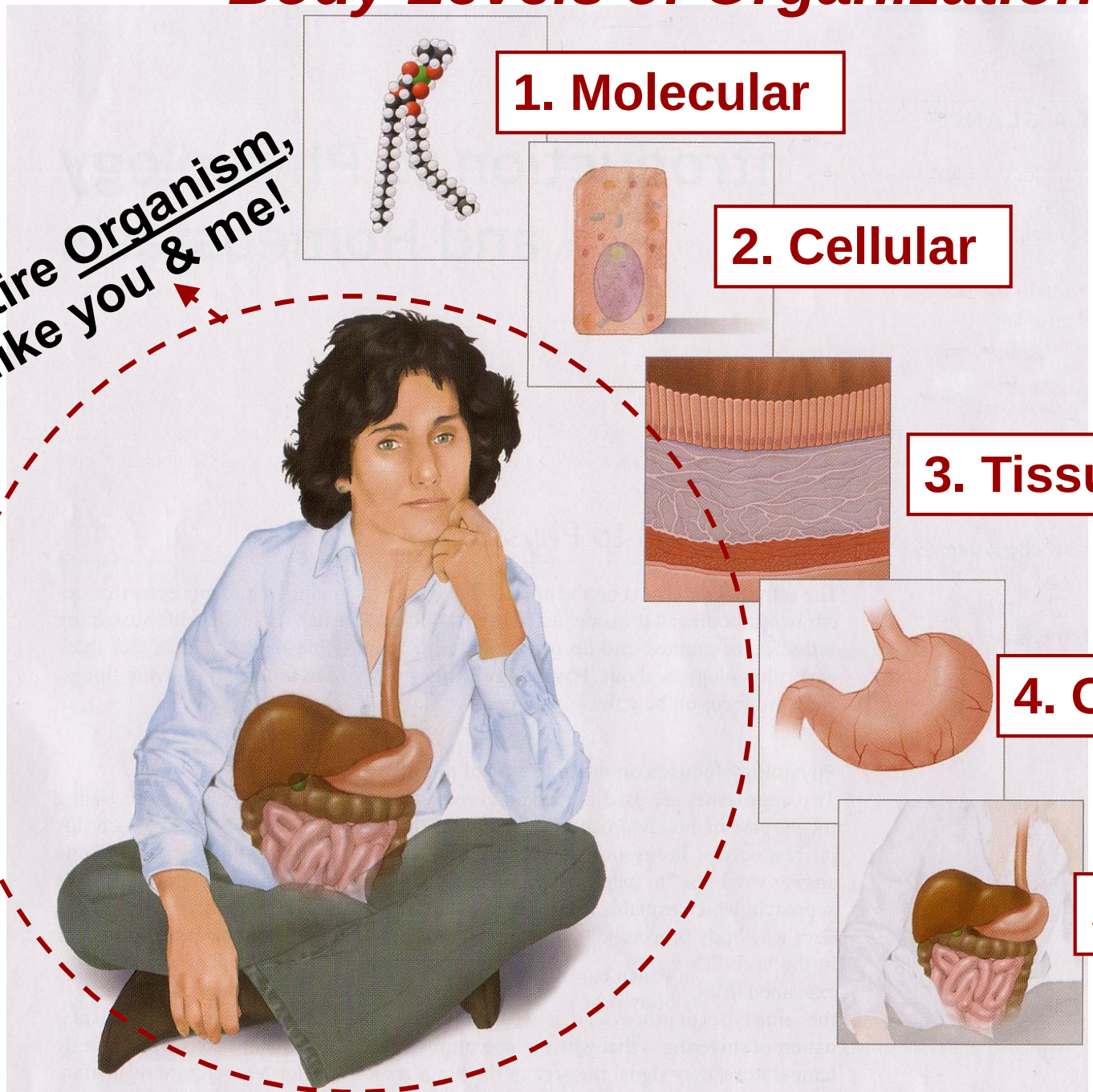




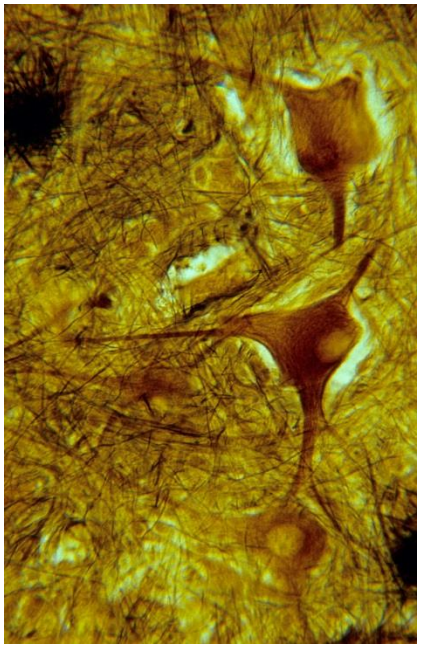
L Hip Osteonecrosis & L Hip Replacement



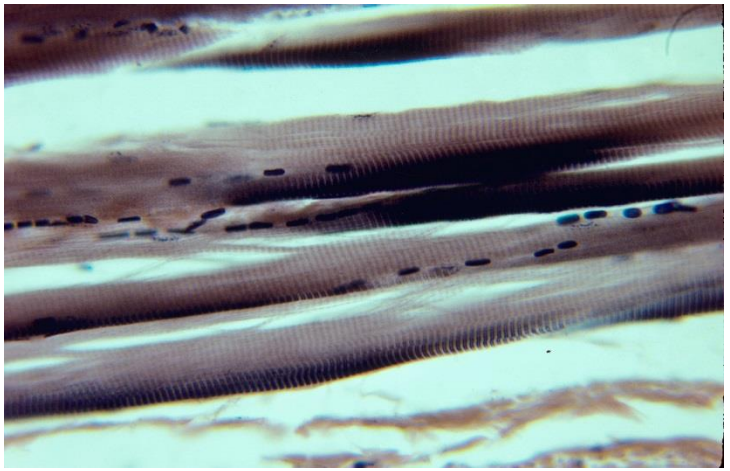
Body Levels of Organization



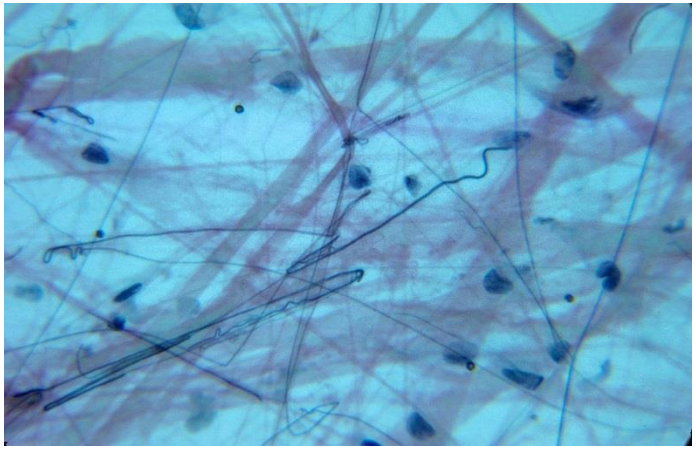
LS fig 1-1 p 2



Nerve conducts



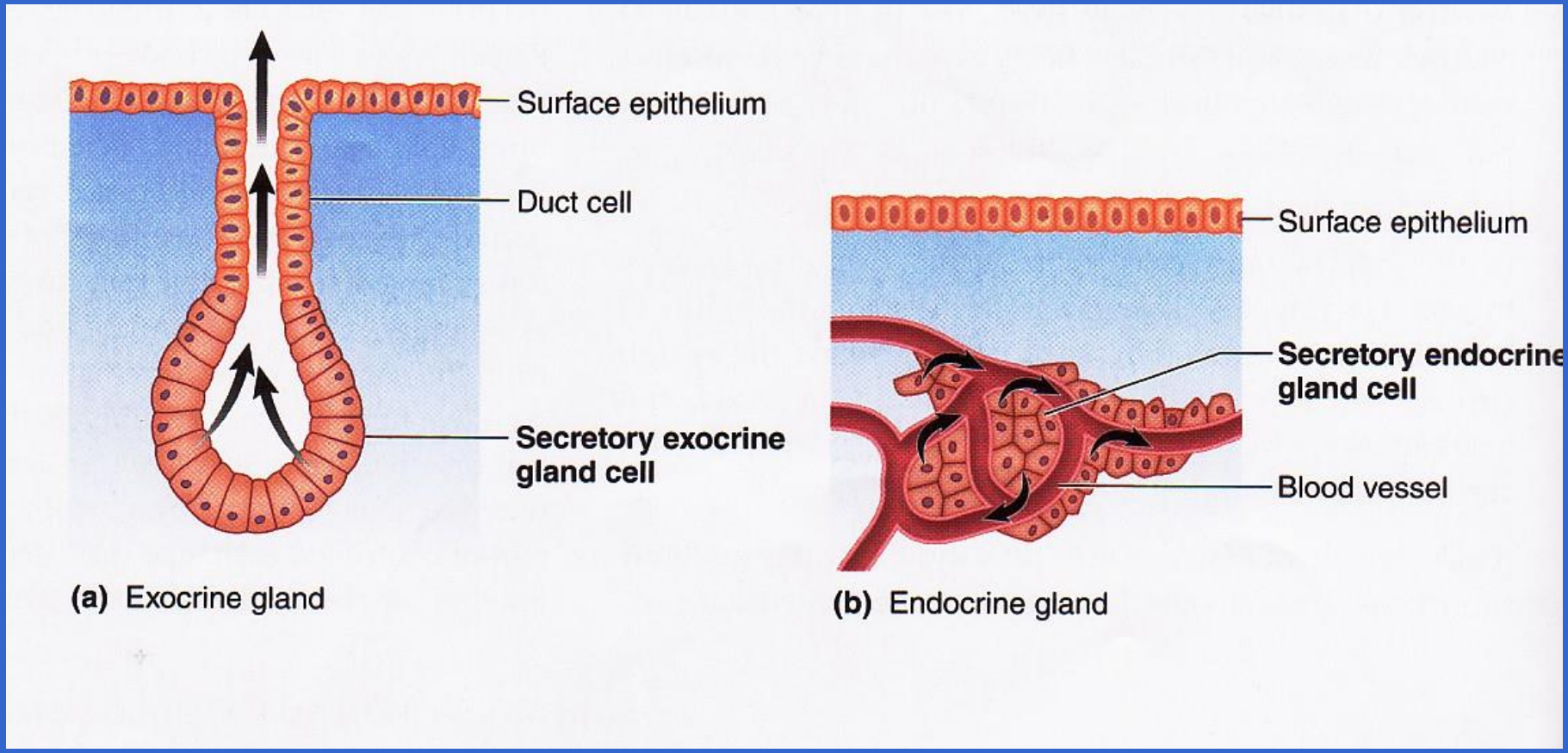
Muscle contracts



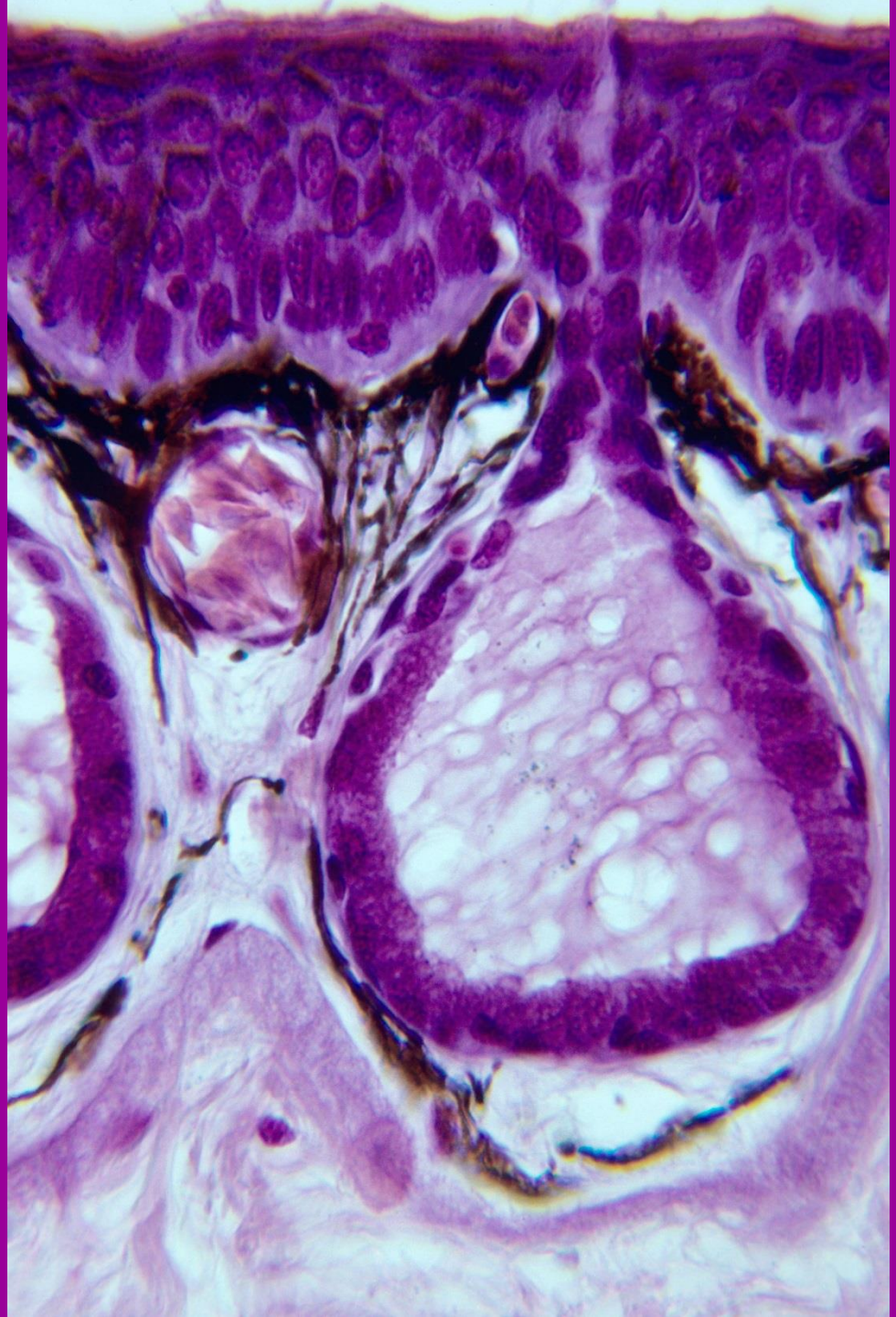
Connective connects!!

Epithelial covers

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

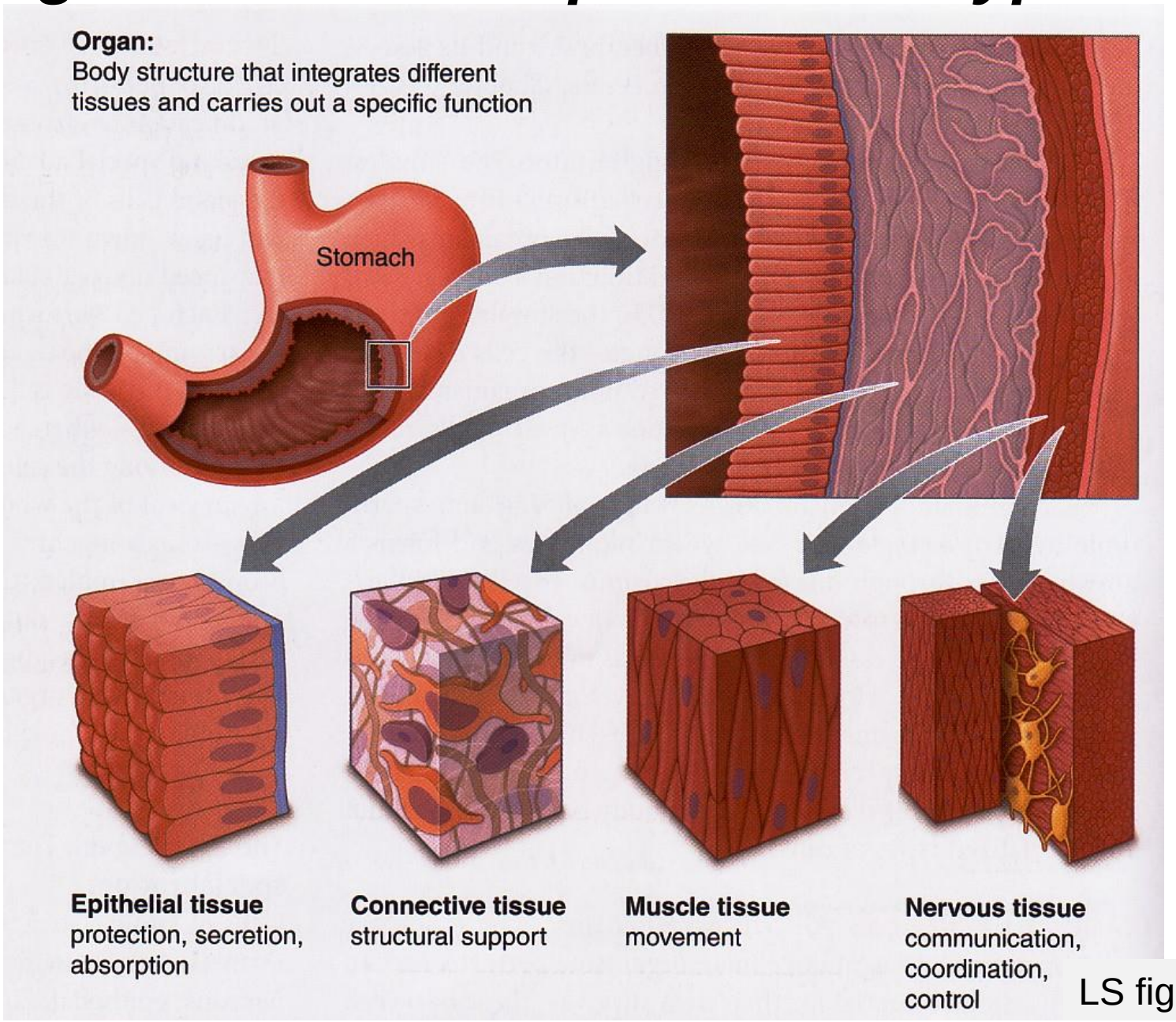


LS fig 1-3 p 4



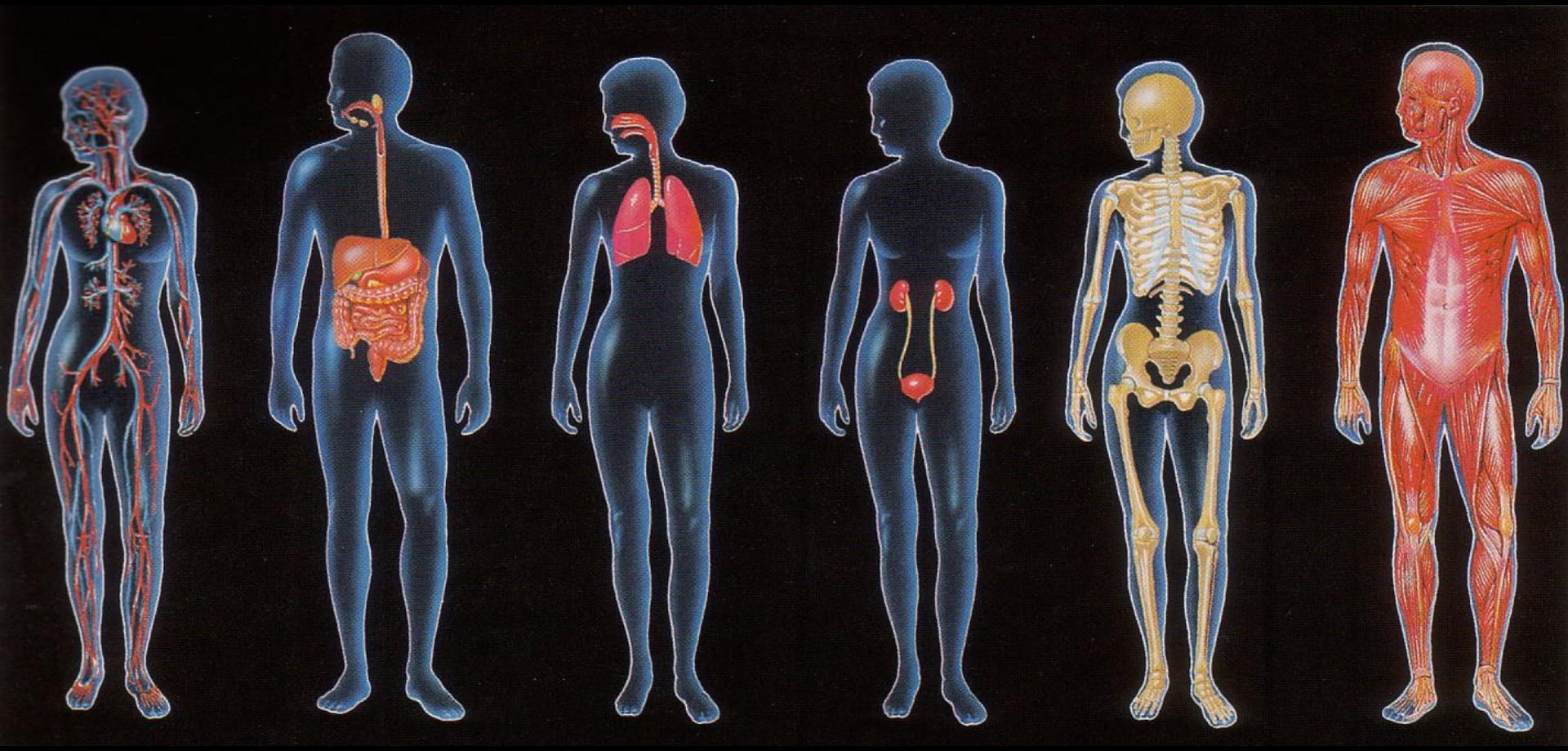
Epithelial tissue in frog skin developing into an *exocrine* gland!

Organs are made up ≥ 2 tissue types



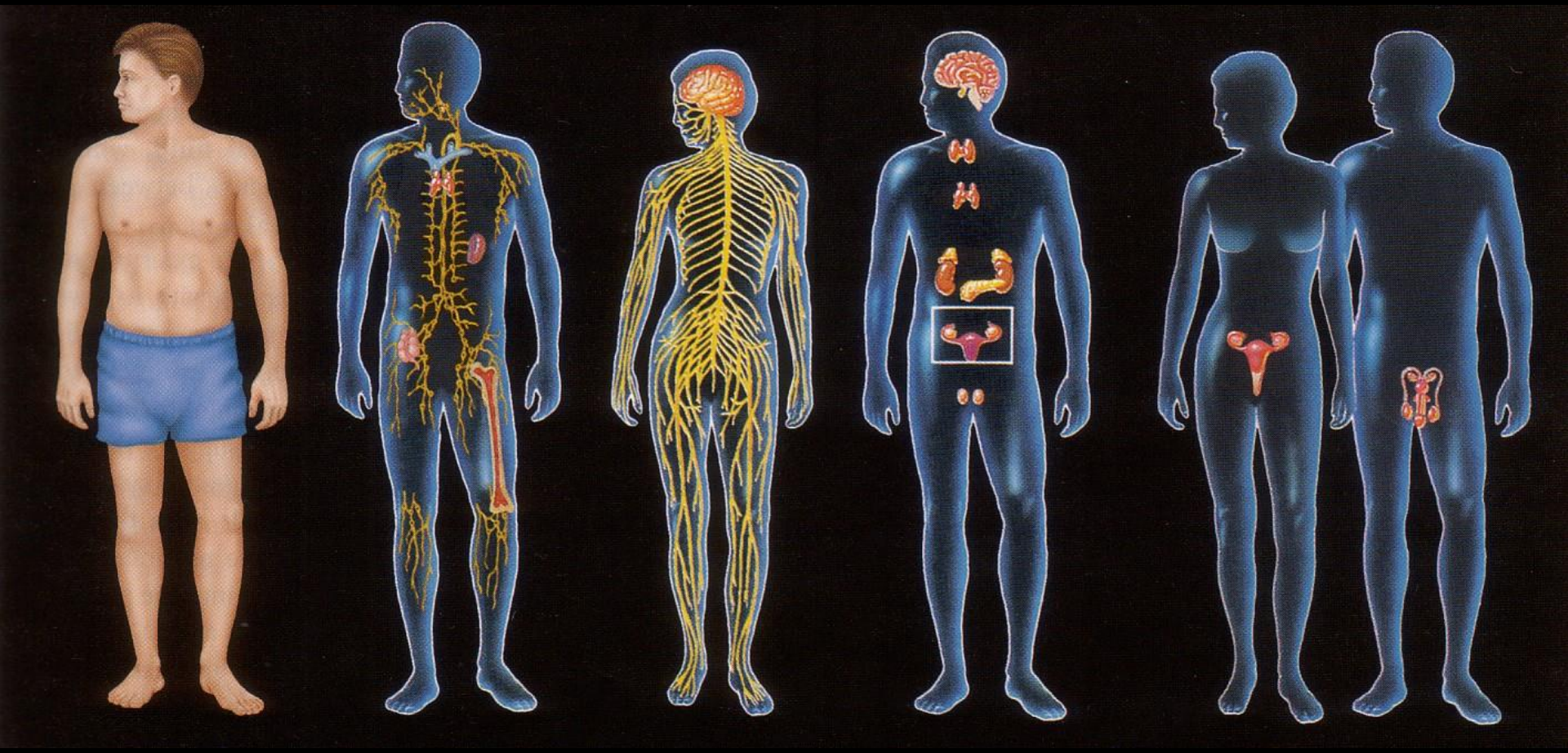
LS fig 1-2 p 4

Which body systems?



LS fig 1-4 p 6

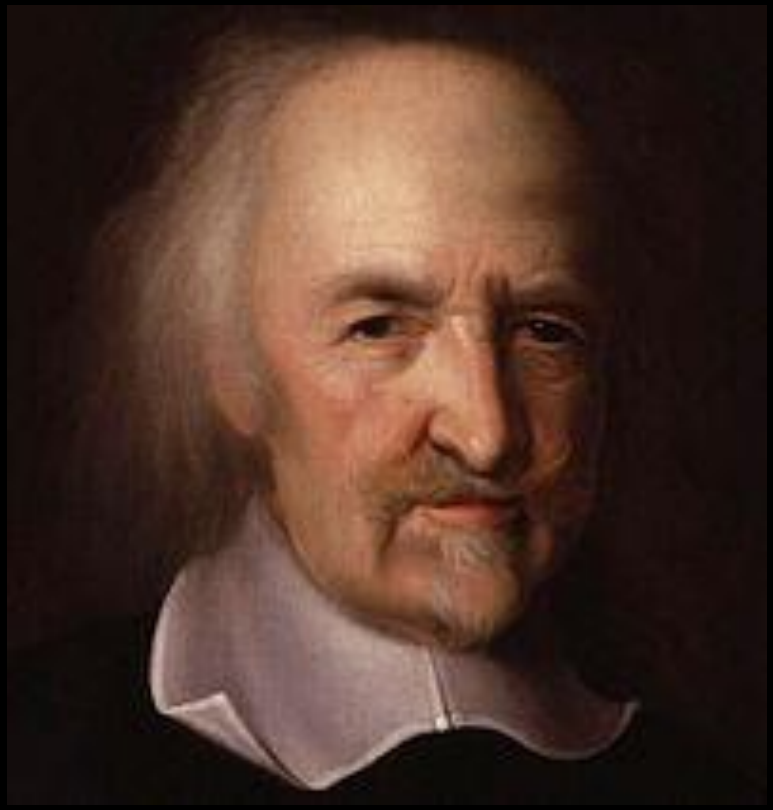
Which body systems?



LS fig 1-4 p 6

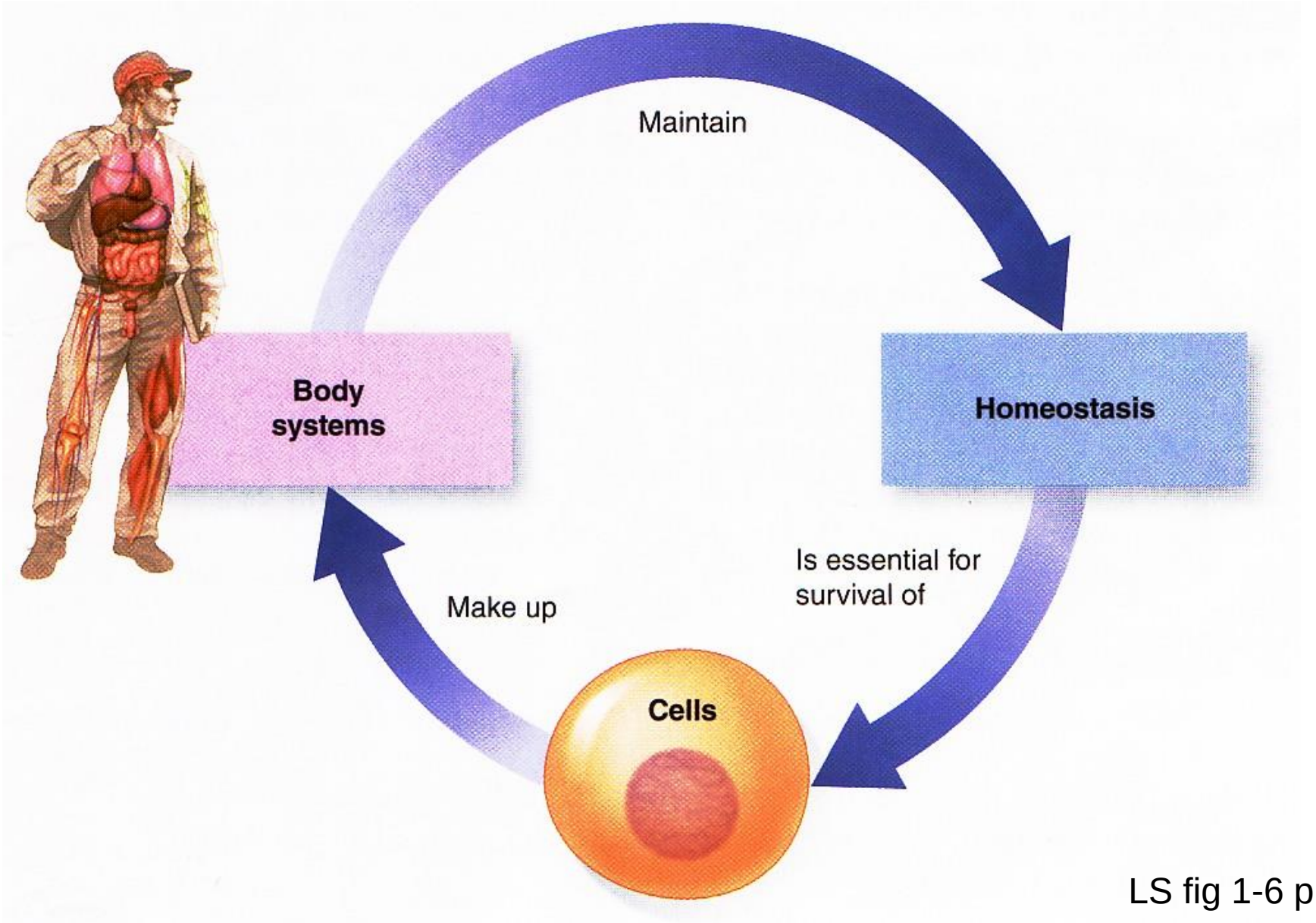
Why study human physiology?

KNOWLEDGE IS POWER!!!



Thomas Hobbes of Malmesbury
English Philosopher, 1658

Homeostasis is essential for cell survival!



LS fig 1-6 p 7

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

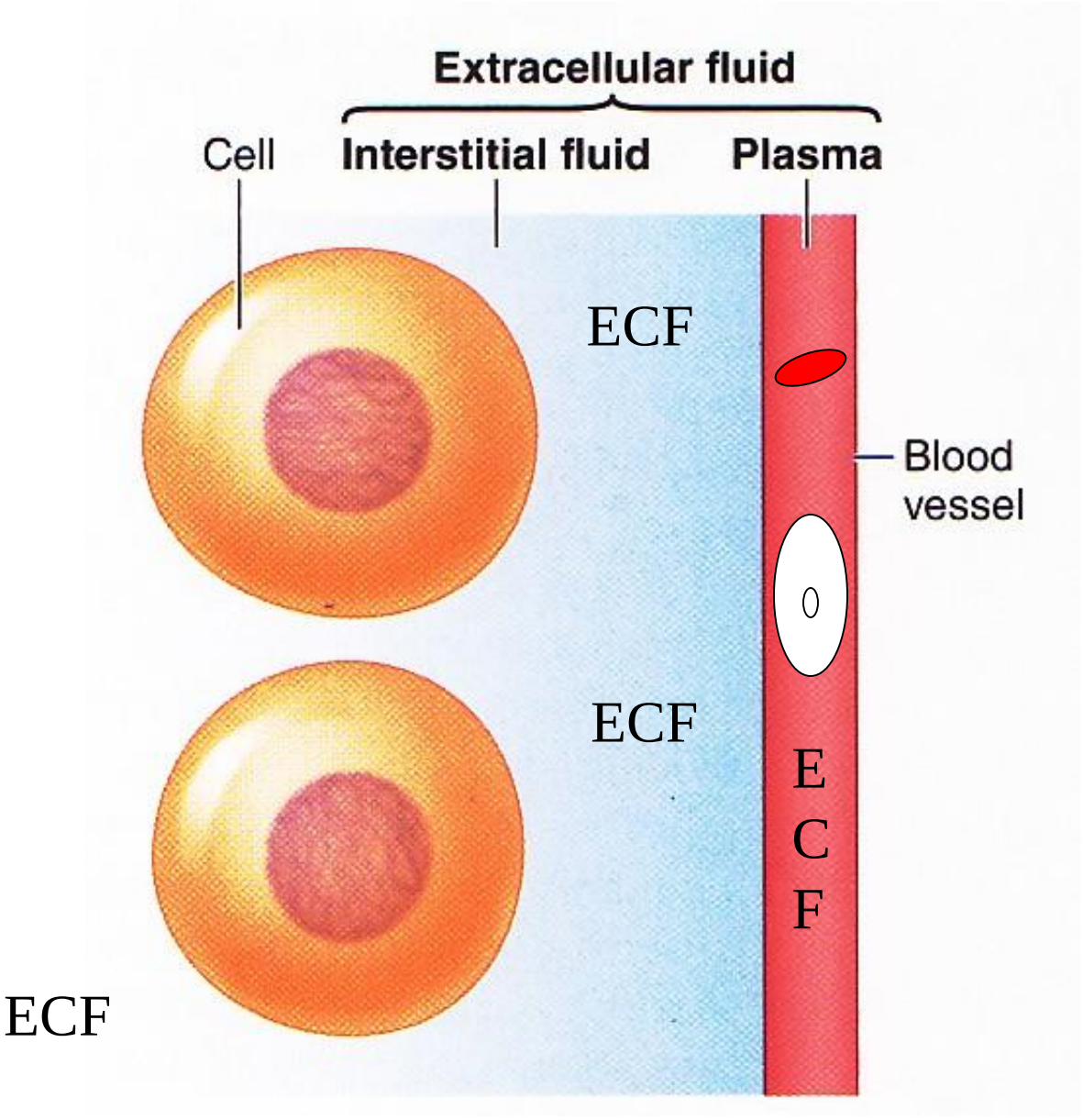
milieu interieur?

Claude Bernard

100 trillion cells working intimately

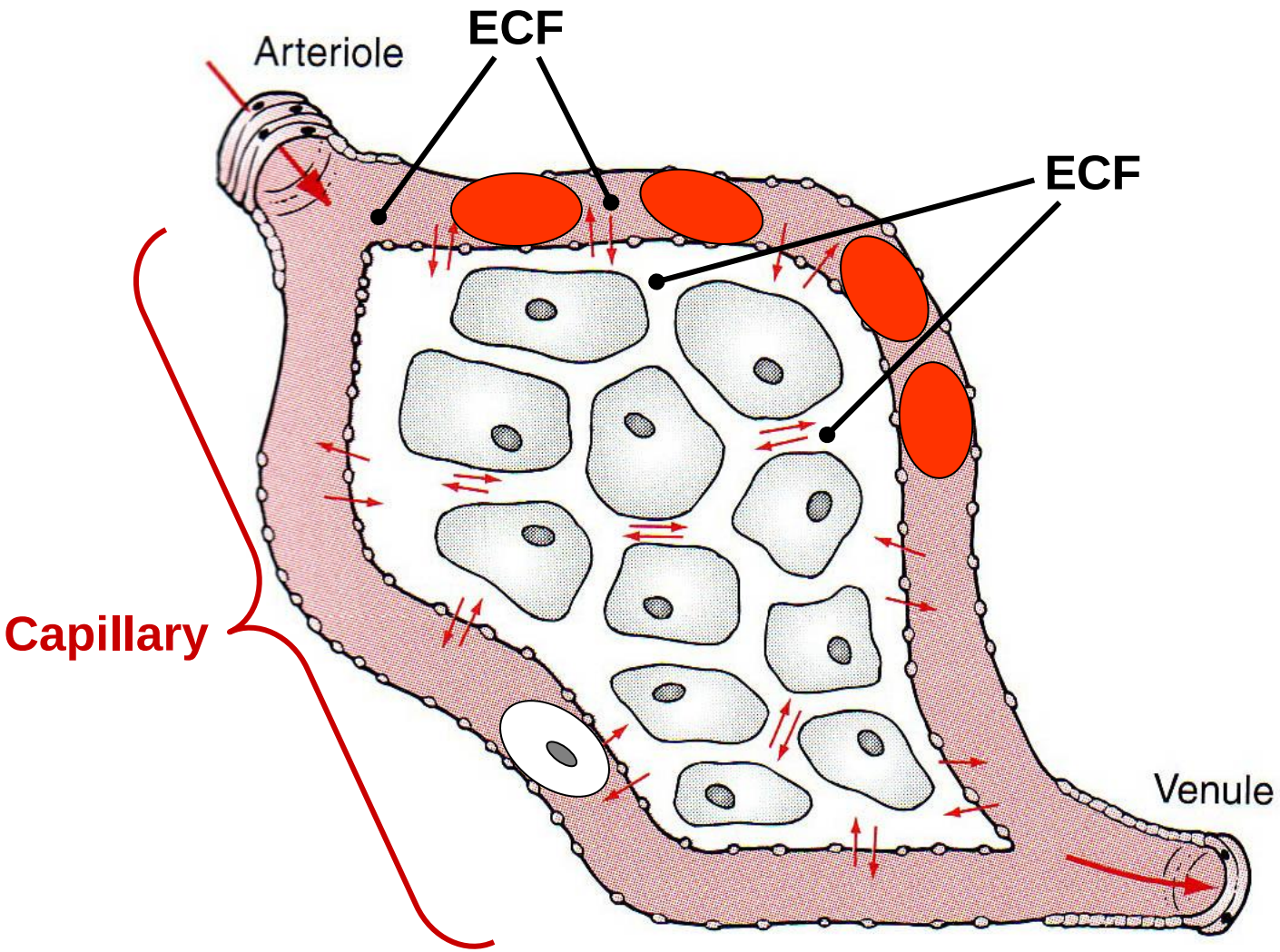
Walter B. Cannon

Where is extracellular fluid?



LS fig 1-5 p 7

Where is extracellular fluid?



As long as <u>between/outside</u> cells, ECF everywhere?

G&H 2011

ECF = Extracellular

Plasma

(within CV System)

Interstitium

(eg, between muscle cells)

ICF = Intracellular

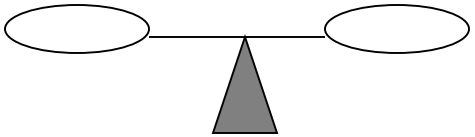
https://www.youtube.com/watch?v=B658Yn3INYc

Homeostasis
or
Homeokinesis?

https://www.khanacademy.org/partner-content/mit-k12/chem-and-bio/v/homeostasis

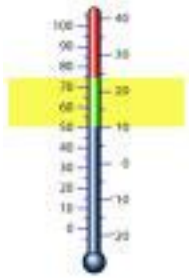
Metabolic

ANA- CATA-



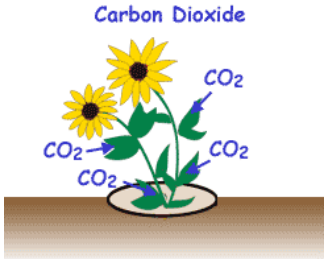
H_2O

T°C



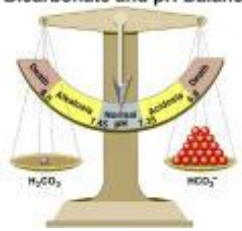
Dr. Evonuk's 6 Balances

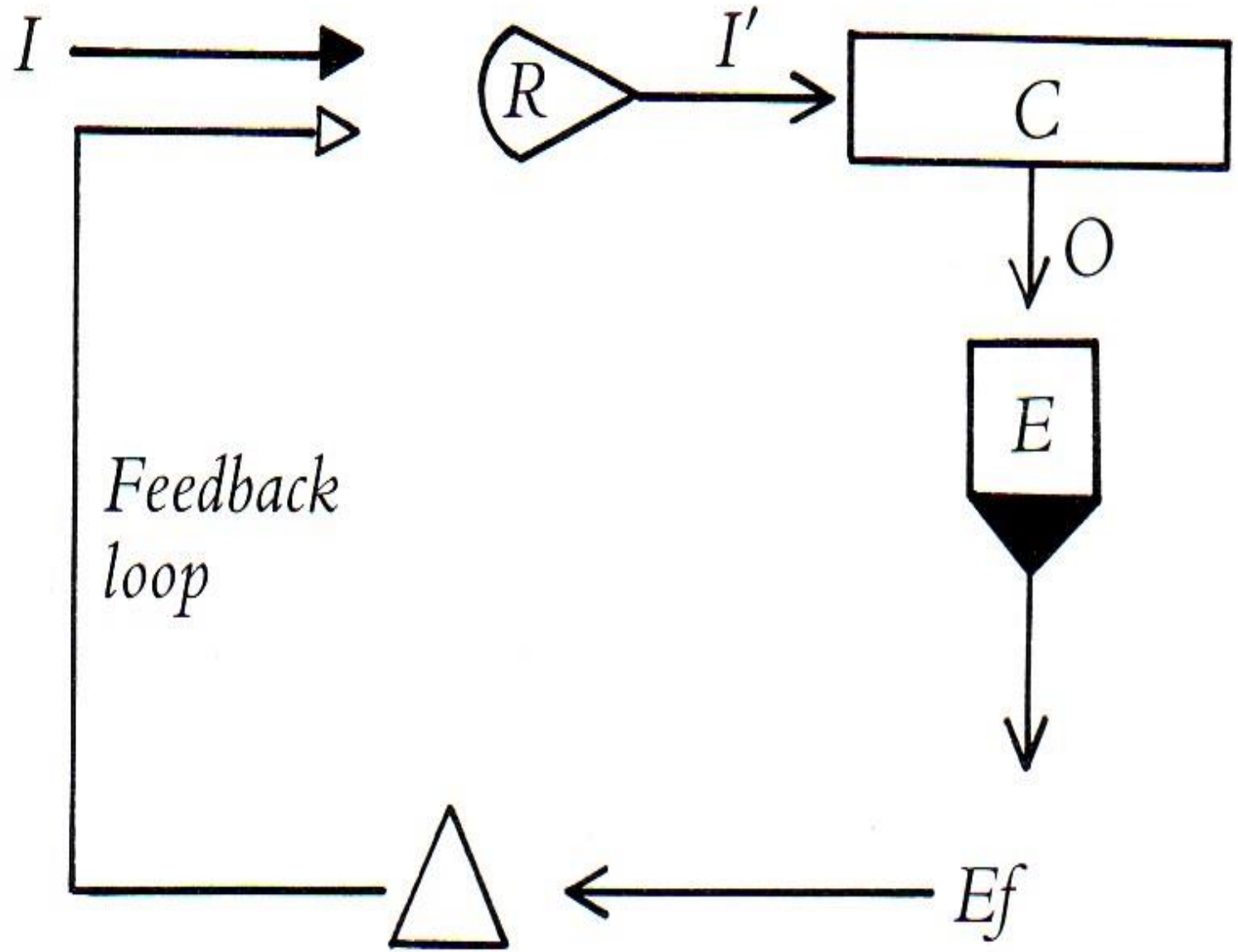
O_2/CO_2



$Ion^{+/-}$

pH




I
R
I′
C
O
E
Feedback
loop
Ef