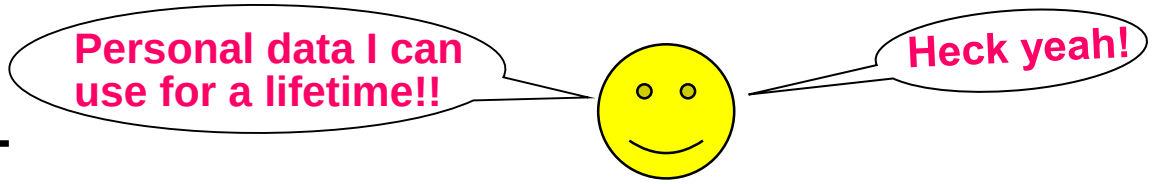
BI 121 Lecture 11



I. ***Announcements*** ***Blood Chemistry Lab today!*** **Fun!! Personal data!!! If you haven't already done so, please review Lab 5 in LM & in e-mail. Thanks! Q from last t?**

II. ***Safety & Techniques Review for Blood Chem Lab*** **Q?**

III. ***Endocrine Connections*** **Peripheral endocrine organs** DC pp 109-13, LS pp 513-36

- **A. Pancreas (insulin – glucagon see-saw!)**
- **B. Thyroid**
- **C. Adrenals**

IV. ***Introduction to the Nervous System*** **LS ch 5, DC Module 9**

- **A. Organization?** LS fig 5-1 DC p 67
- **B. Neurons? What kind? Classes? Velocity?** LS fig 5-2, 5-4
- **C. Myelin? How does it help?** DC fig 9-3, LS pp 83-5
- **D. Brain structure & function** DC fig 9-6 thru 9-10 pp 71-5+…
- **E. Protect your head with a helmet! Bicycle head injury statistics** *NHTSA & BHSI*, 2013 & 2014

No food, drink or gum in lab today! Thanks sincerely!

…Healthy, tasty & fresh, but not in lab!!

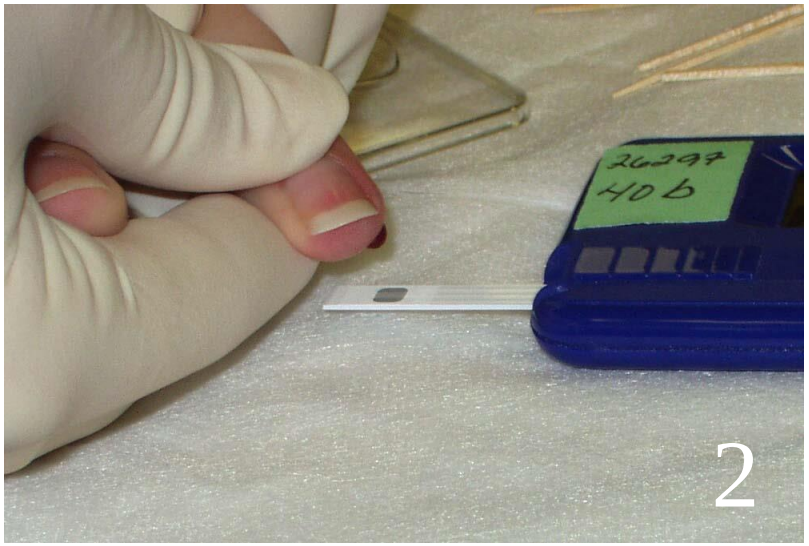
PREPARATION

WASH & DRY

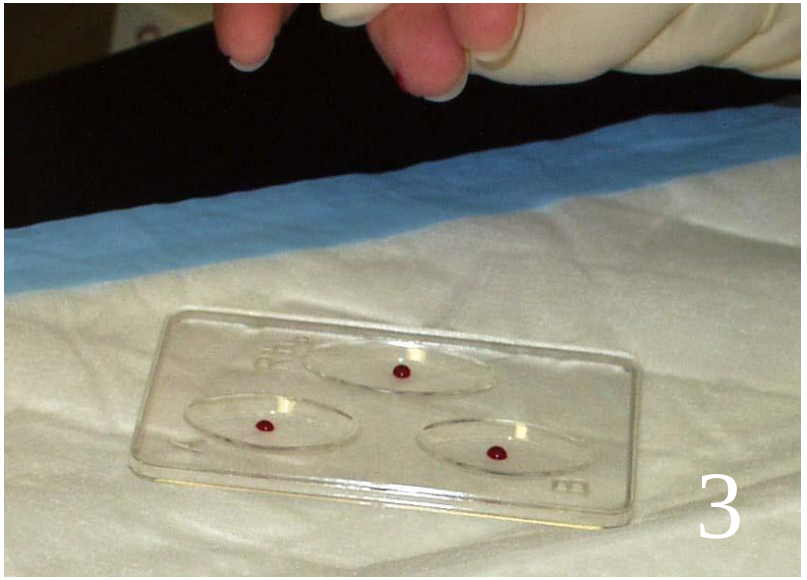
ALCOHOL

SAMPLE+TESTS

OBTAIN μSAMPLE

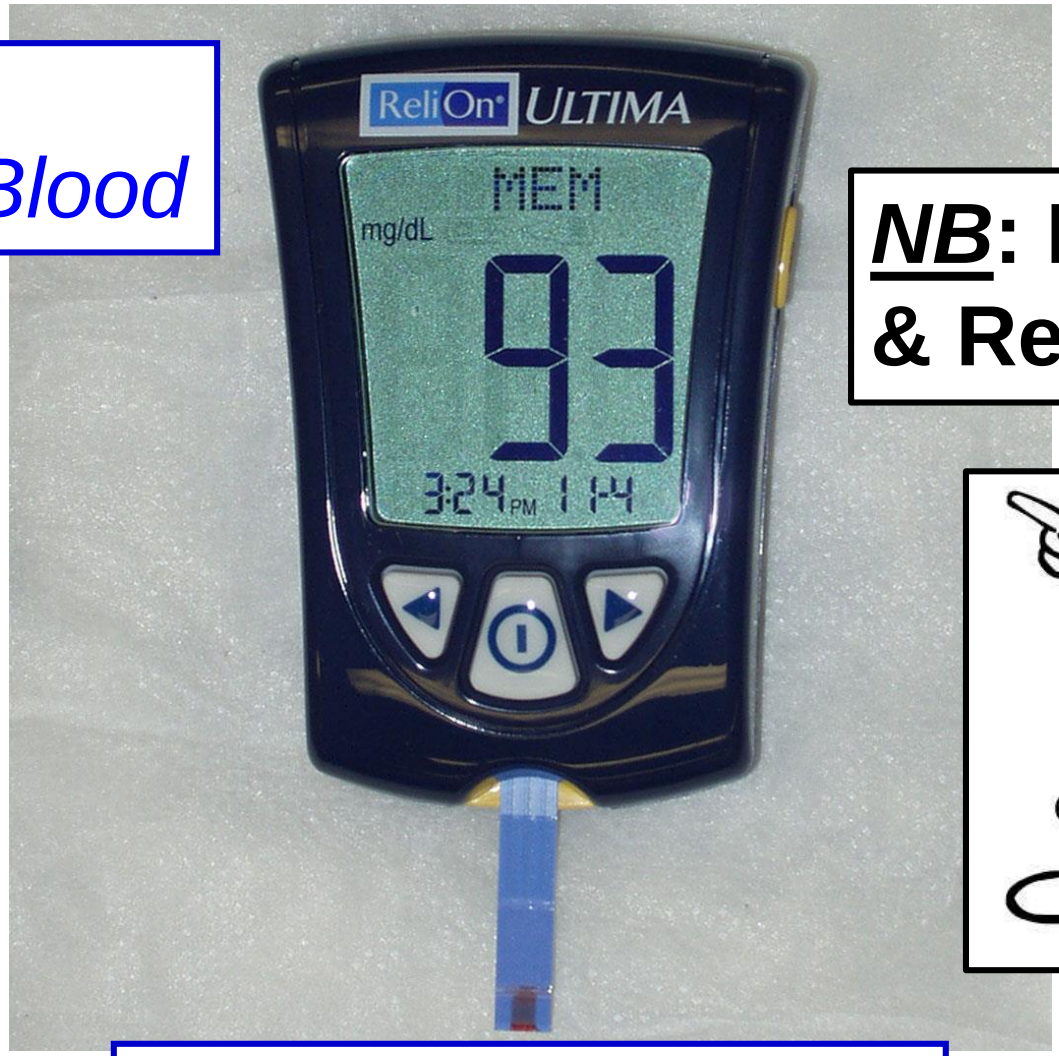


BLOOD GLUCOSE

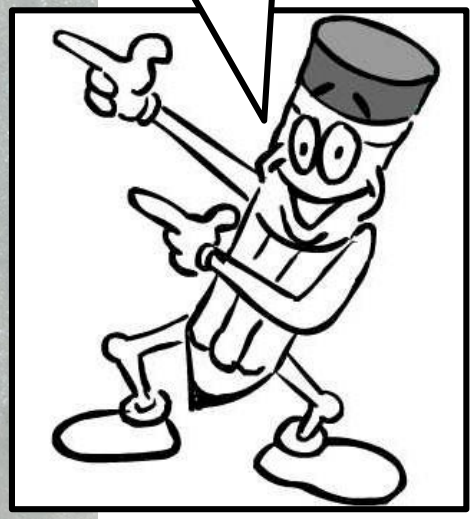


BLOOD TYPING

Glucose:
Sugar in Blood



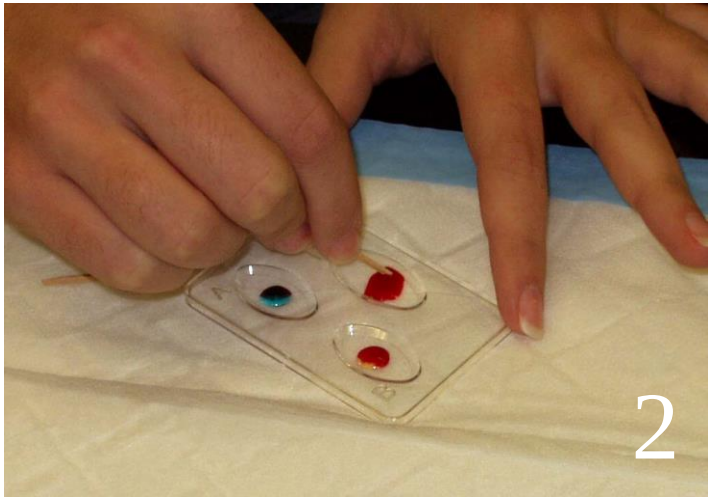
***NB*: Read & Record!**



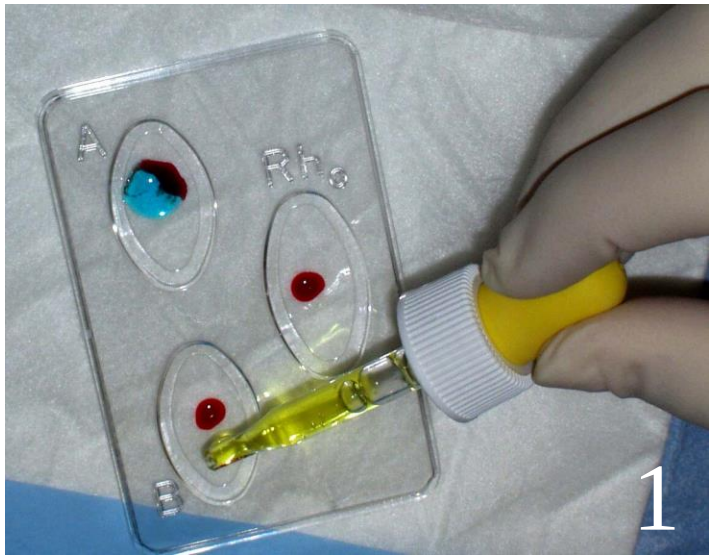
Normal: 70-99
Pre-Diabetes: 100-125
Diabetes: ≥ 126 mg/dL

https://doihaveprediabetes.org/

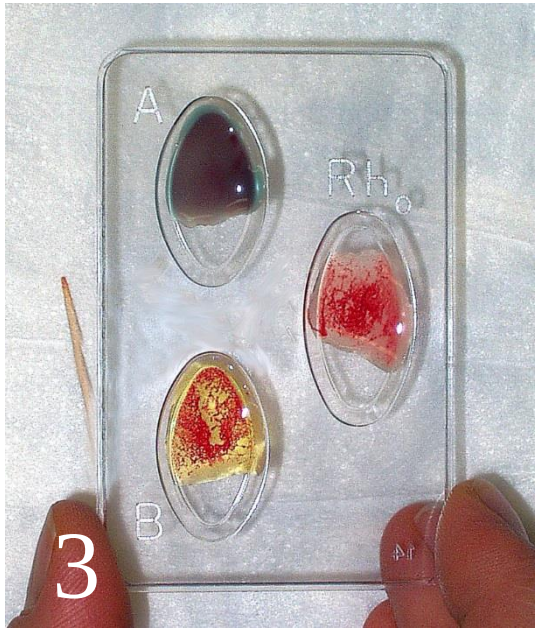
BLOOD TYPING



MIX W/TOOTHPICKS



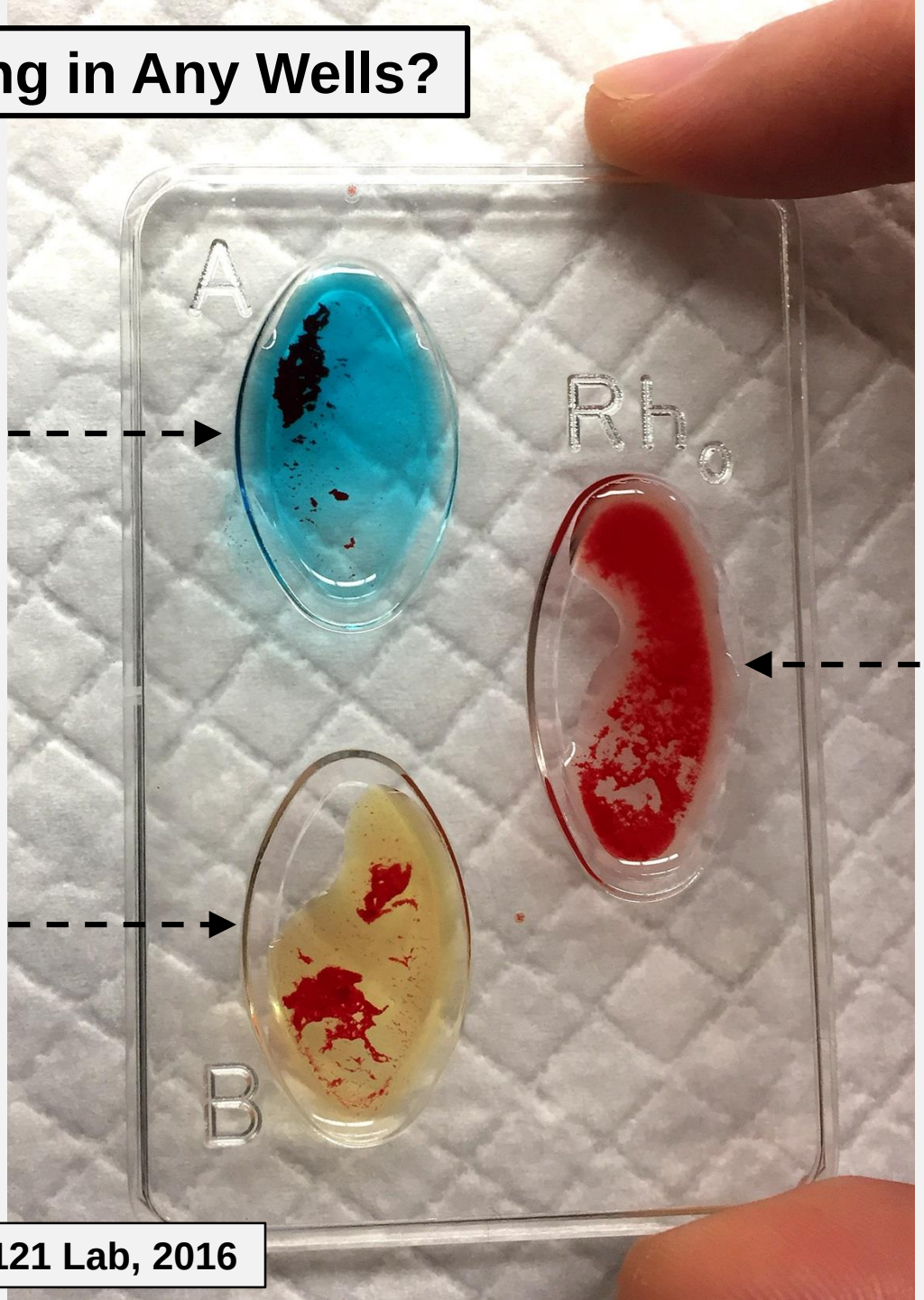
ADD ANTISERA



READ & RECORD!!

1^0 Q? Clumping in Any Wells?

Type AB+



Here?

Here?

Here?

Source: S Wong, BI 121 Lab, 2016

CLEAN-UP!

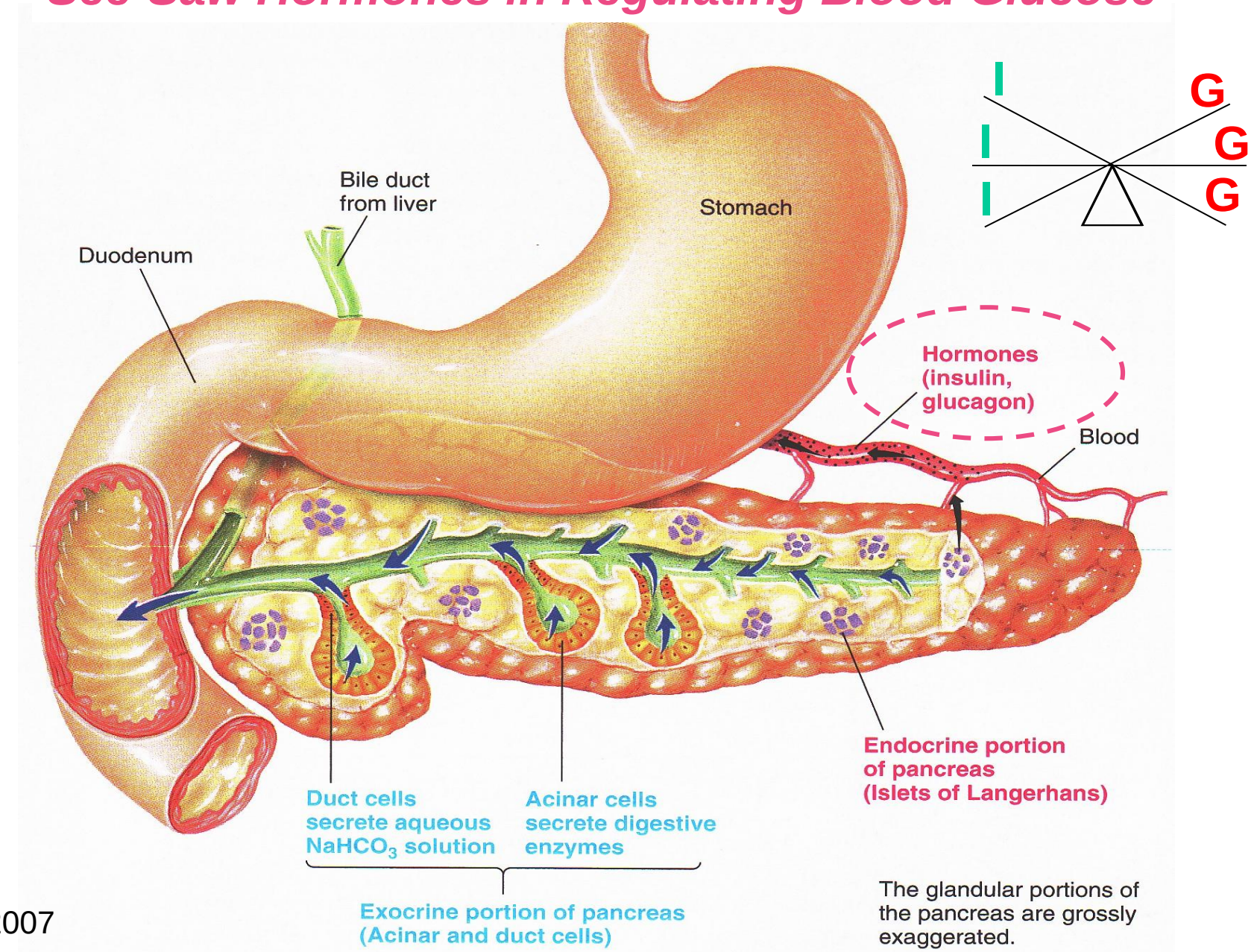
FOLD DIAPER

BLOOD PRODUCTS

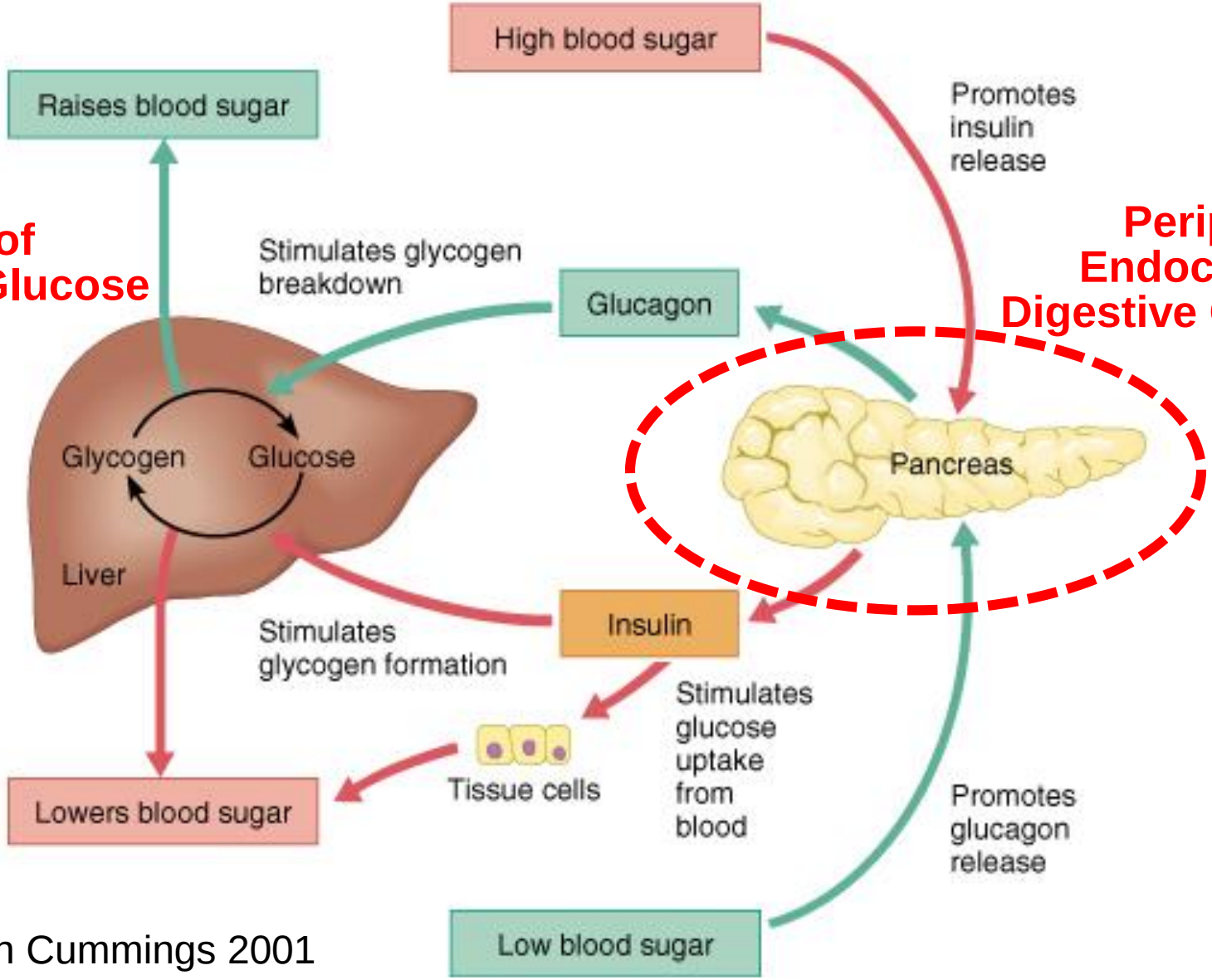
REWASH!!

Blood Chem Lab Q?

Endocrine Pancreas: Insulin (I) & Glucagon (G) See-Saw Hormones in Regulating Blood Glucose



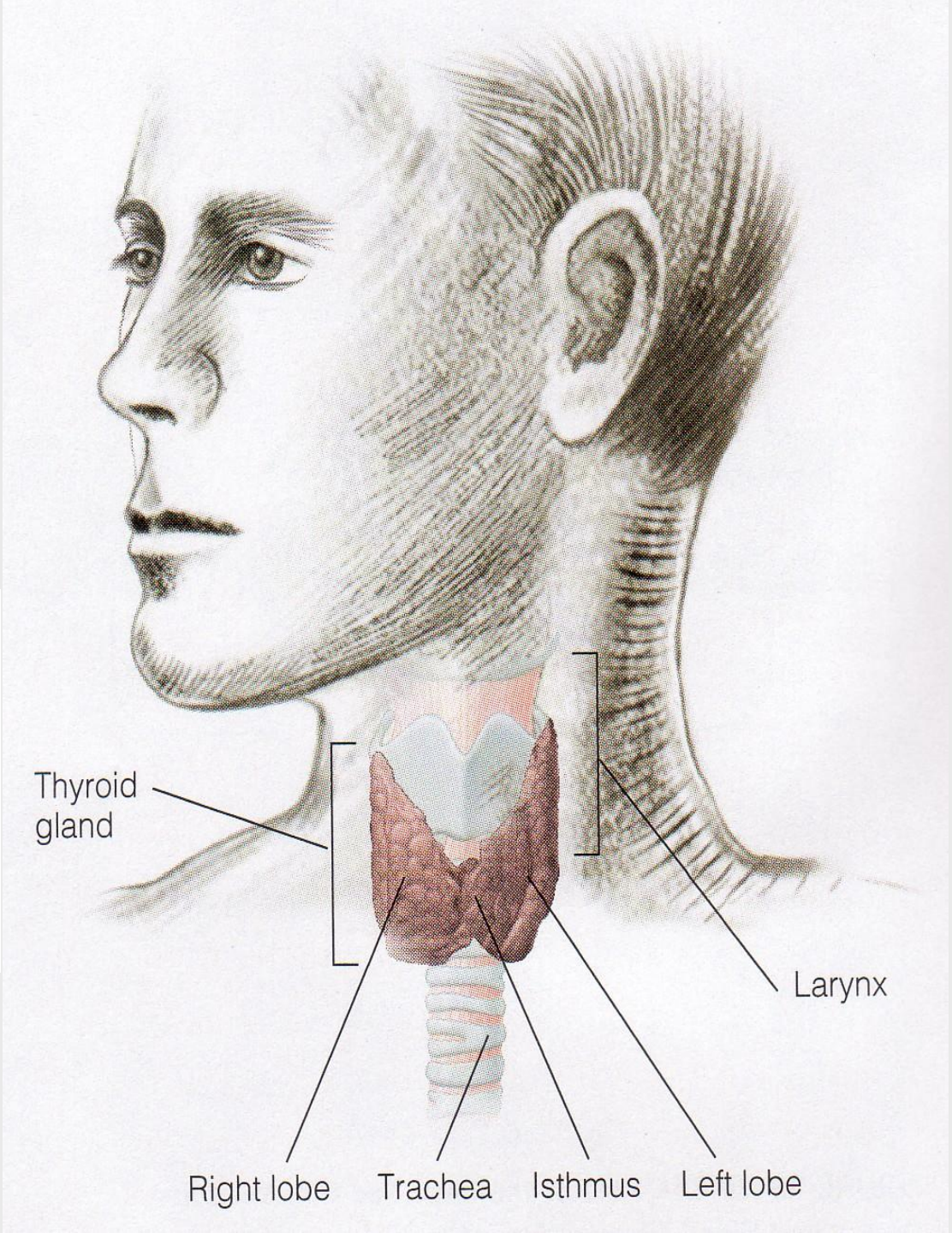
Insulin Stores Sugar, Glucagon Mobilizes Sugar!



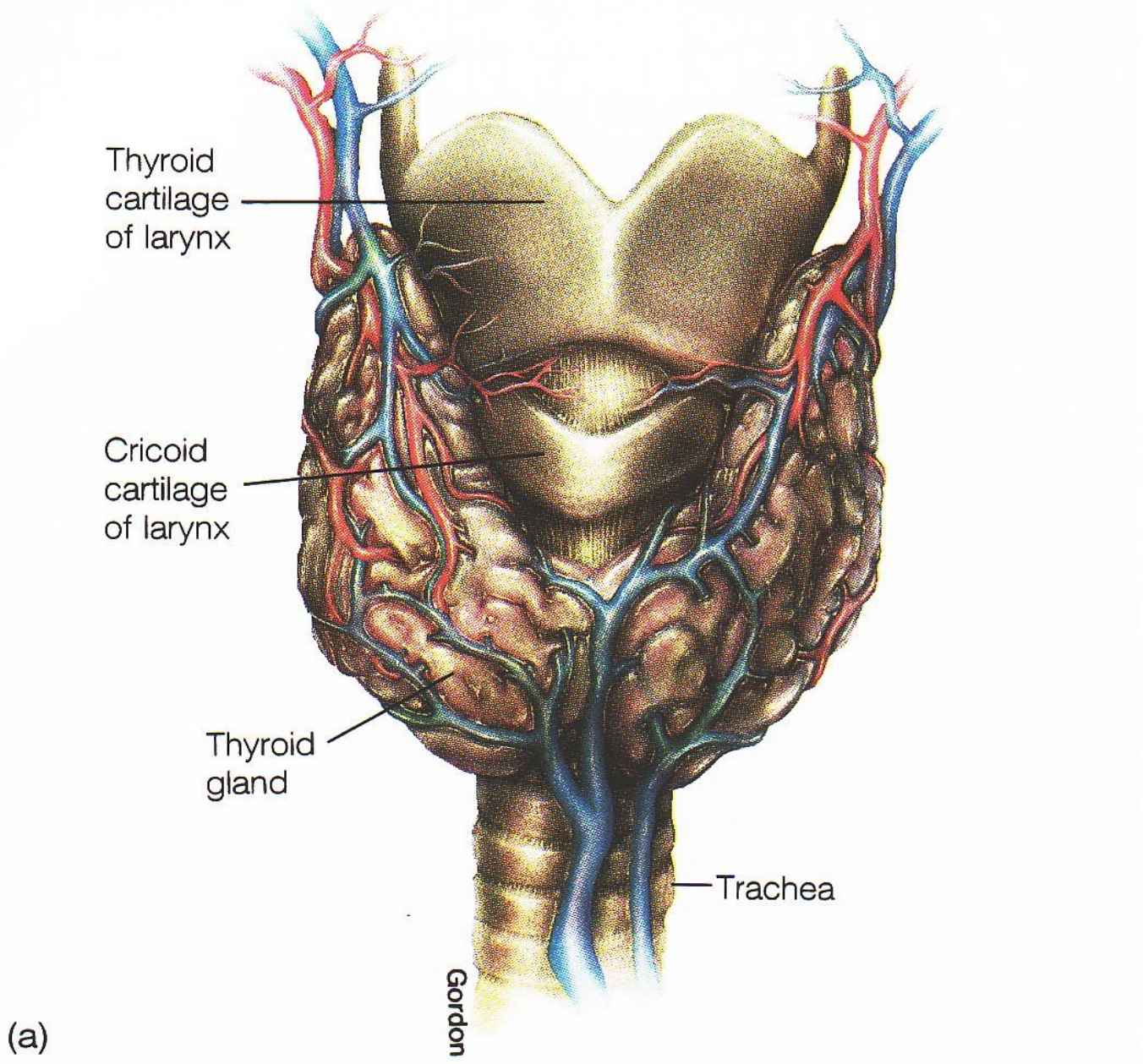
Benjamin Cummings 2001

https://www.youtube.com/watch?v=y9Bdi4dnSlg

https://www.fuseschool.org



DC 2003


Thyroid cartilage of larynx
Cricoid cartilage of larynx
Thyroid gland
Trachea
Gordon
(a)

DC 2003


DC 2003

LS 2012 fig 17-16

LS 2012 fig 17-17

Guyton & Hall 2000

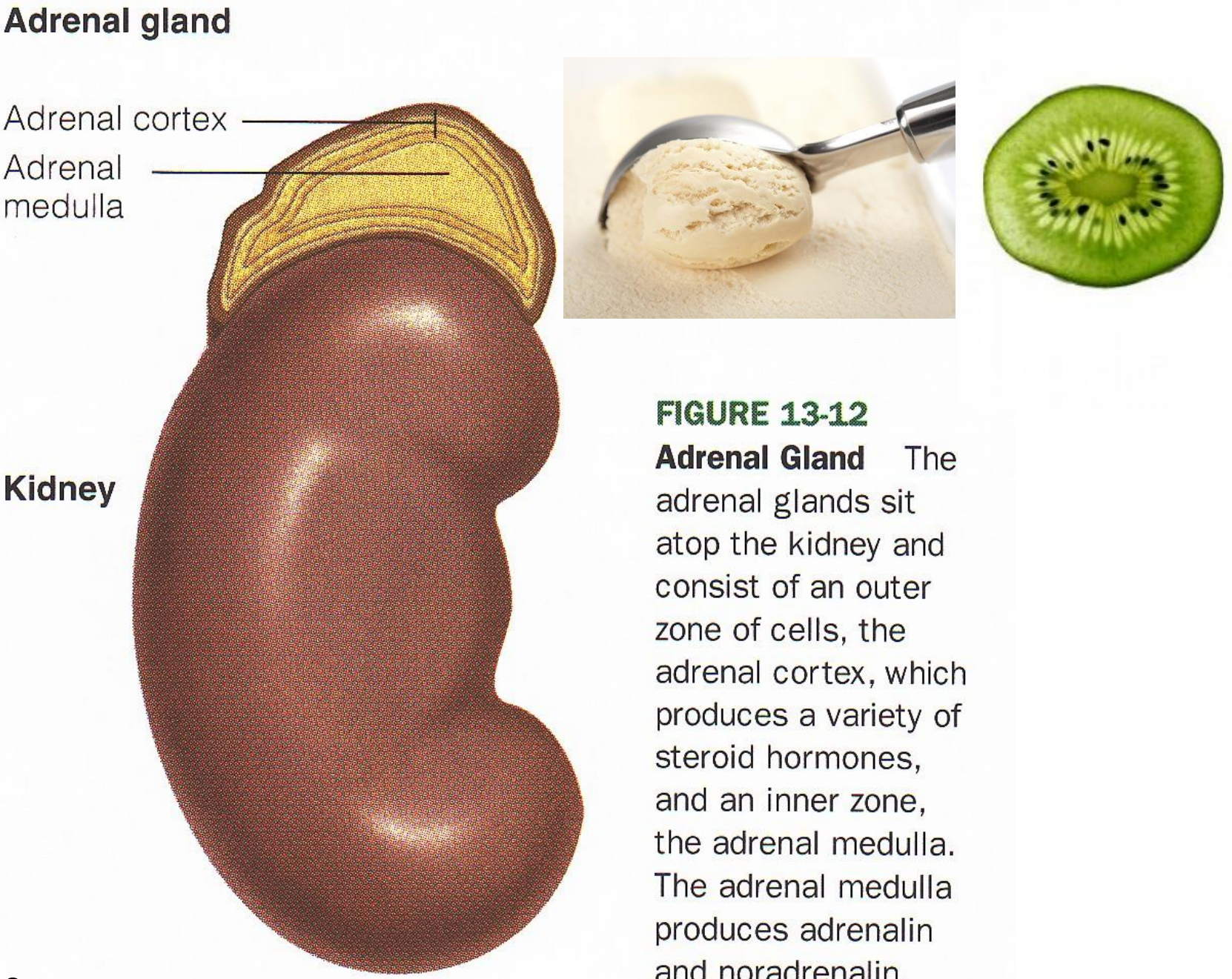
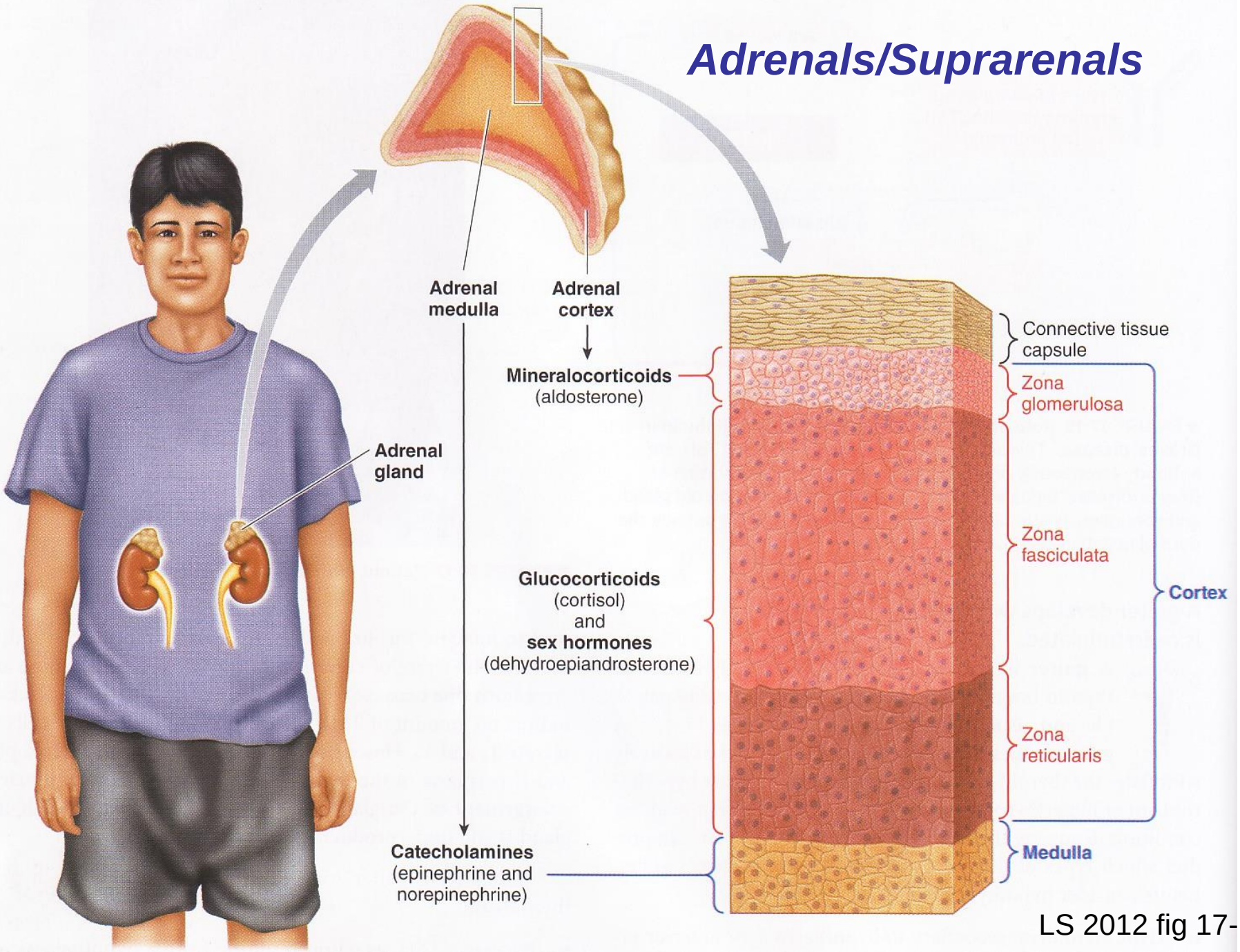


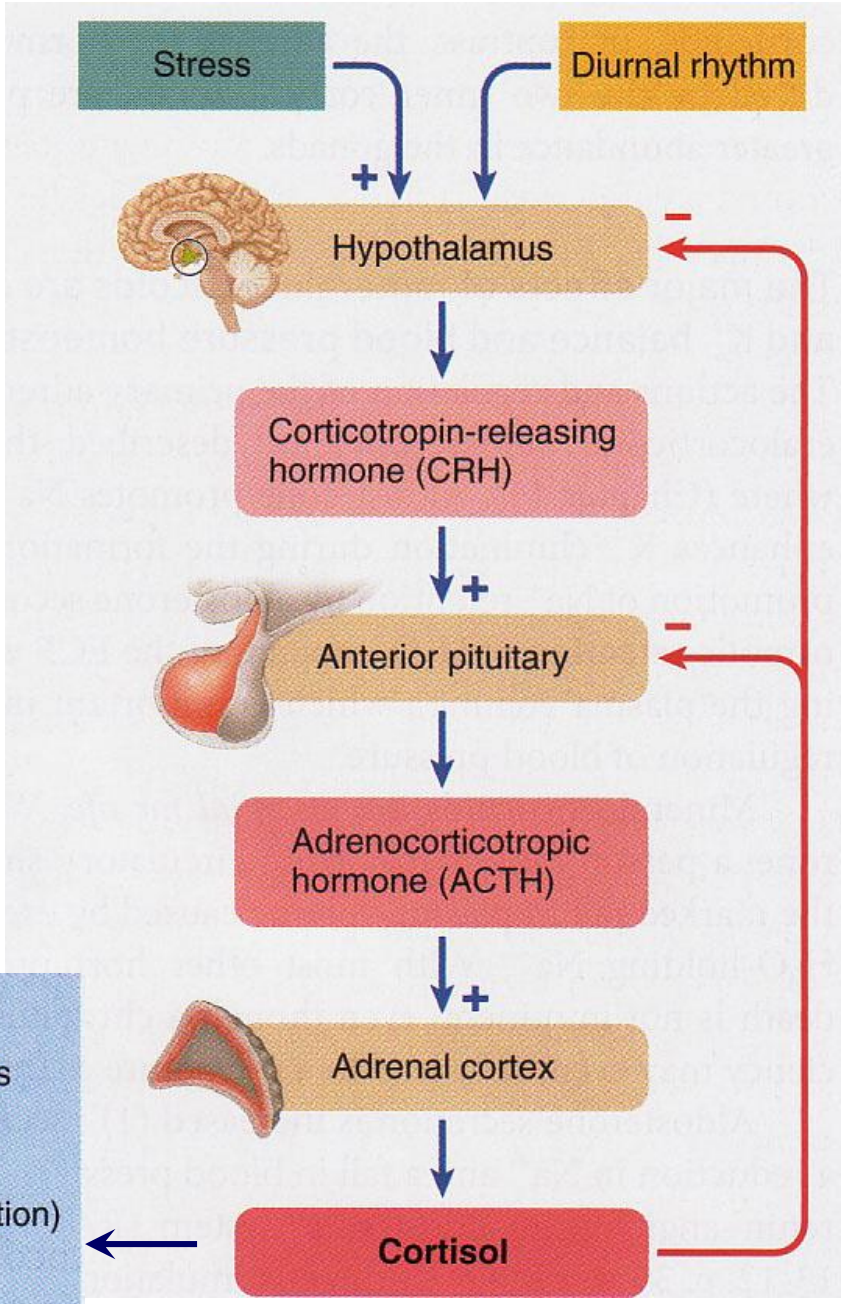
FIGURE 13-12
Adrenal Gland The adrenal glands sit atop the kidney and consist of an outer zone of cells, the adrenal cortex, which produces a variety of steroid hormones, and an inner zone, the adrenal medulla. The adrenal medulla produces adrenalin and noradrenalin.

Adrenals/Suprarenals



LS 2012 fig 17-18

Stress Promotes Cortisol Secretion

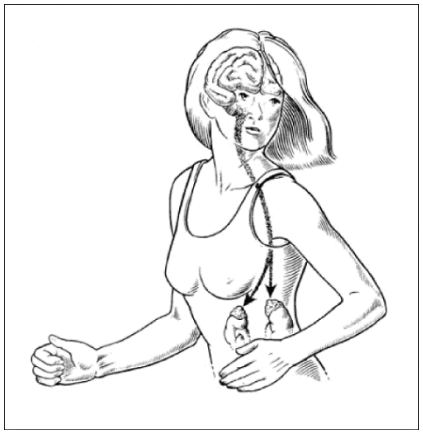


Metabolic fuels and building blocks available to help resist stress

- ↑ Blood glucose (by stimulating gluconeogenesis and inhibiting glucose uptake)
- ↑ Blood amino acids (by stimulating protein degradation)
- ↑ Blood fatty acids (by stimulating lipolysis)

LS 2012 fig 17-19

Epinephrine 80%
Norepinephrine 20%



Guyton & Hall 2000

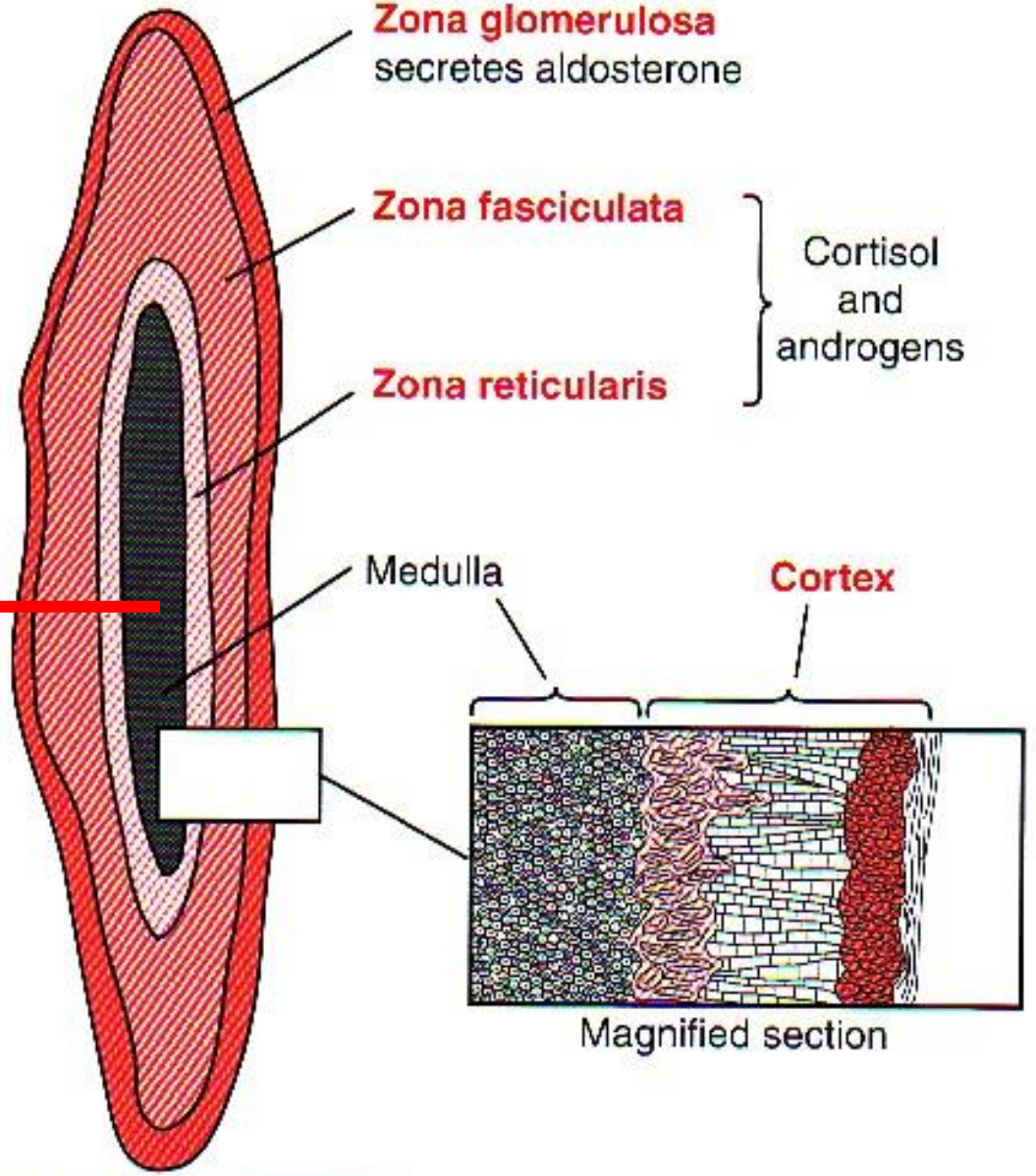
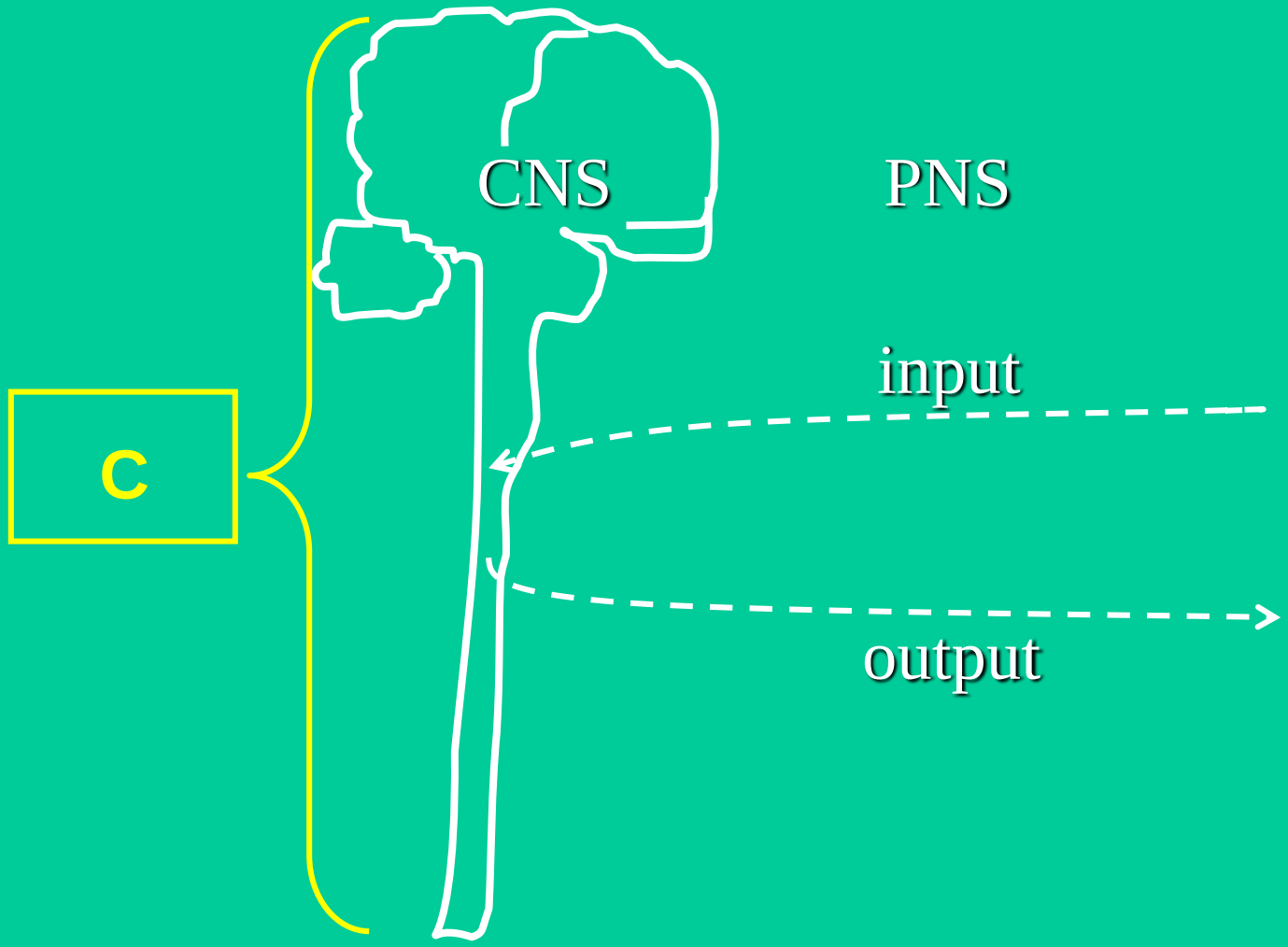


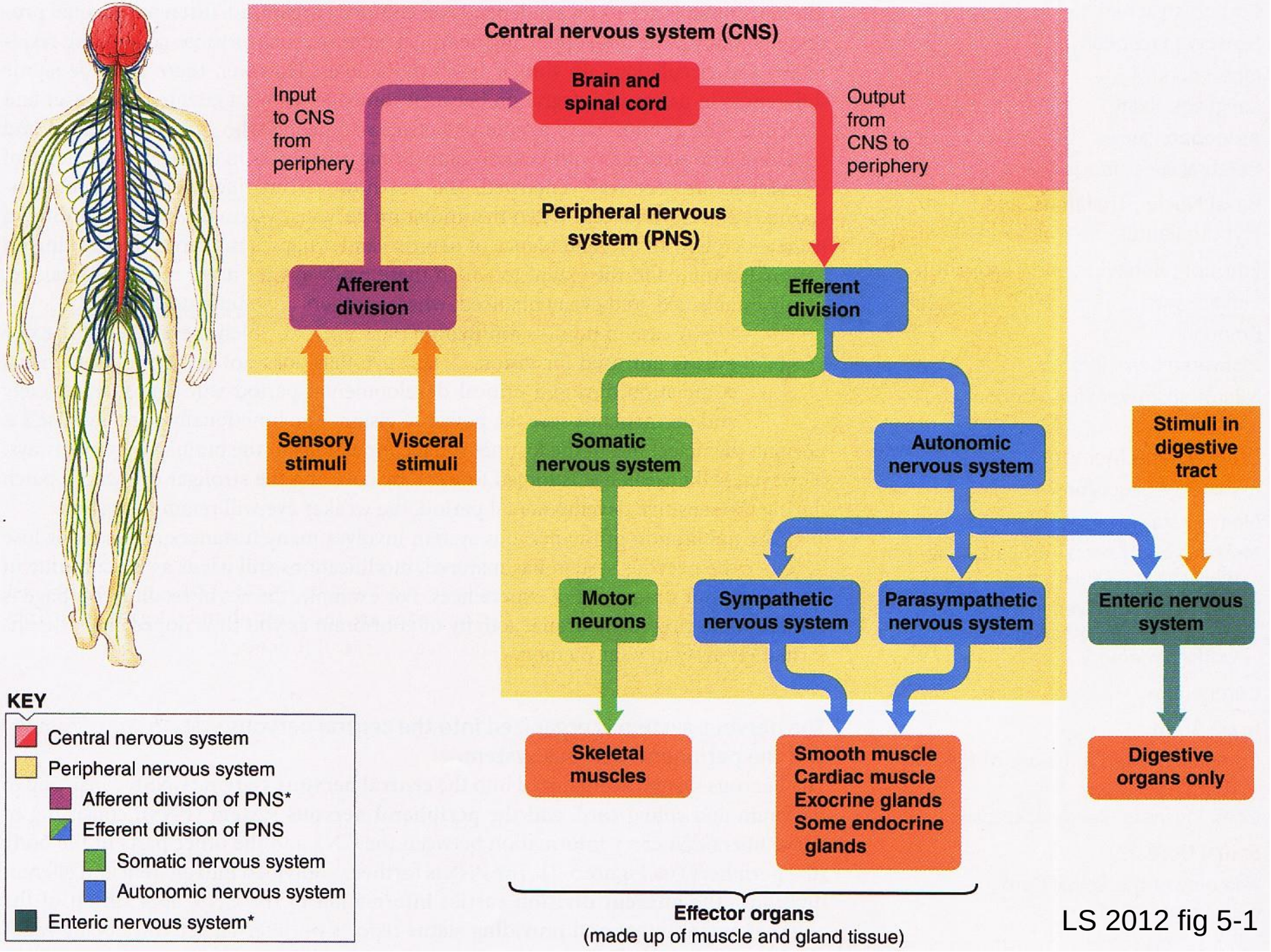
FIGURE 77–1

Secretion of adrenocortical hormones by the different zones of the adrenal cortex.

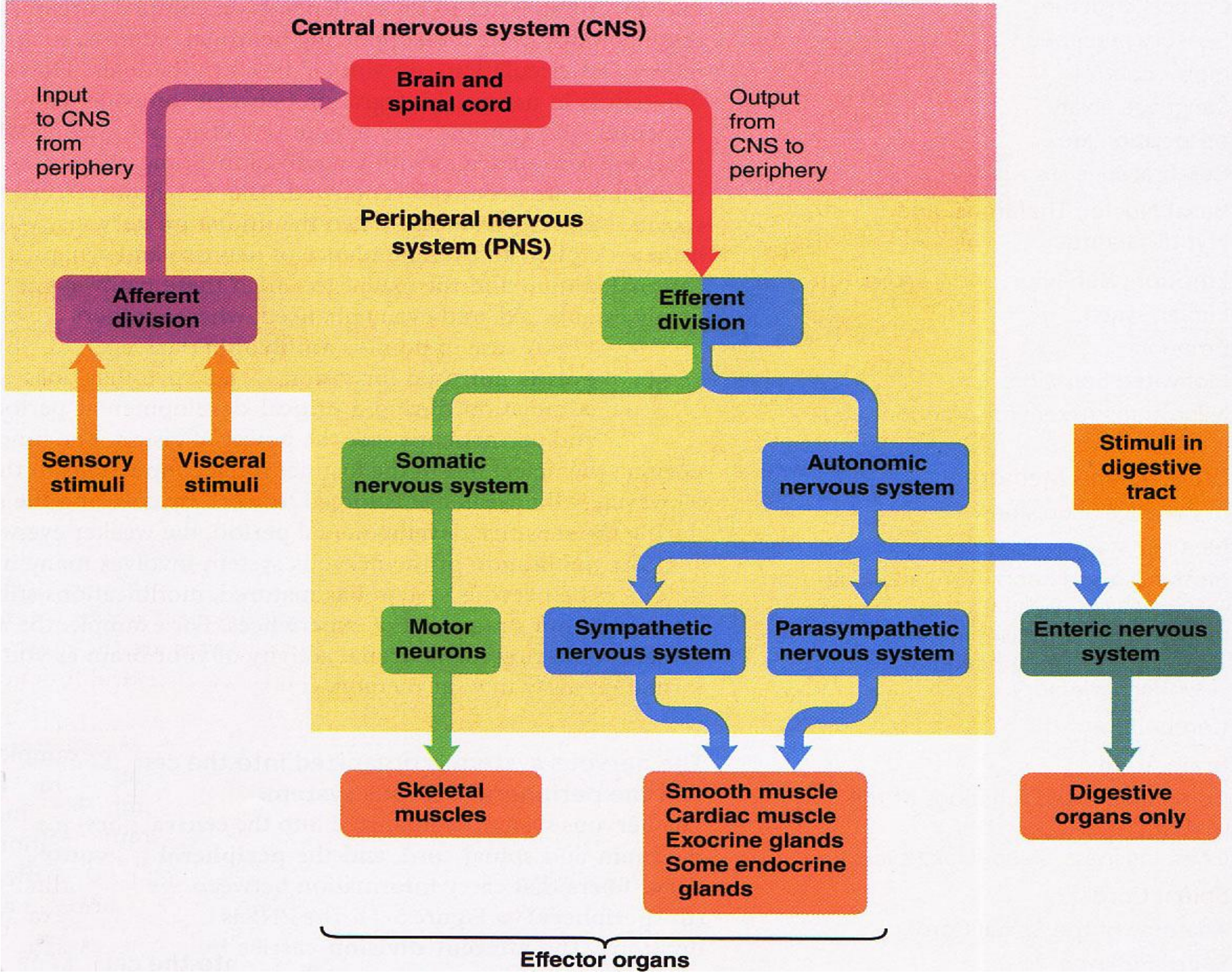
Questions + Discussion

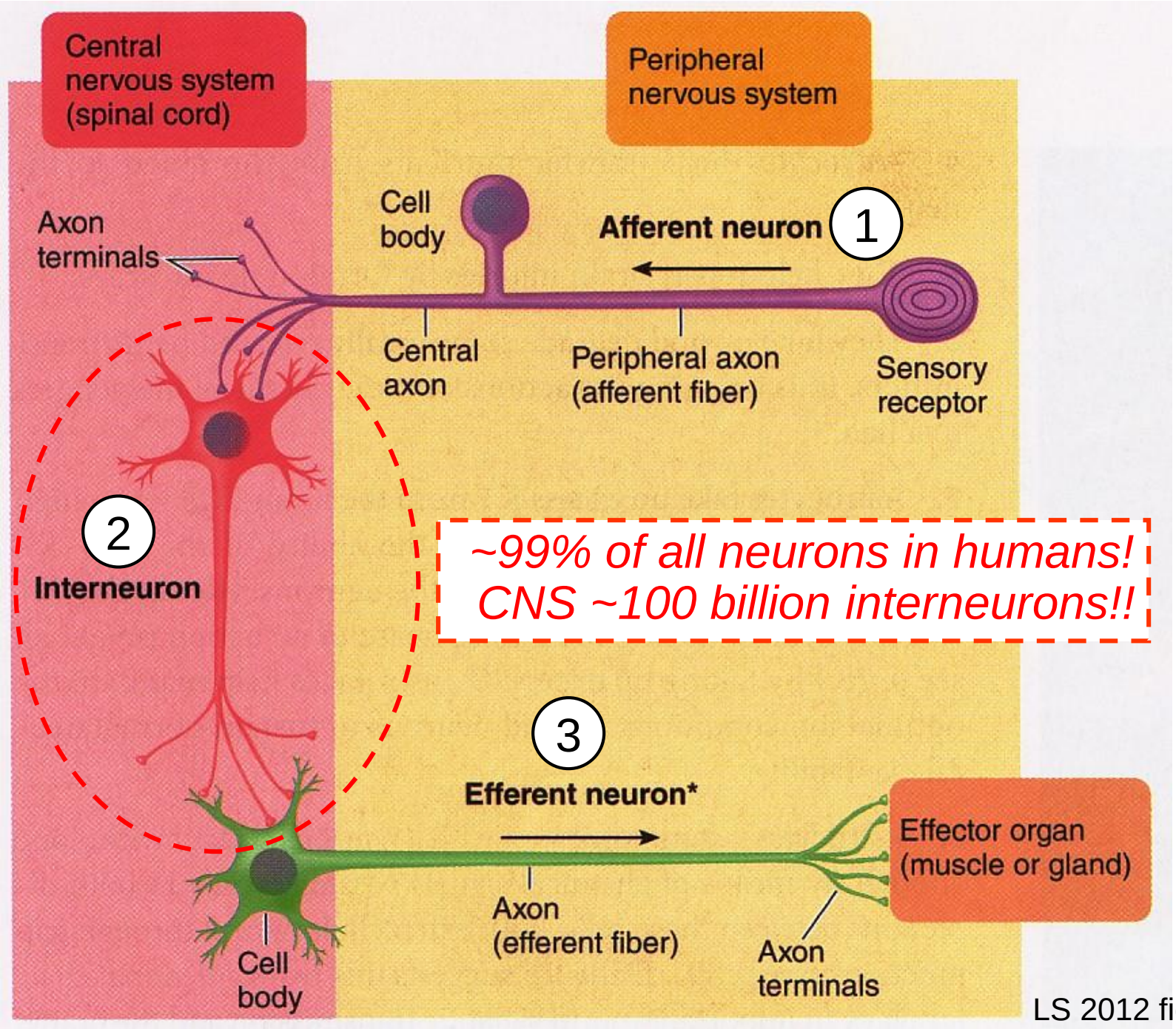
Nervous System





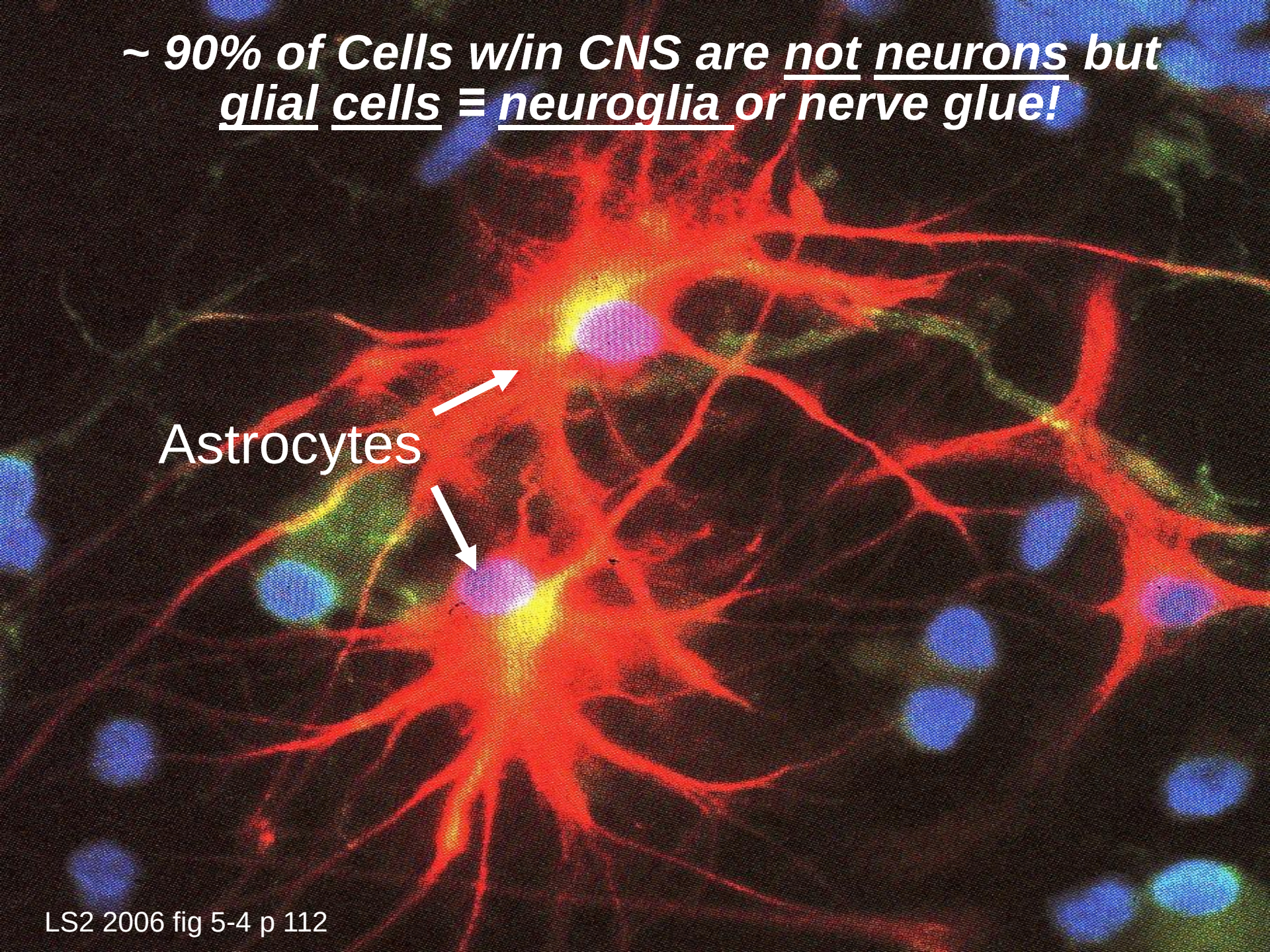
LS 2012 fig 5-1


Central nervous system (CNS)
Brain and spinal cord
Input to CNS from periphery
Output from CNS to periphery
Peripheral nervous system (PNS)
Afferent division
Efferent division
Sensory stimuli
Visceral stimuli
Somatic nervous system
Autonomic nervous system
Stimuli in digestive tract
Motor neurons
Sympathetic nervous system
Parasympathetic nervous system
Enteric nervous system
Skeletal muscles
Smooth muscle
Cardiac muscle
Exocrine glands
Some endocrine glands
Digestive organs only
Effector organs

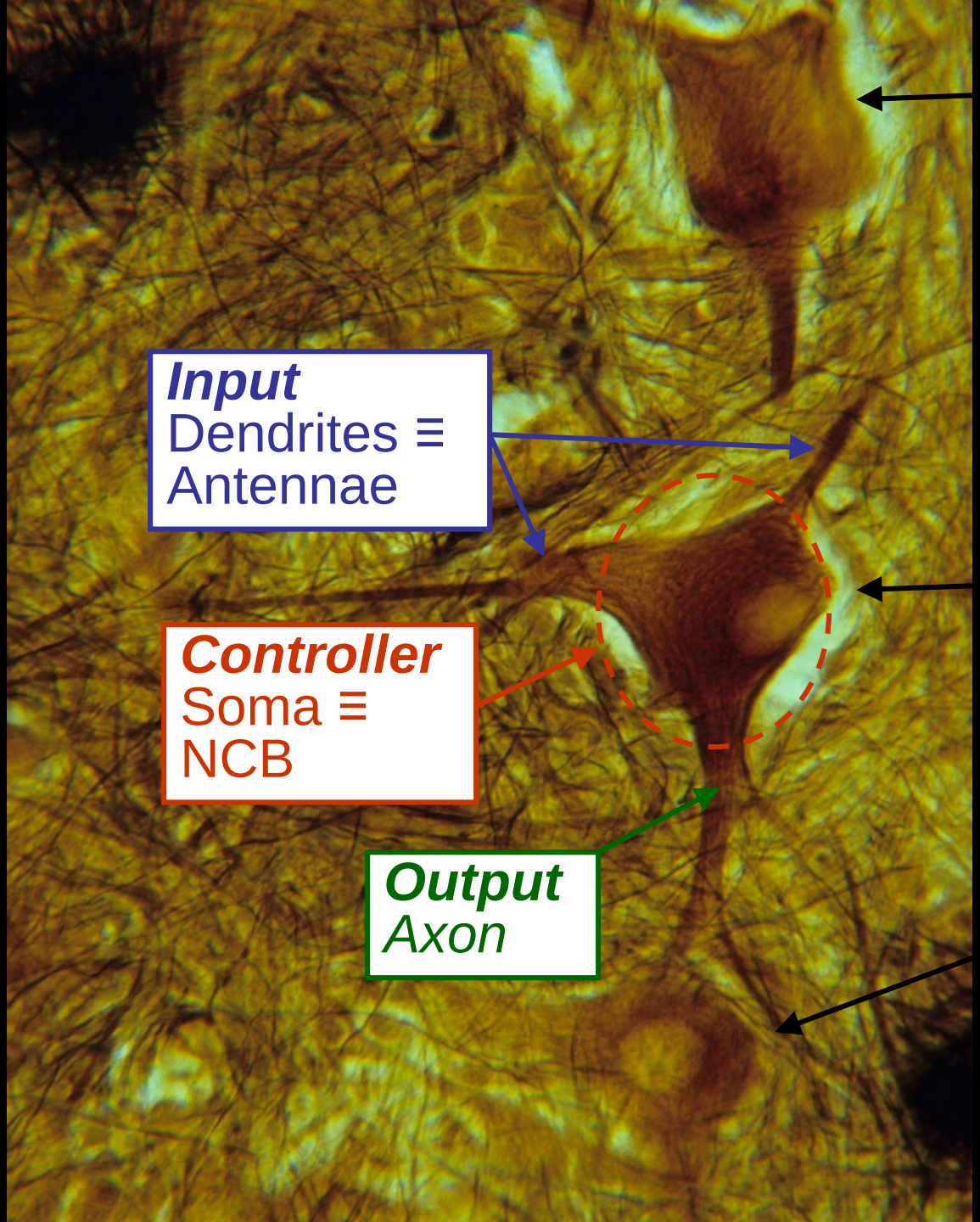


LS 2012 fig 5-2

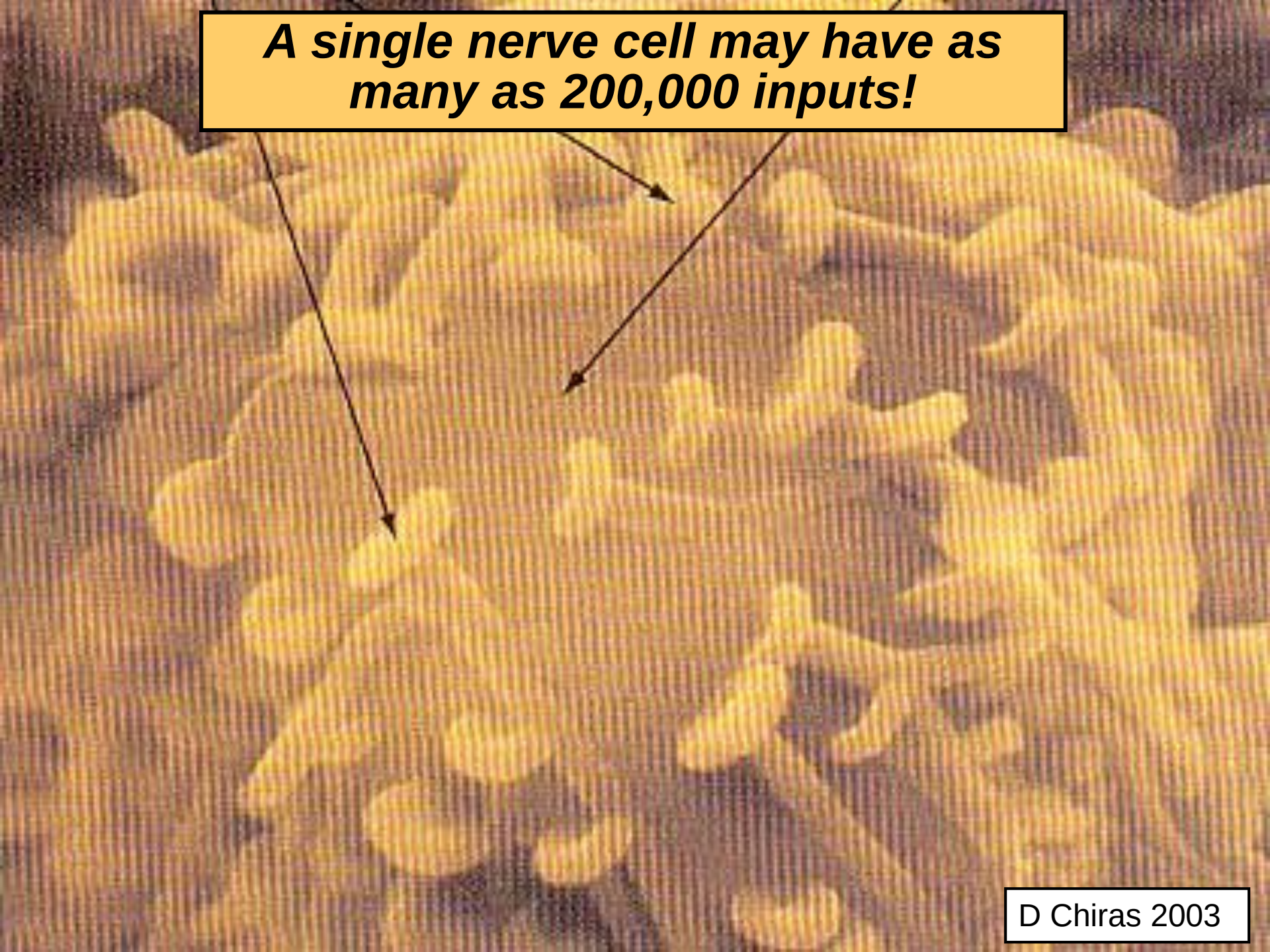
~ 90% of Cells w/in CNS are <u>not</u> <u>neurons</u> but <u>glial</u> <u>cells</u> ≡ <u>neuroglia</u> or nerve glue!



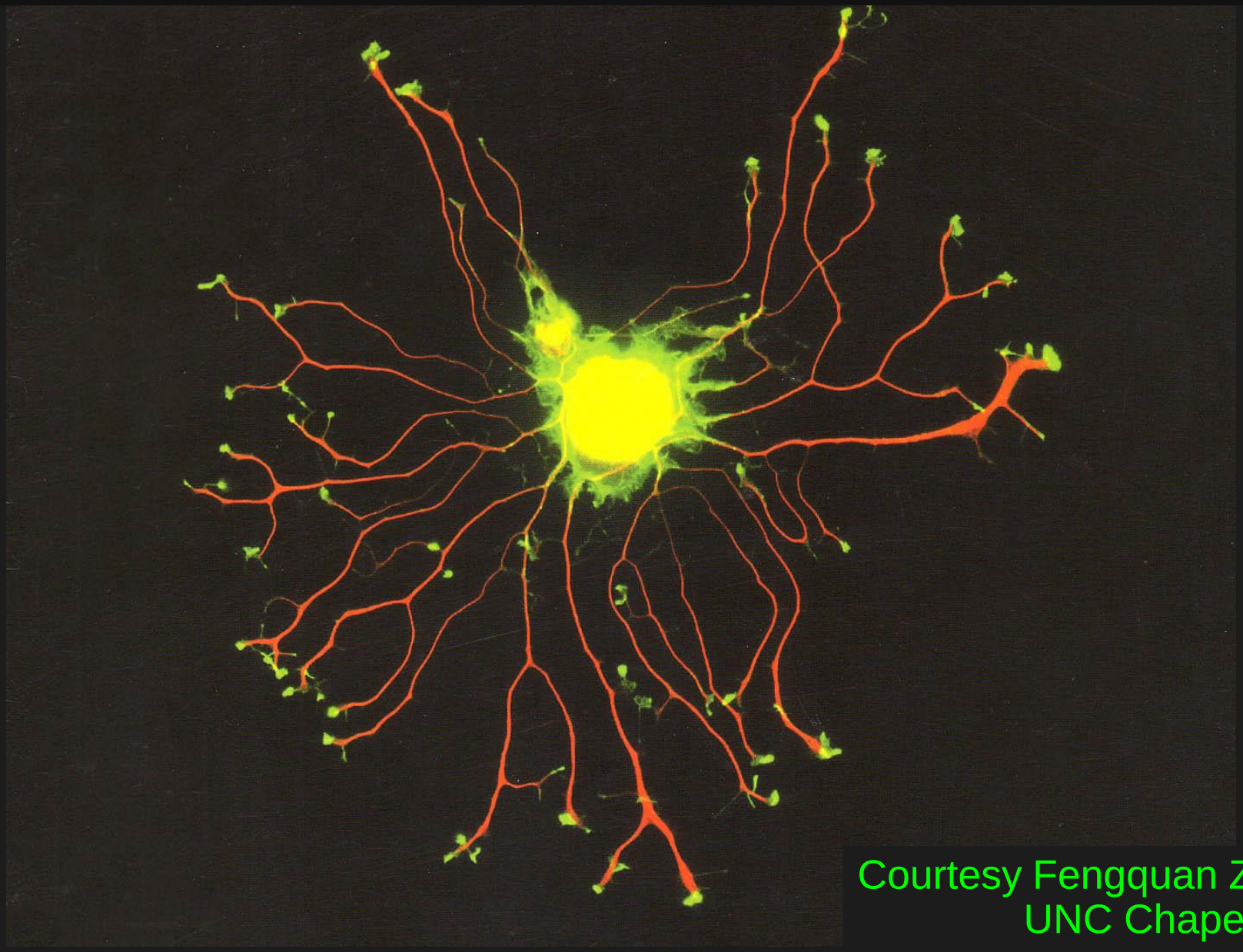
LS2 2006 fig 5-4 p 112



H. Howard 1980


A single nerve cell may have as many as 200,000 inputs!
D Chiras 2003

Nerve cell with multiple axons grown by adding a mitogen/neurogen ≡ nerve growth factor!



Courtesy Fengquan Zhou
UNC Chapel Hill

Sensory nerves especially, come in all shapes & sizes!

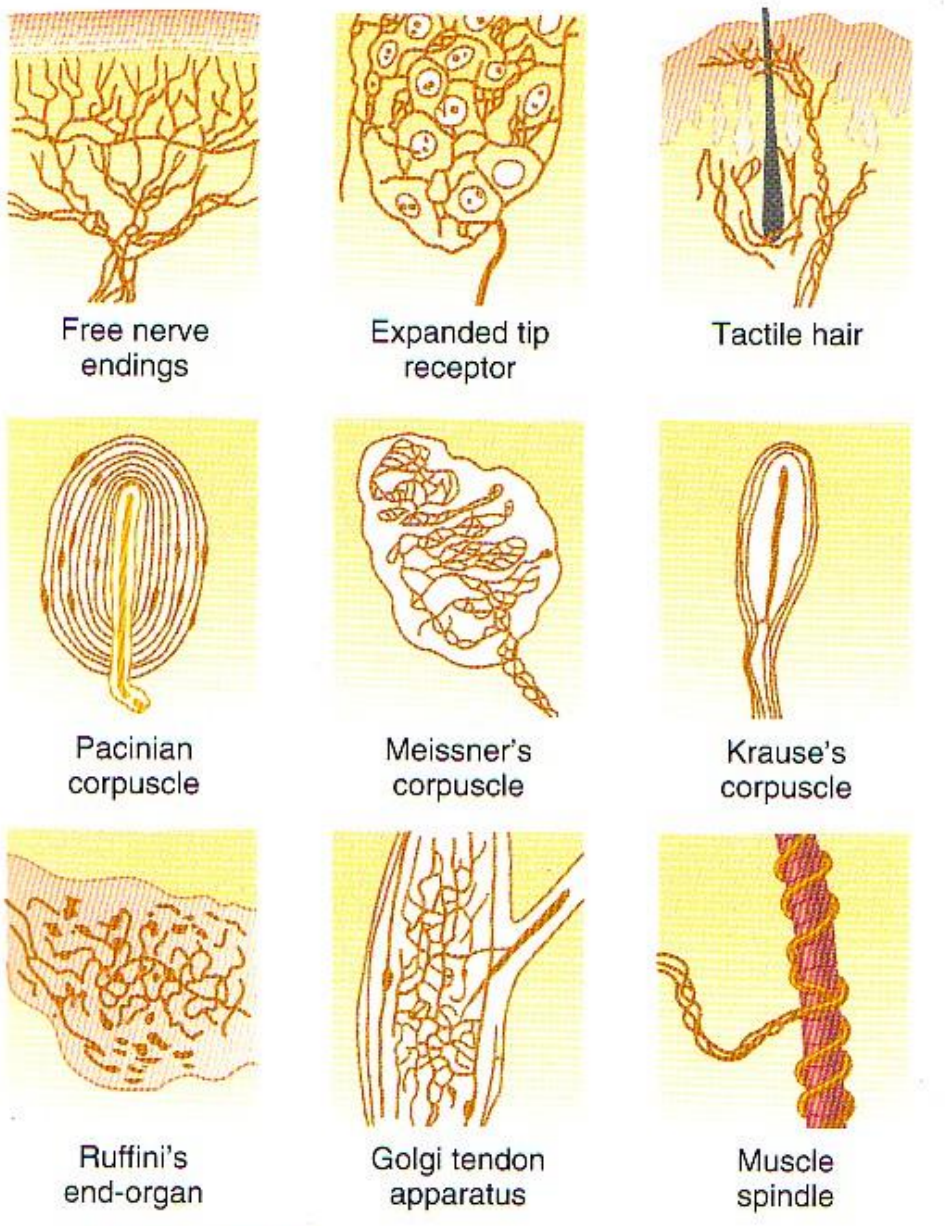


Figure 46–1

Several types of somatic sensory nerve endings.

Guyton & Hall 2011

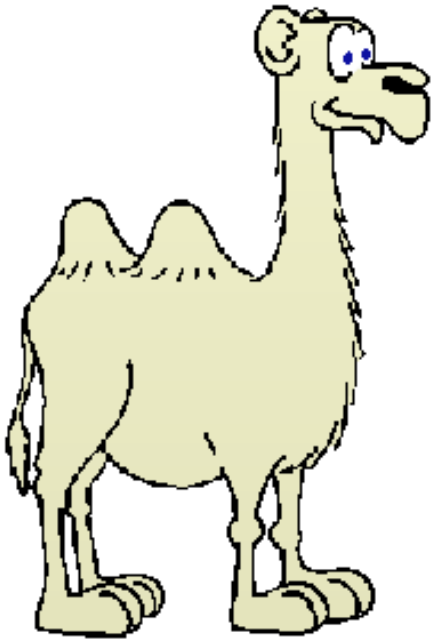
Nerve Extremes: Far ends of the Continuum

A = Large to medium myelinated, up to 120 m/sec

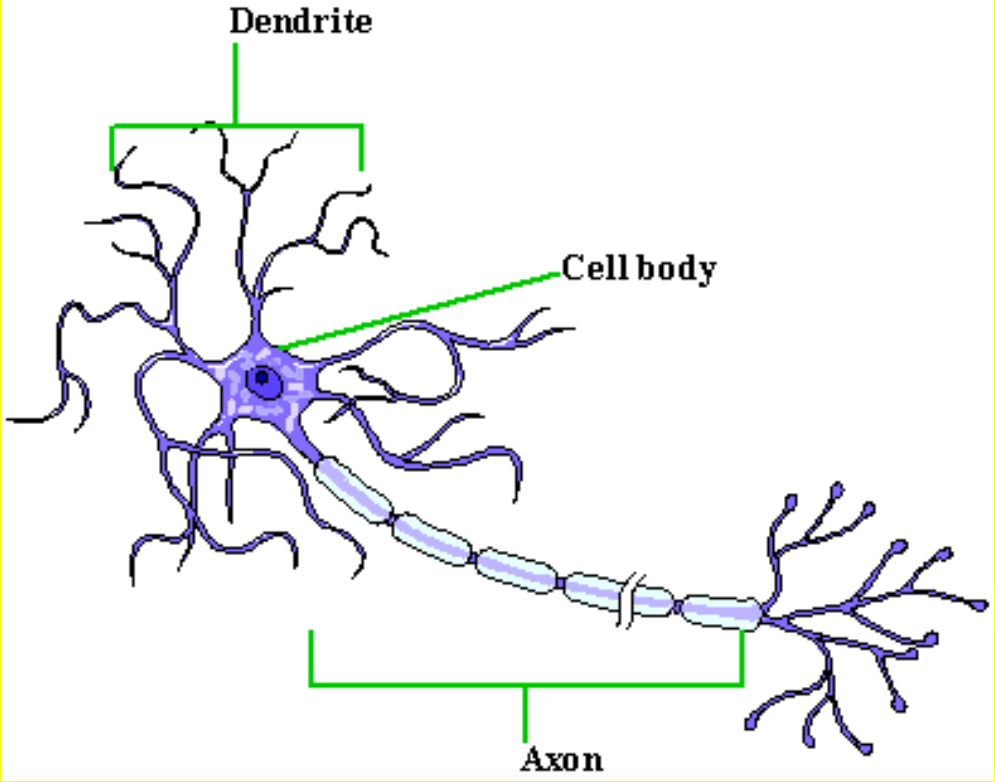
α,β, γ, δ

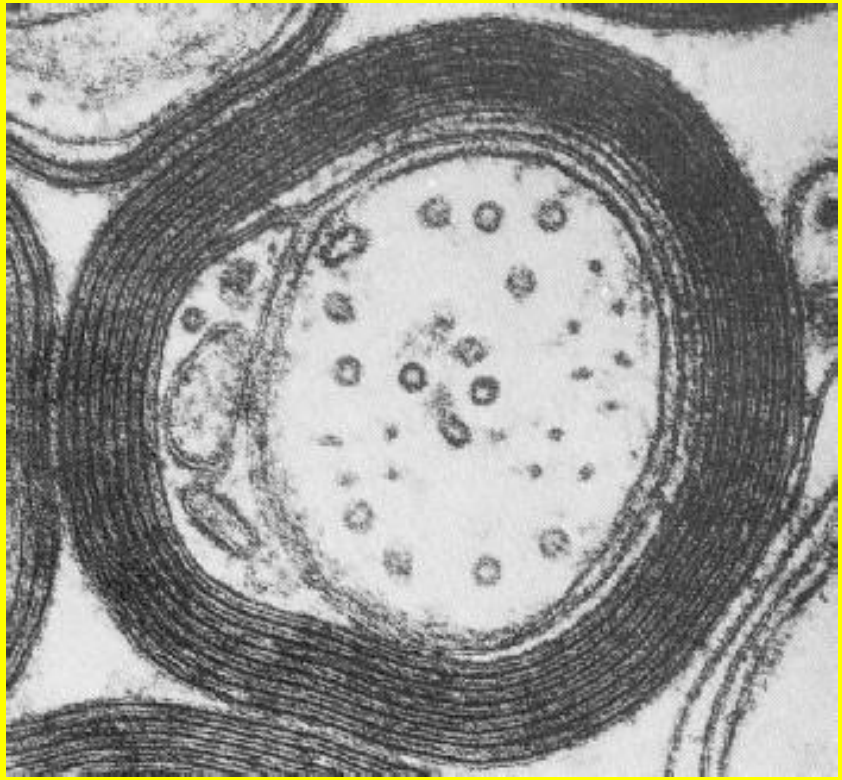
C = Small unmyelinated, 0.25 m/sec

IV



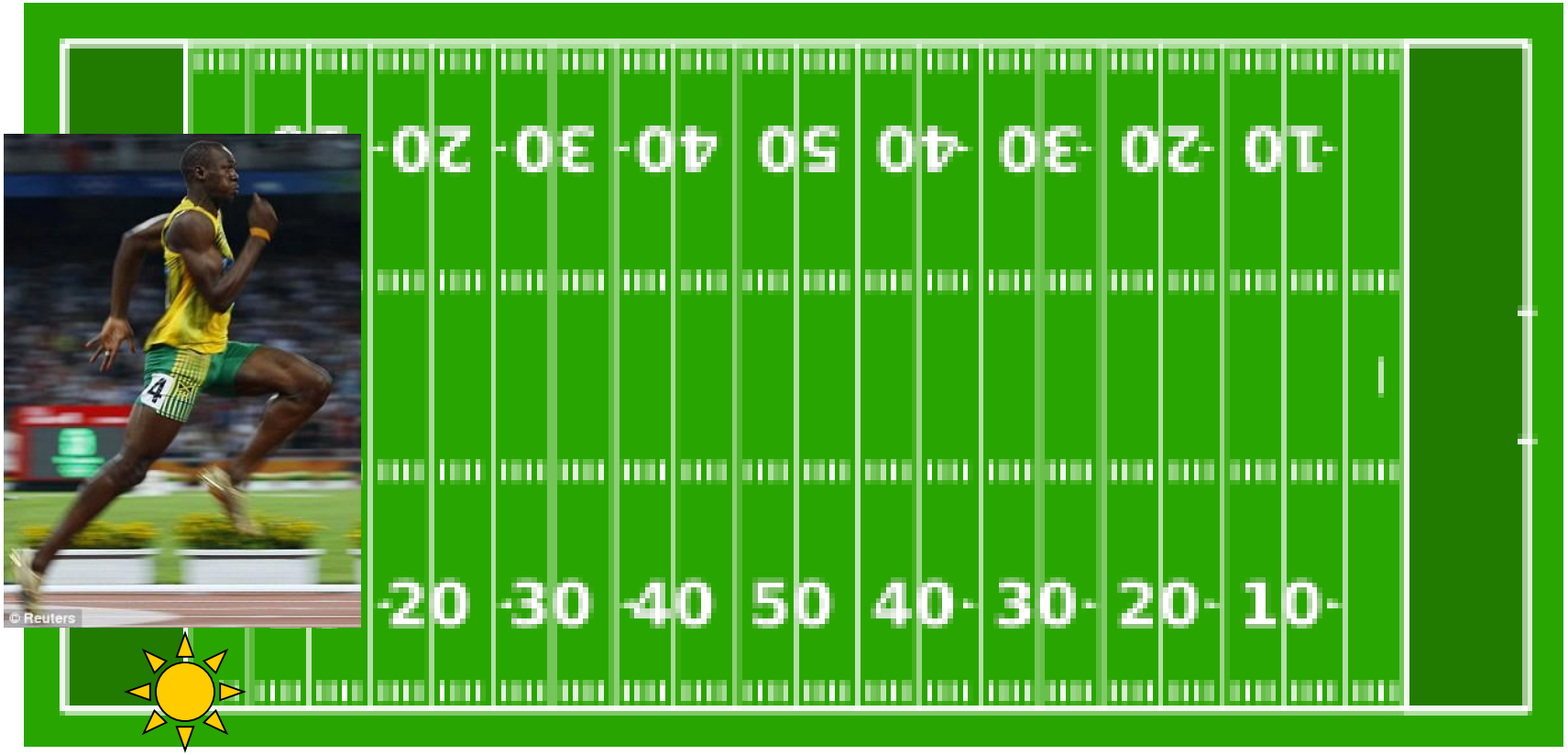
What is myelin?
Why is it important?





Lipid insulative coat
↑ $\vec{v}$, conserves ions & ATP

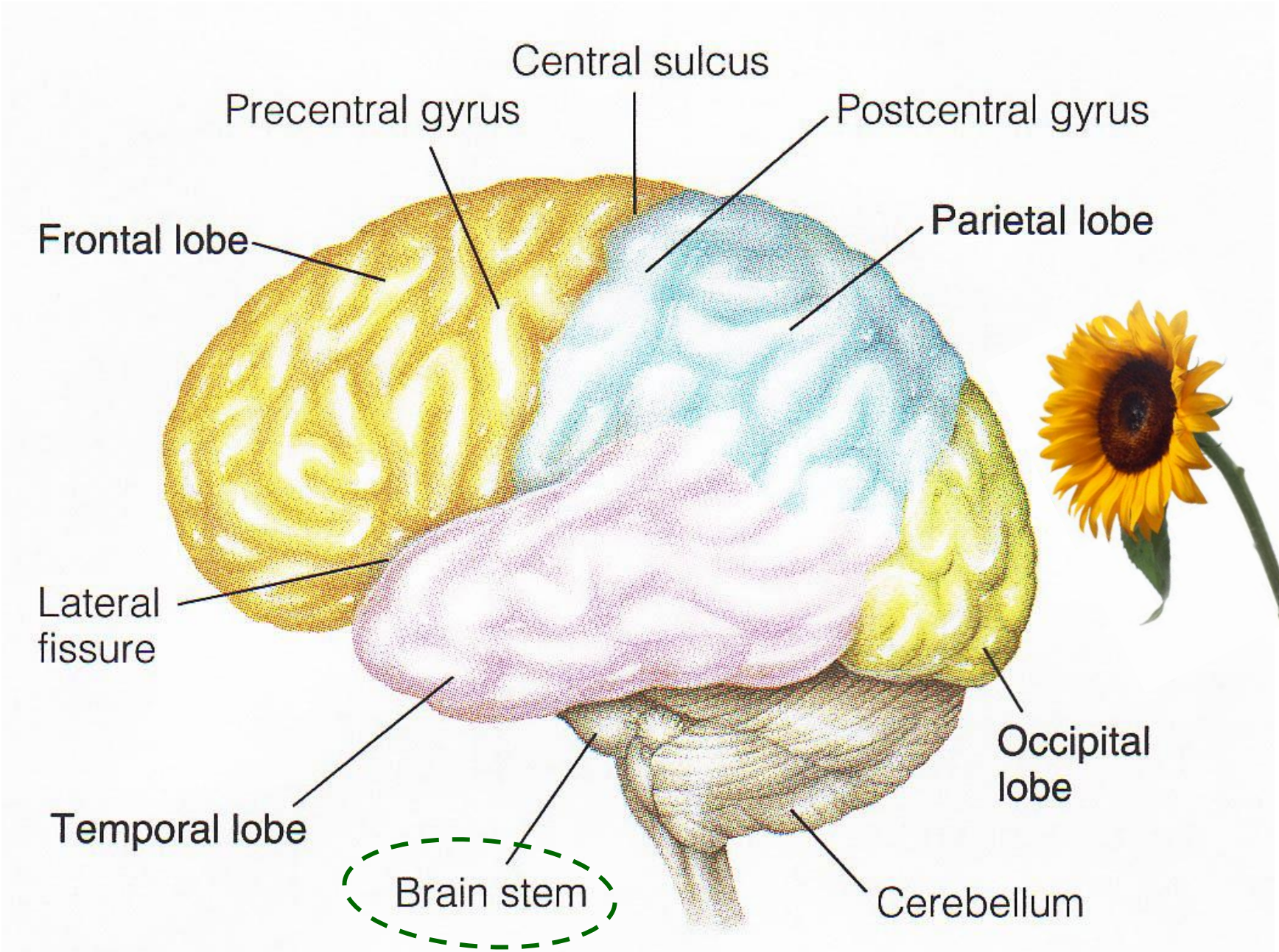
A large myelinated "survival" nerve can conduct impulses the length of football field in < 1 second!



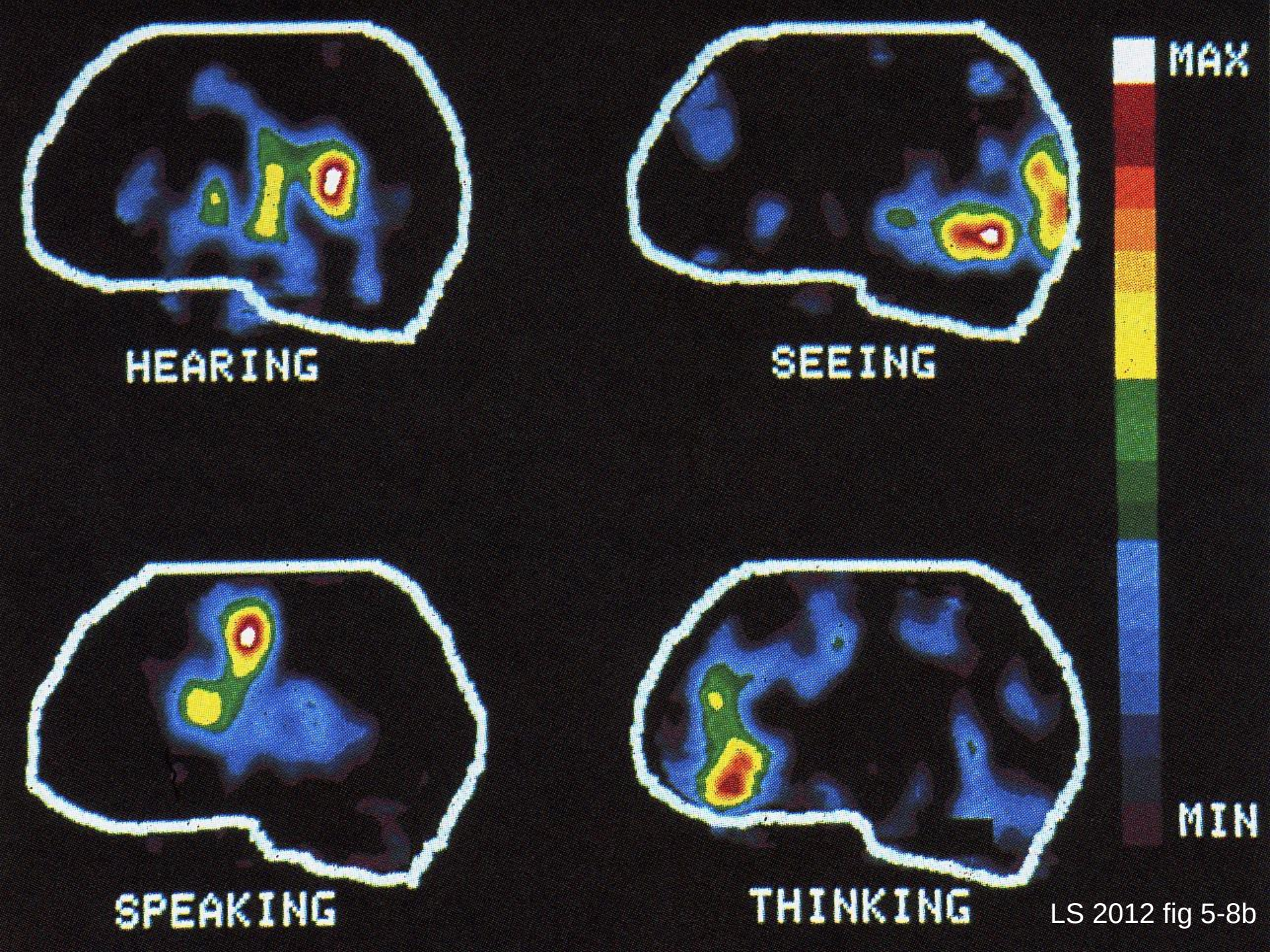
Saltatory/Leaping Conduction! Crucial Sensory & Motor Nerves

L. <u>salt</u>are to hop or leap! Fr. <u>salt</u>, sautier, sauté, leap, high air, vault

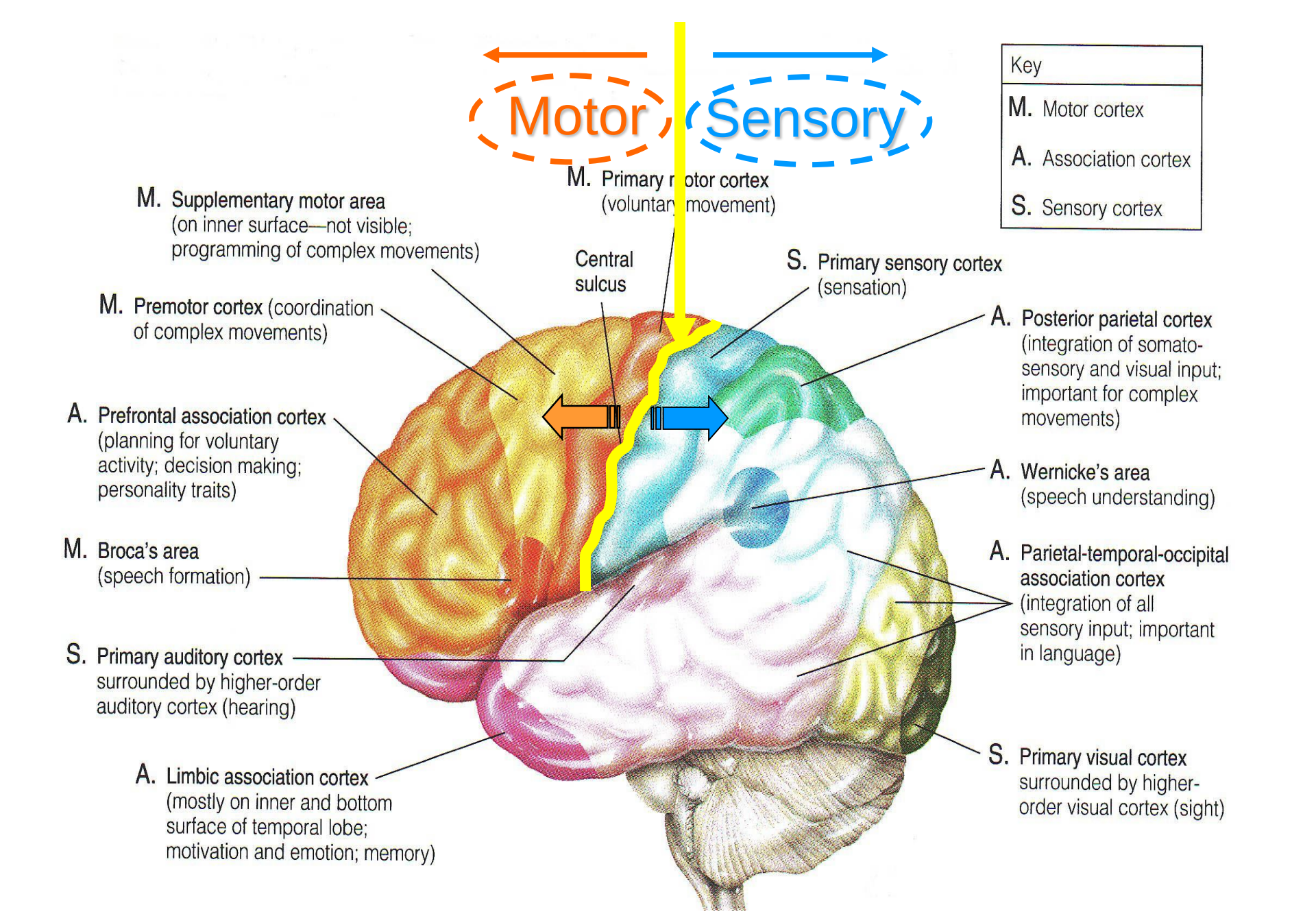
DC 2003



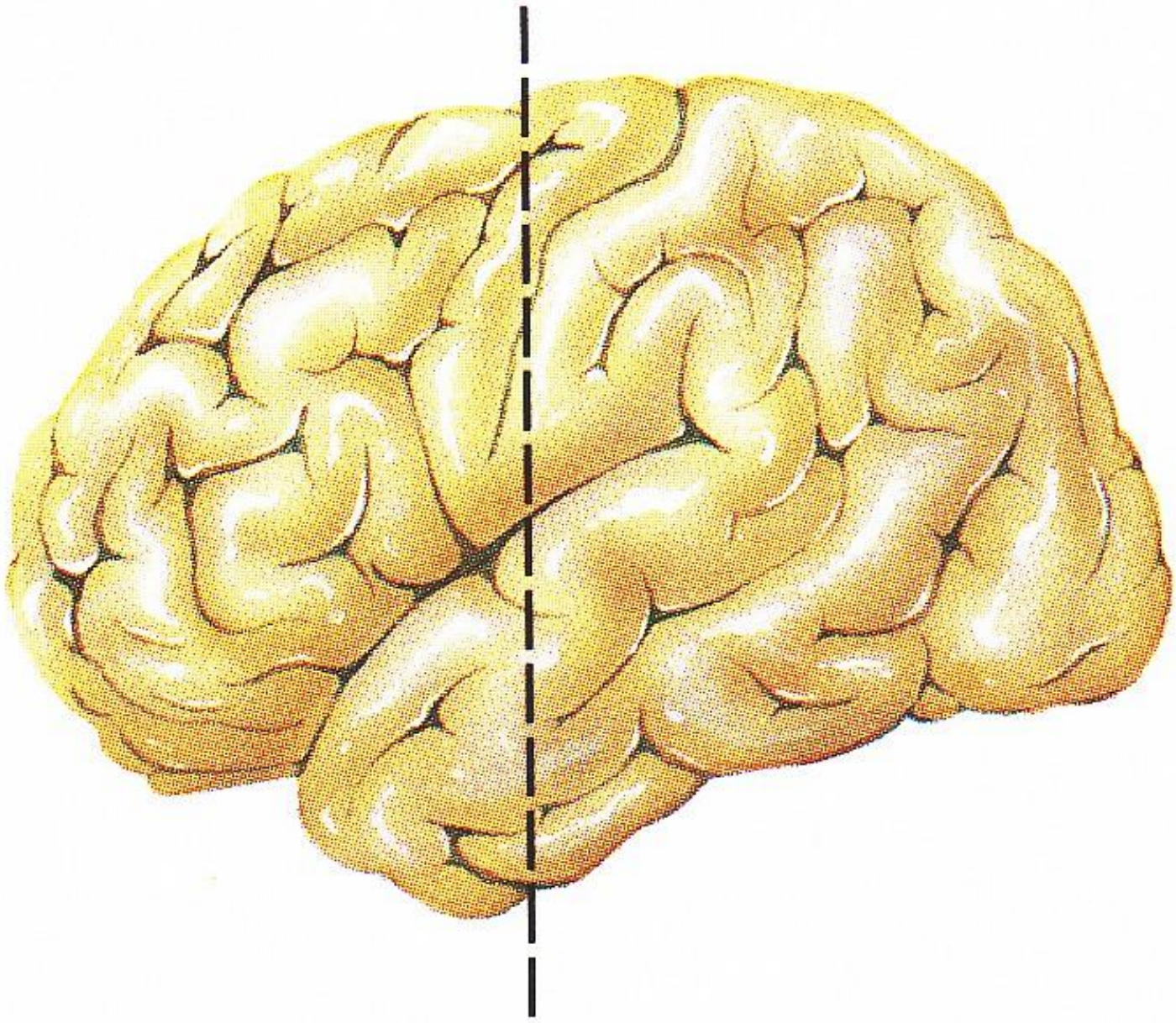
LS 2012 fig 5-7



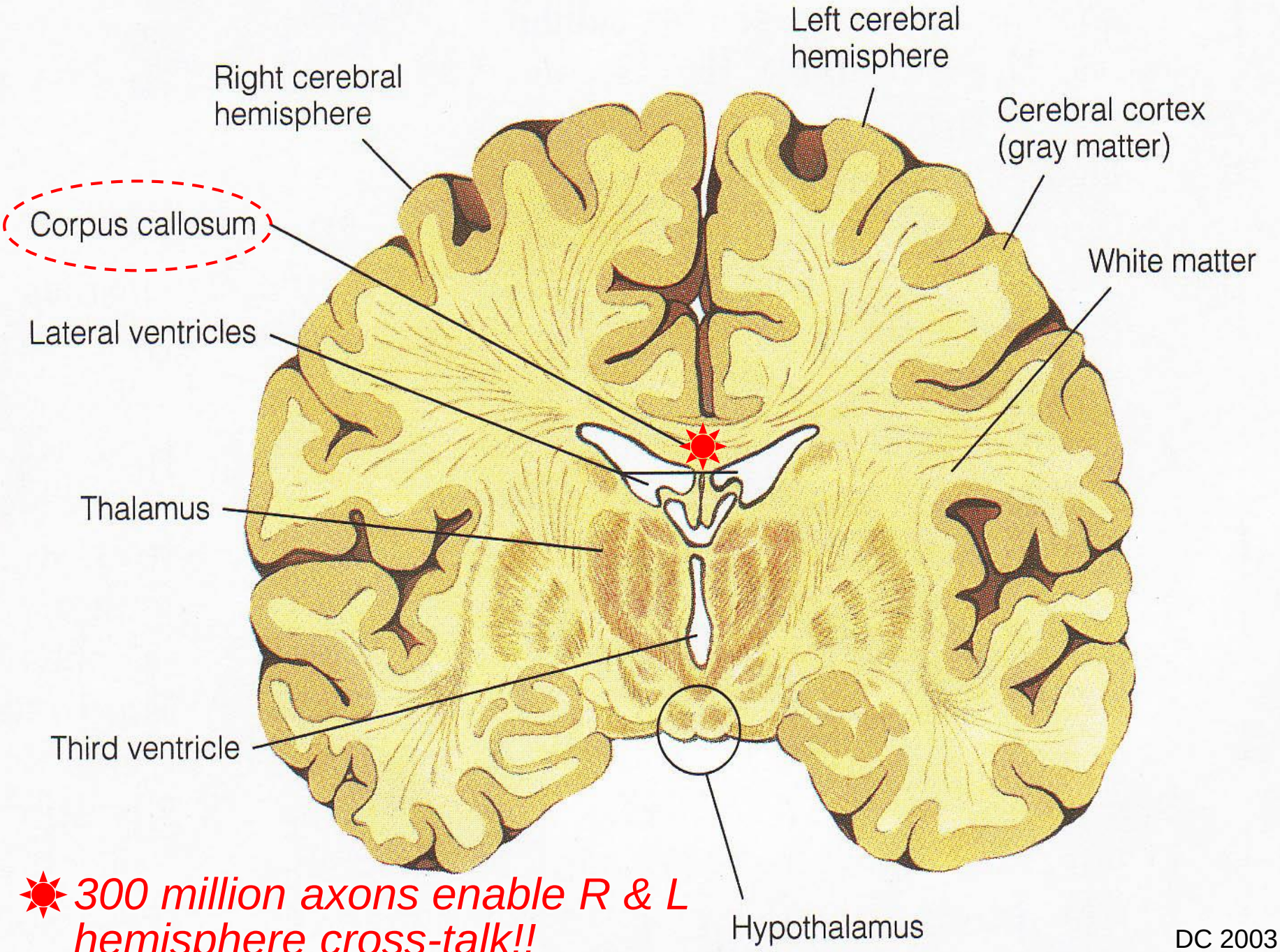
LS 2012 fig 5-8b



LS 2006, cf: LS 2012 fig 5-8a

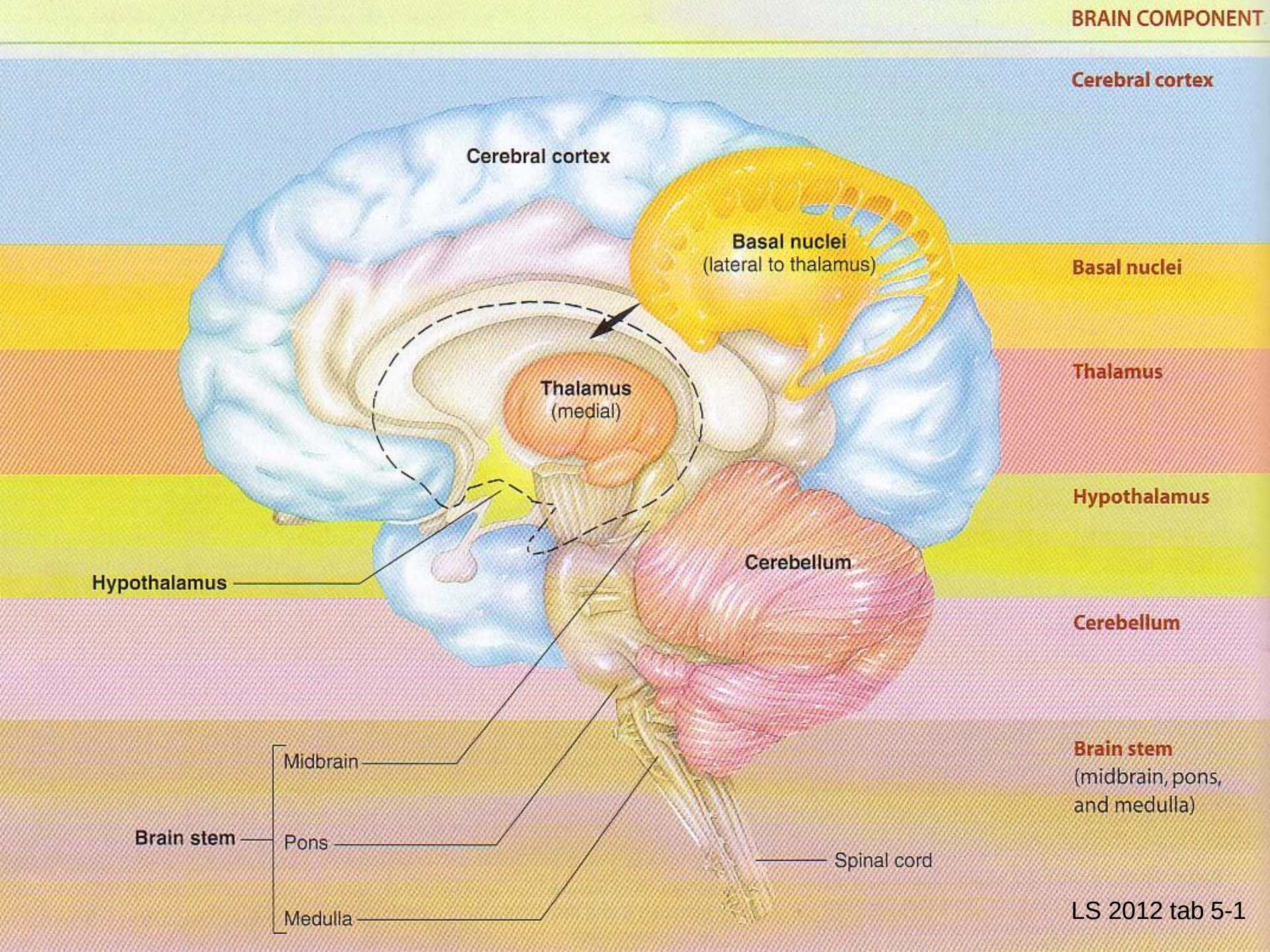


DC 2003; cf: LS 2012 fig 5-6

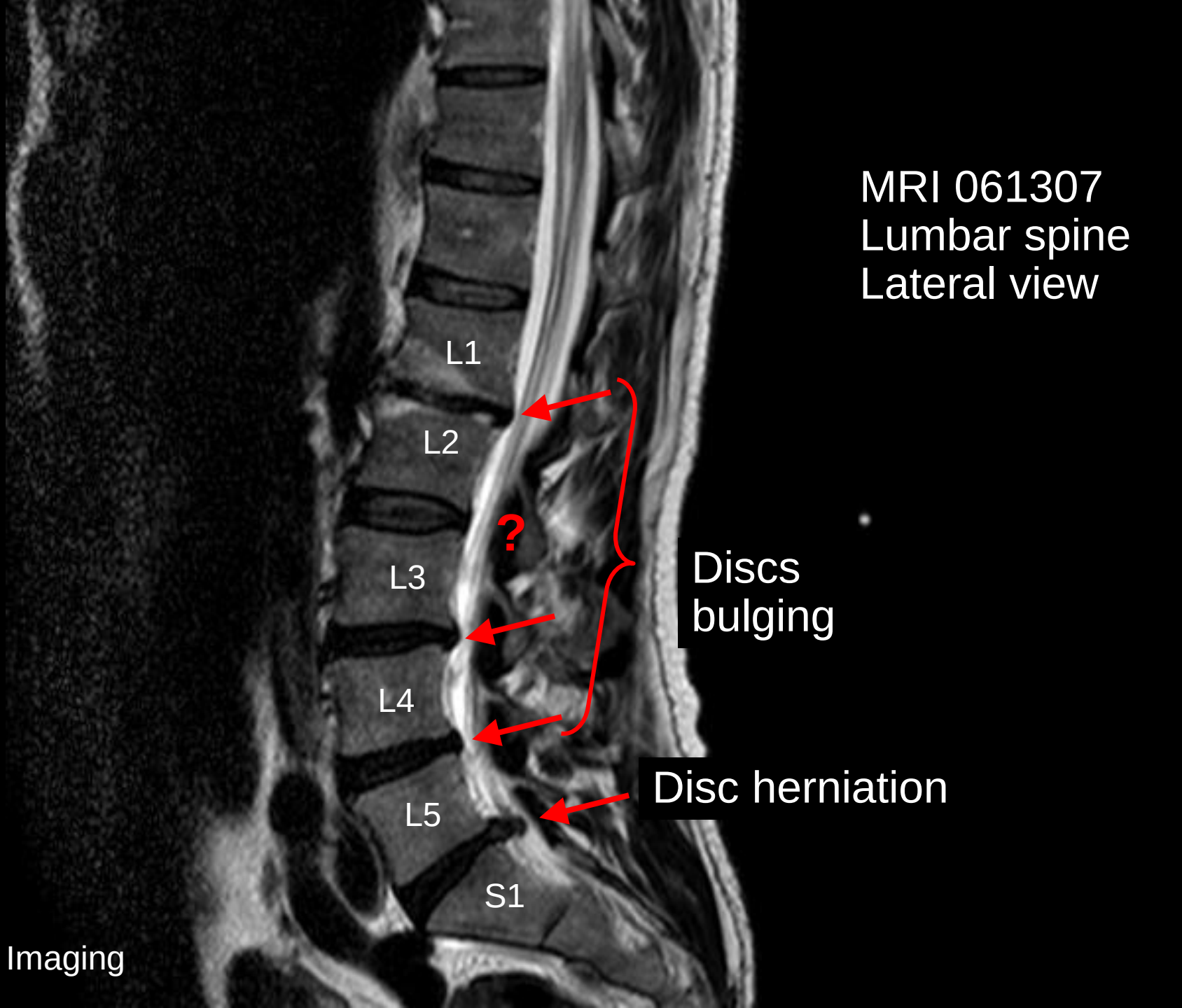


300 million axons enable R & L hemisphere cross-talk!!

DC 2003



LS 2012 tab 5-1


MRI 061307
Lumbar spine
Lateral view
L1
L2
?
L3
L4
L5
S1
Discs bulging
Disc herniation
Oregon Imaging

MRI 061307
Lumbar spine
Axial view

Oregon Imaging

9.4 x 8.1 mm
Protrusion

Helmets Cheap, Brains Expensive!!
Use Your Head, Get a Helmet!!

http://www-nrd.nhtsa.dot.gov/Pubs/812018.pdf
http://www.bhsi.org/stats.htm

~ 500,000 bicyclists/yr visit emergency rooms

As of 2014, the population estimate of

State of Wyoming 584,153
Albany OR 51,980
Corvallis OR 54,953
Springfield OR 60,263

~ 26,000 traumatic brain injuries

743 of ~900 cyclist deaths, 2013 ≡ ~ 2% of all traffic fatalities

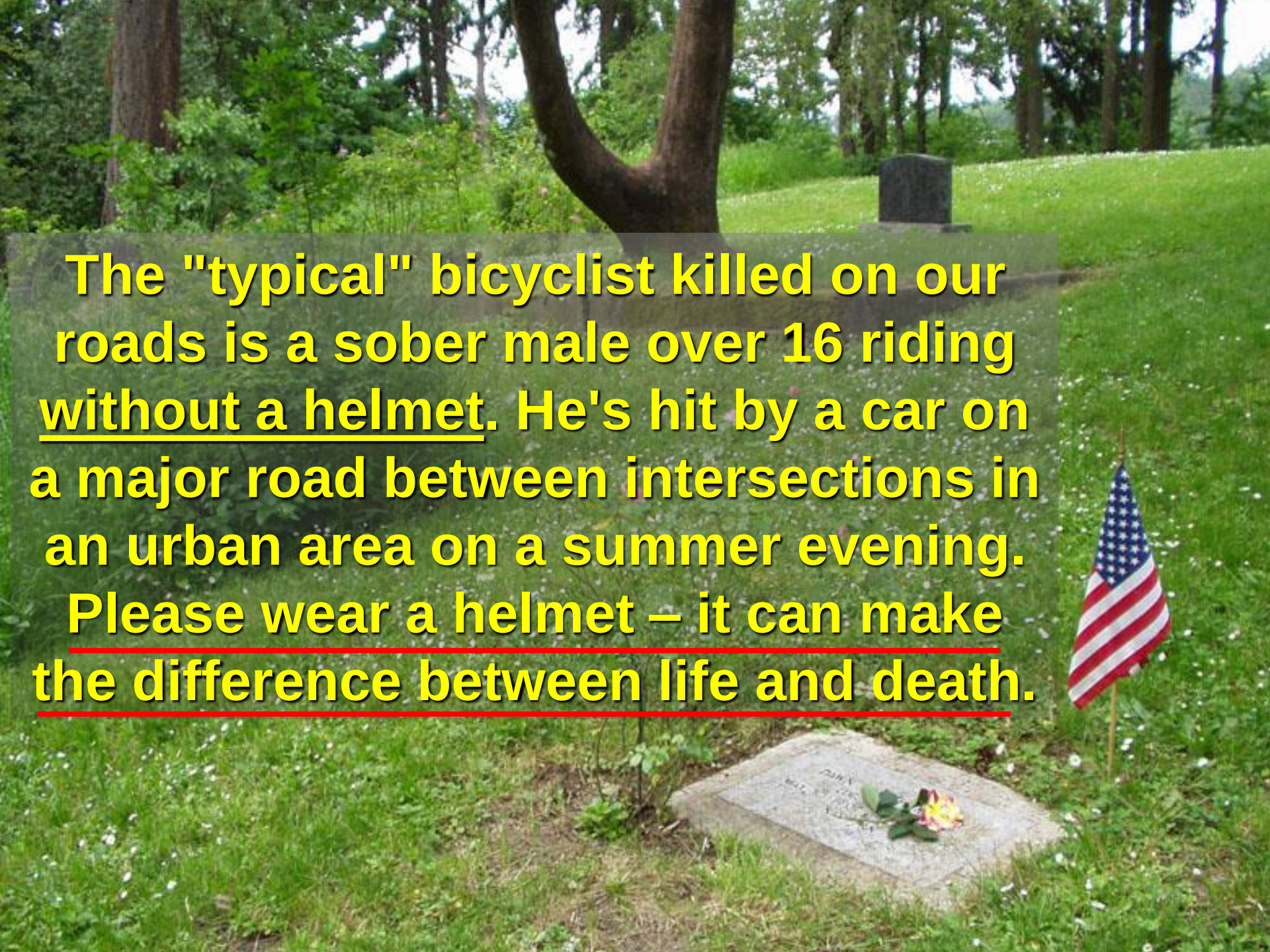
13% of deaths children ≤ 14 yr, 87% ♂

11% involved wrong-way riding!

Bicycle crashes & injuries are under reported,
since majority not serious enough for ER visits.

Helmets may reduce head & brain injury risk by 85%!

~$2.3 billion/yr = indirect injury costs from not using helmets!


The "typical" bicyclist killed on our roads is a sober male over 16 riding without a helmet. He's hit by a car on a major road between intersections in an urban area on a summer evening. Please wear a helmet – it can make the difference between life and death.

Hey, I'm alive because I wore a helmet!!