

BI 121 Lecture 11



Fun lab today! Data for a lifetime!
Thanks for being prepared!

I. Lab 5 Review: Safety & Techniques Q?

II. Introduction to Endocrinology LS ch 17, DC Module 13, SI Fox+

- A. Endocrine vignette: Cushing's syndrome LS fig17-20 p 521-2
- B. Endocrine system DC p 103 fig 13-1, LS fig 17-1, tab 17-1
- C. What's an endocrine? + classes ~ LS pp 495 - 6
- D. Hypothalamus (Master) – Pituitary (subcontroller)
DC pp 104-6 + LS pp 499-506
- E. Posterior pituitary + hormones DC p 108, LS fig 17-4 p 502
- F. Anterior pituitary + hormones DC pp 105-7, LS pp 502-6
- G. GH: Body builder's dream? Fountain of youth? LS pp 506-11
- H. Peripheral endocrine organs DC pp 109-13, LS pp 513-36
 - 1. Pancreas (insulin, glucagon, diabetes) 2. Thyroid 3. Adrenals

III. Nervous System & Excitable Cell Connections LS ch 5, 4, 7

- A. How is the nervous system organized? fig 5-1 p 108
- B. Neurons? What kind? fig 5-2 p 109
- C. Brain structure & function fig 5-7, 5-8 pp 116 - 7
- D. **Protect your head with a helmet!** Bicycle head injury statistics, *NHTSA & BHSI*
- E. Autonomic nervous system overview LS pp 178 – 85

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



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

PREPARATION



WASH & DRY



ALCOHOL

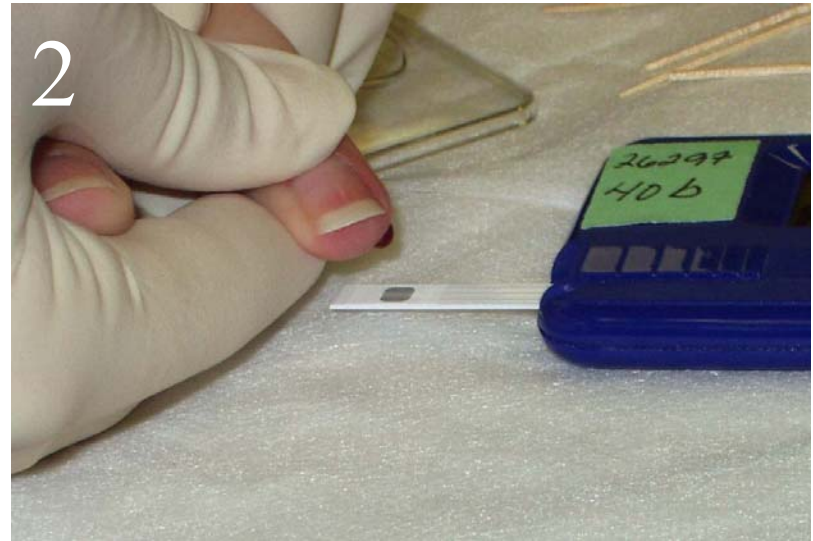


SAMPLE+TESTS

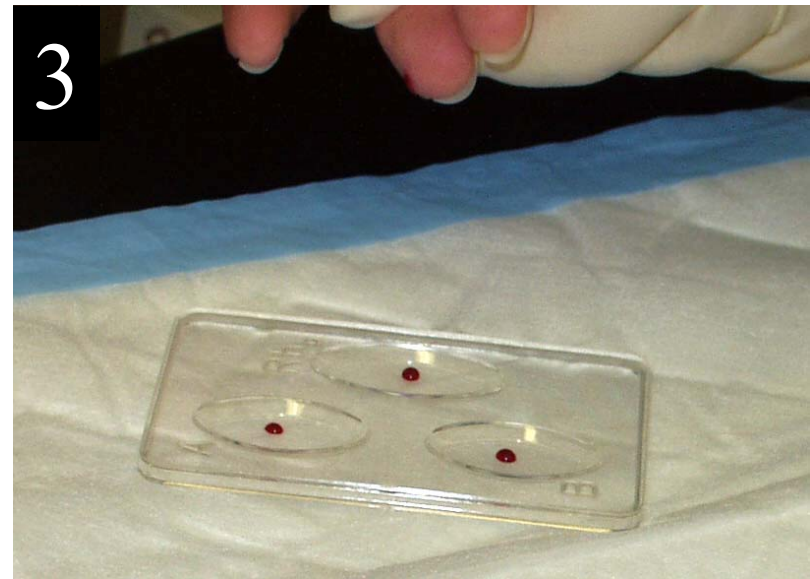


1

OBTAIN μ SAMPLE



BLOOD GLUCOSE



BLOOD TYPING

Glucose:
Sugar in Blood

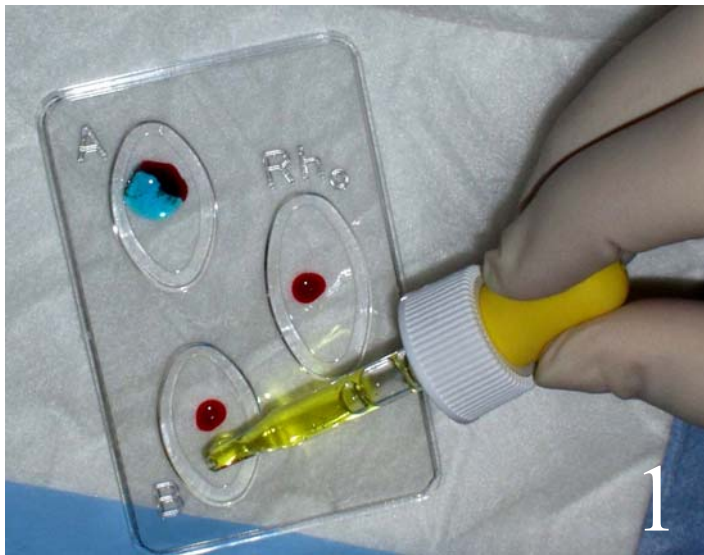


Normal: 70-99

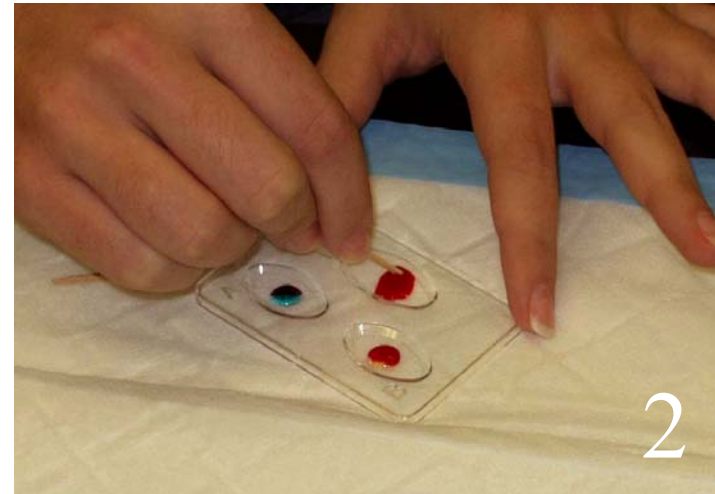
Pre-Diabetes: 100-125

Diabetes: ≥ 126 mg/dL

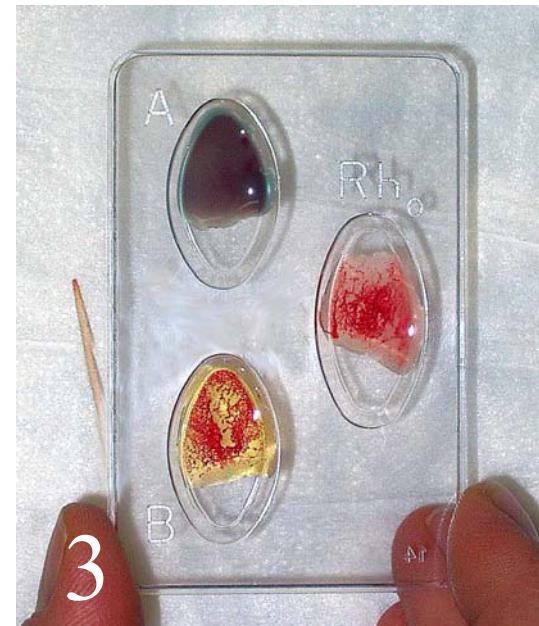
BLOOD TYPING



ADD ANTISERA



MIX W/TOOTHPICKS



READ & RECORD!!

CLEAN-UP!



FOLD DIAPER



BLOOD PRODUCTS

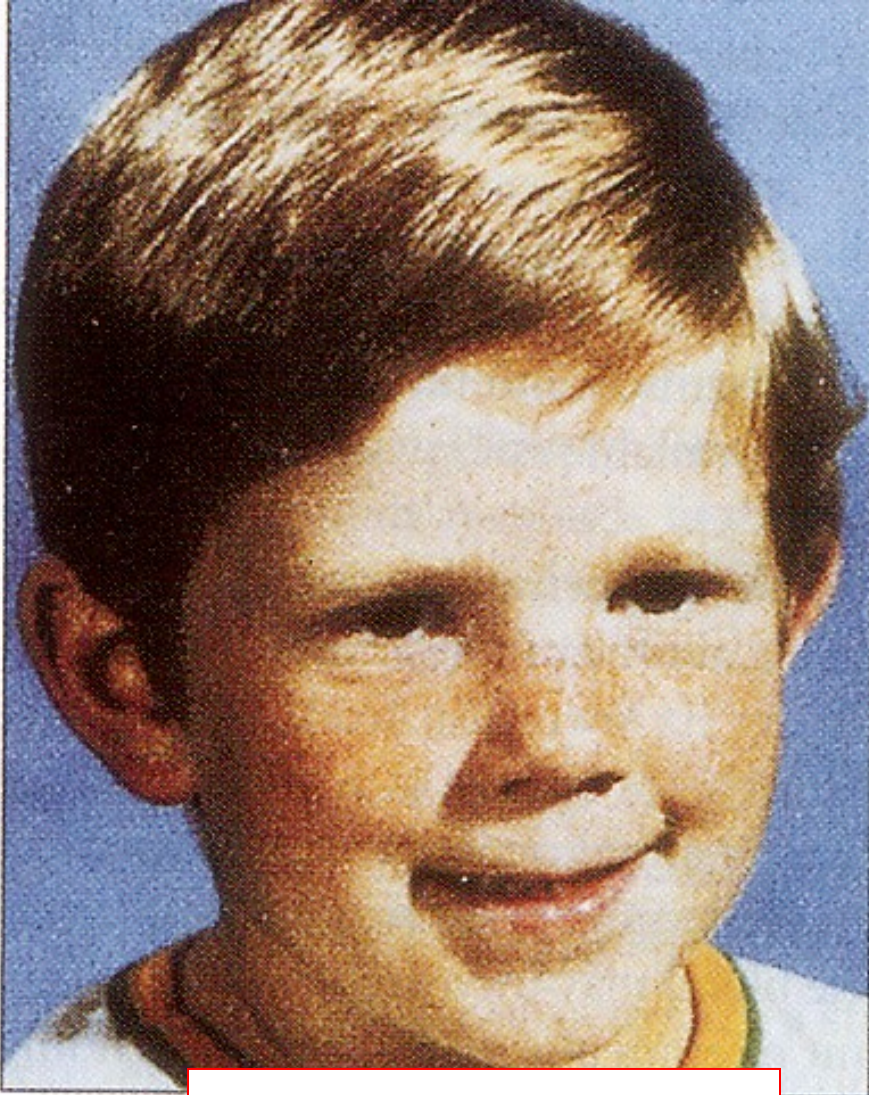


REWASH!!

Blood Chem Lab Q?



***Cushing's Syndrome = Hypersecretion
of Cortisol: Hypothalamic (CRH),
Pituitary (ACTH), or Adrenal (Cortisol)***



T = 0, near normal

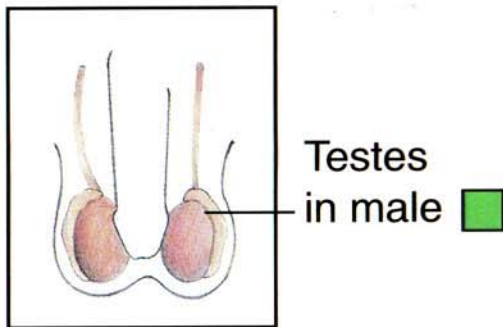
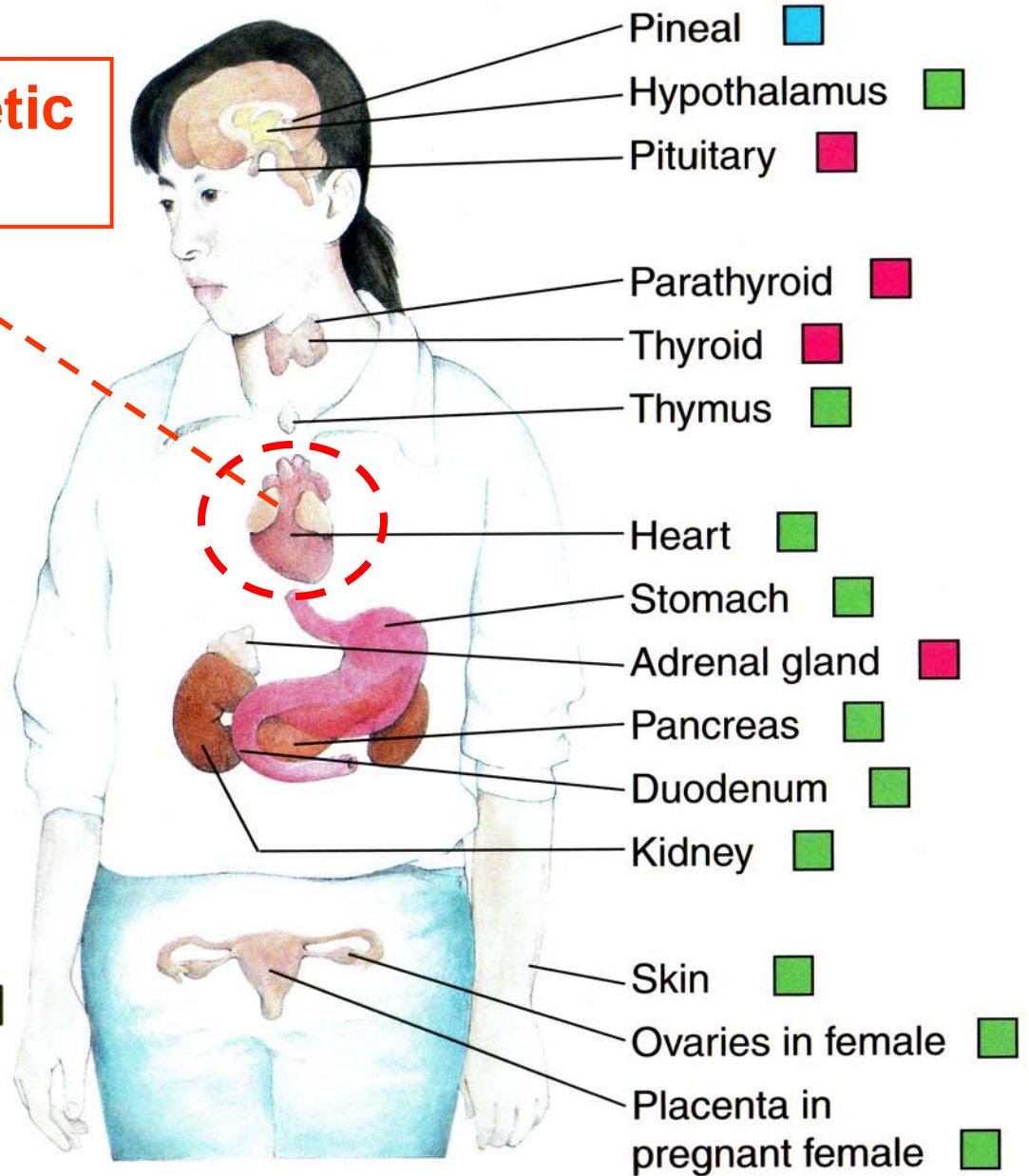


T = 4 months later

Endocrine System

ANP = Atrial Natriuretic Polypeptide

- Solely endocrine function
- Mixed function
- Complete function uncertain

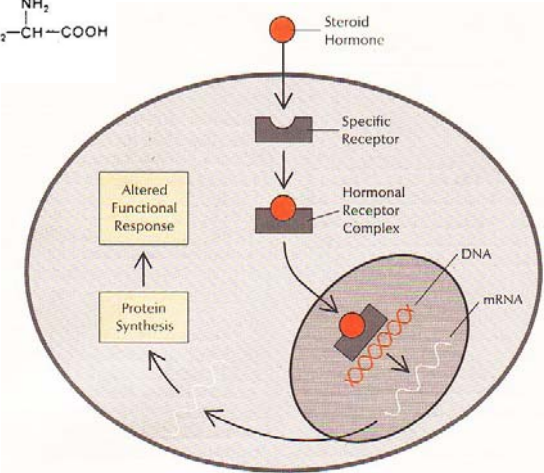
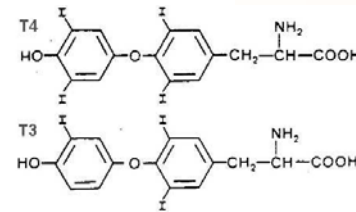
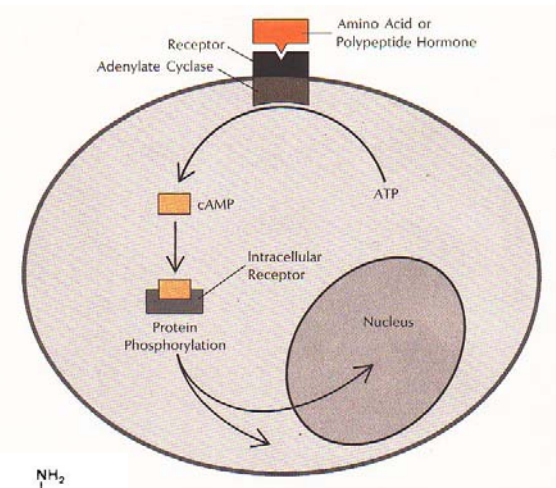


Hormone/Endocrine Classifications

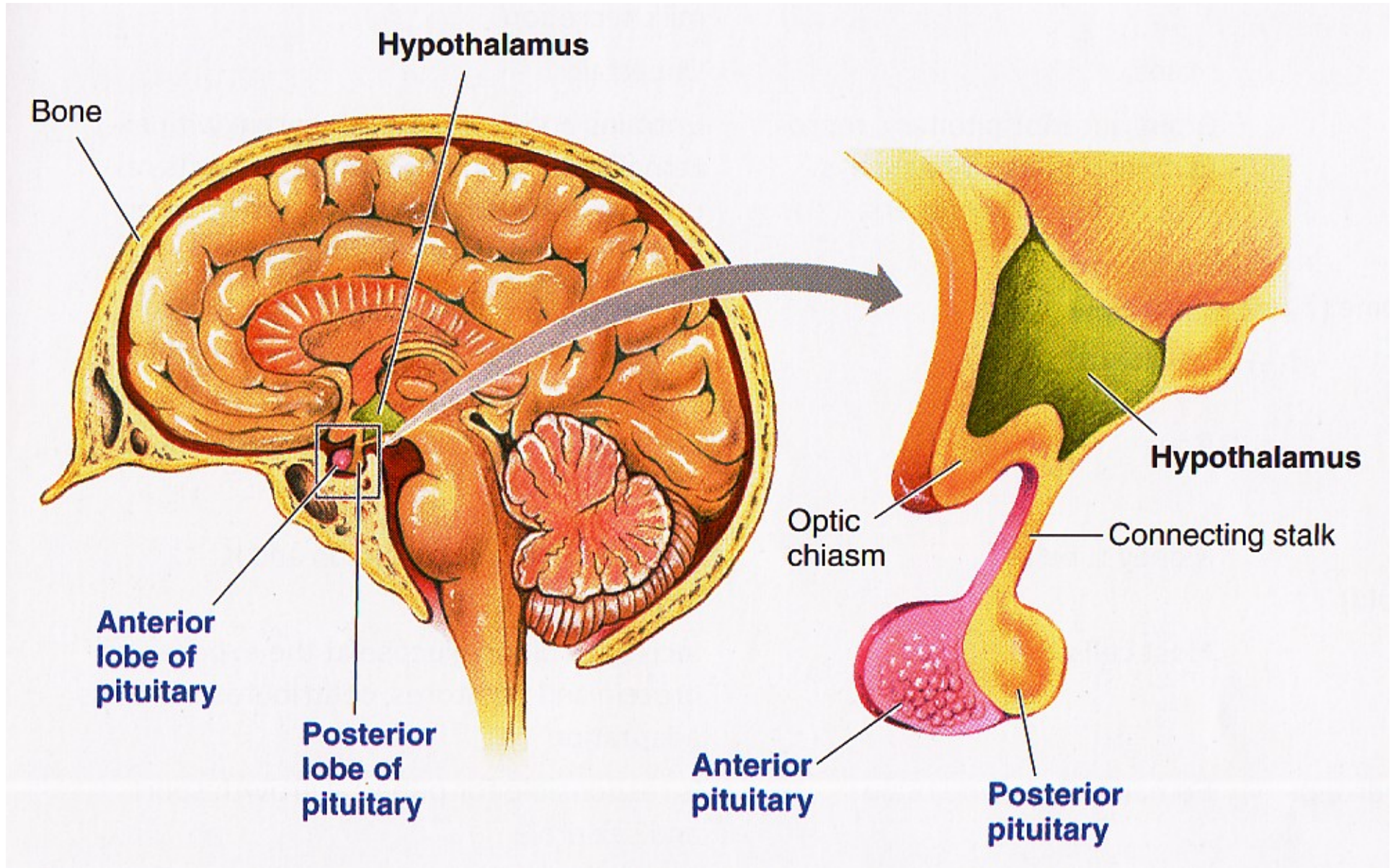
Exogenous



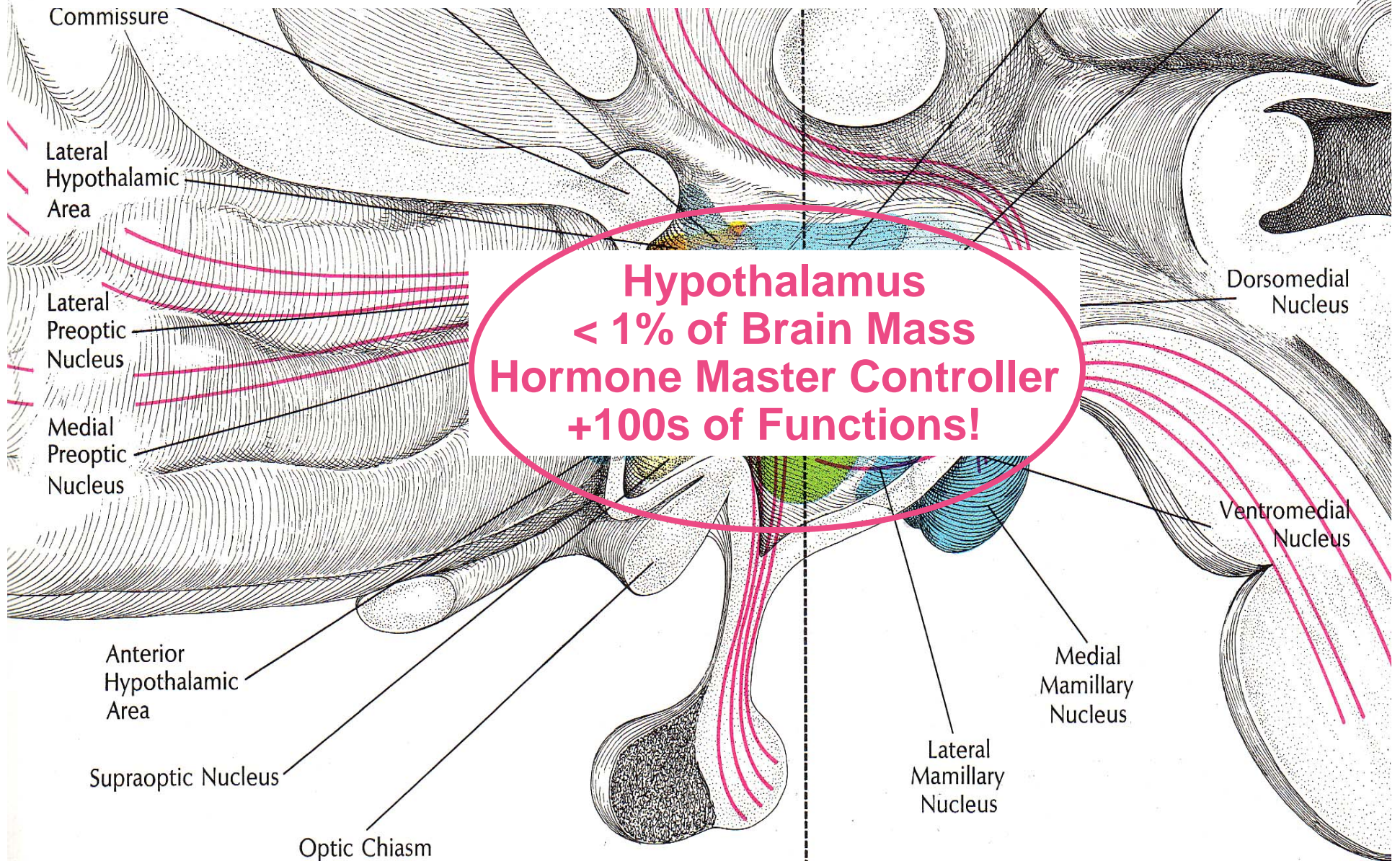
Endogenous



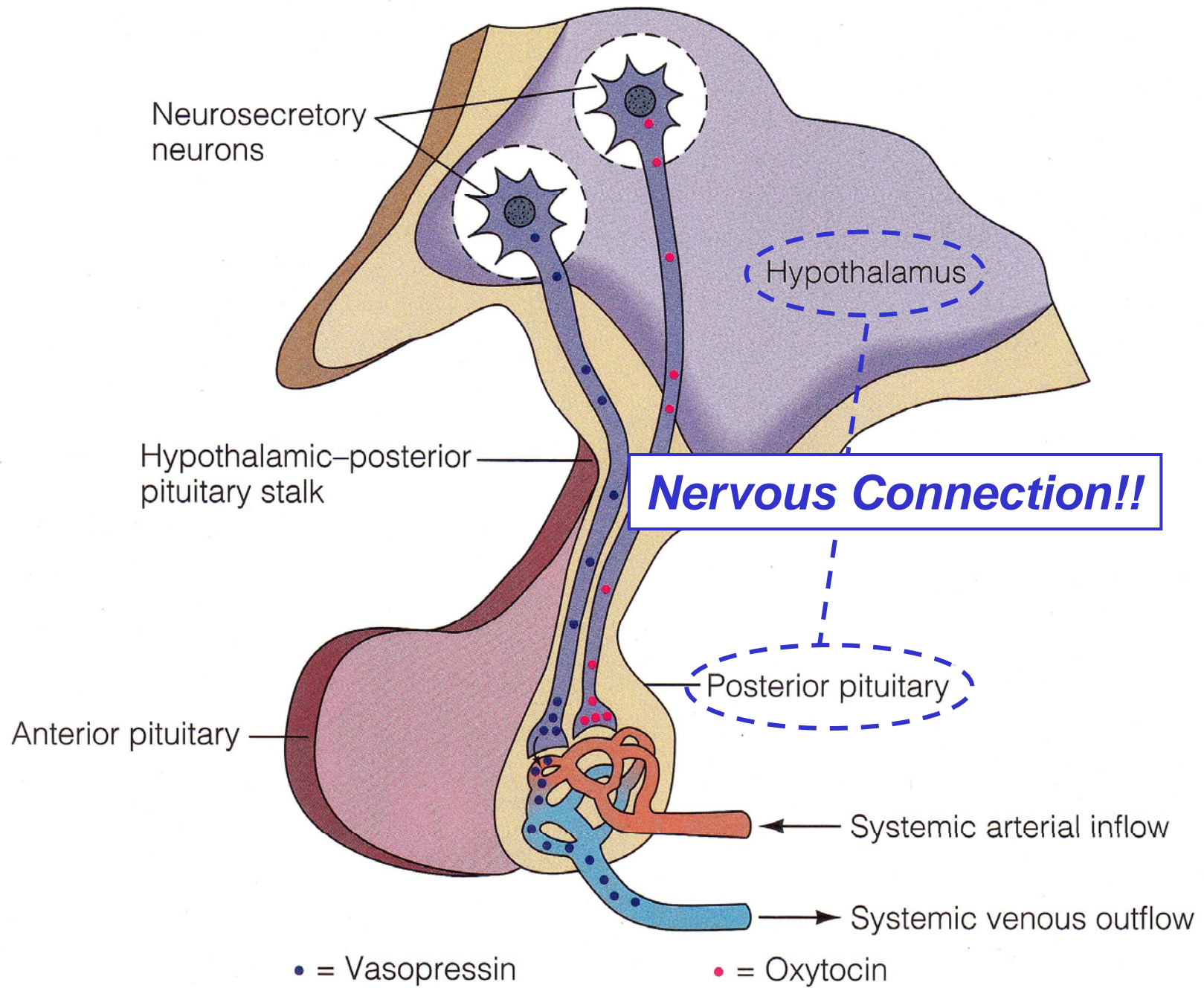
Hypothalamus & Pituitary: Intimate Relationship



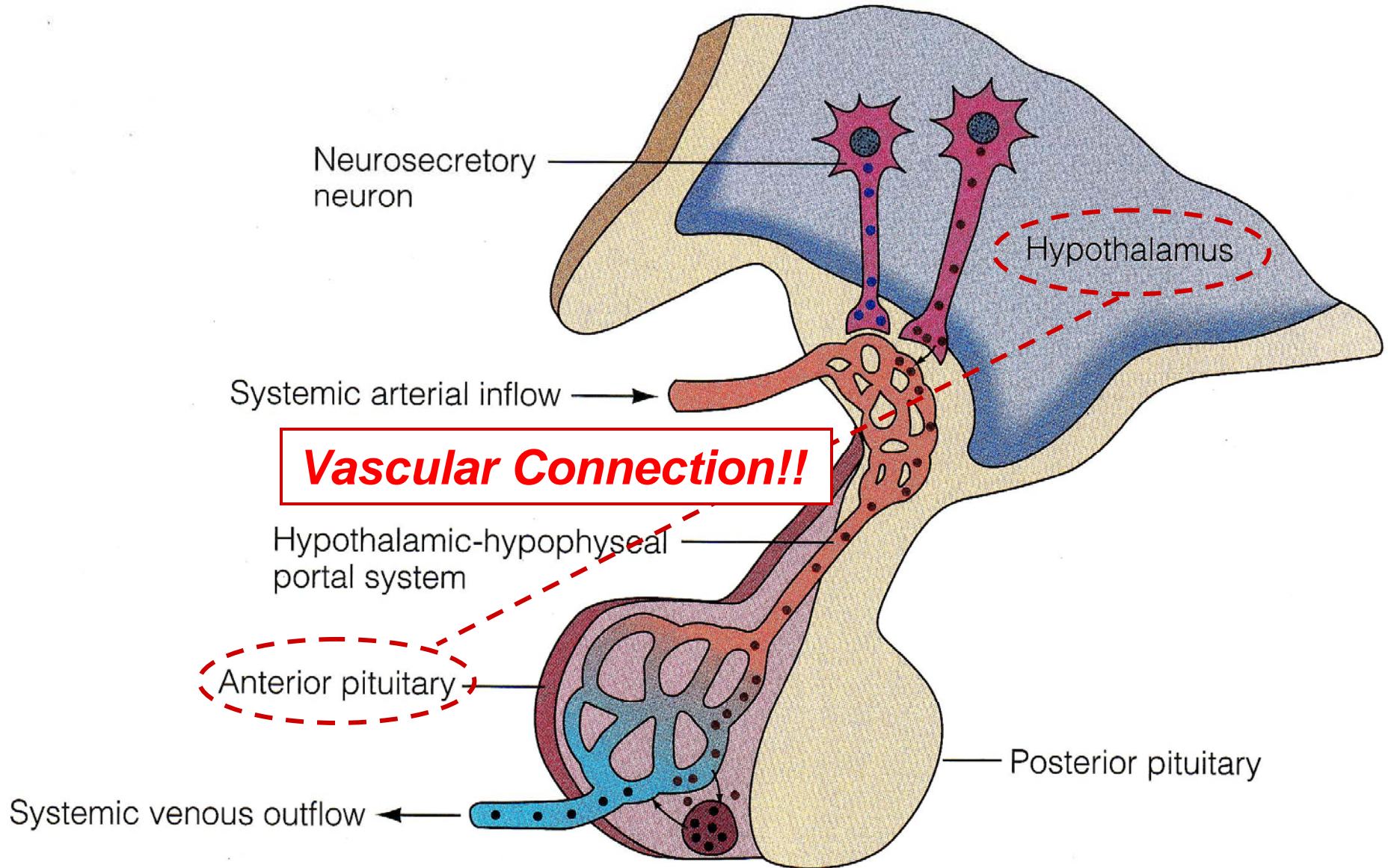
Good Things Come in Small Packages!



Kreiger & Hughes 1980

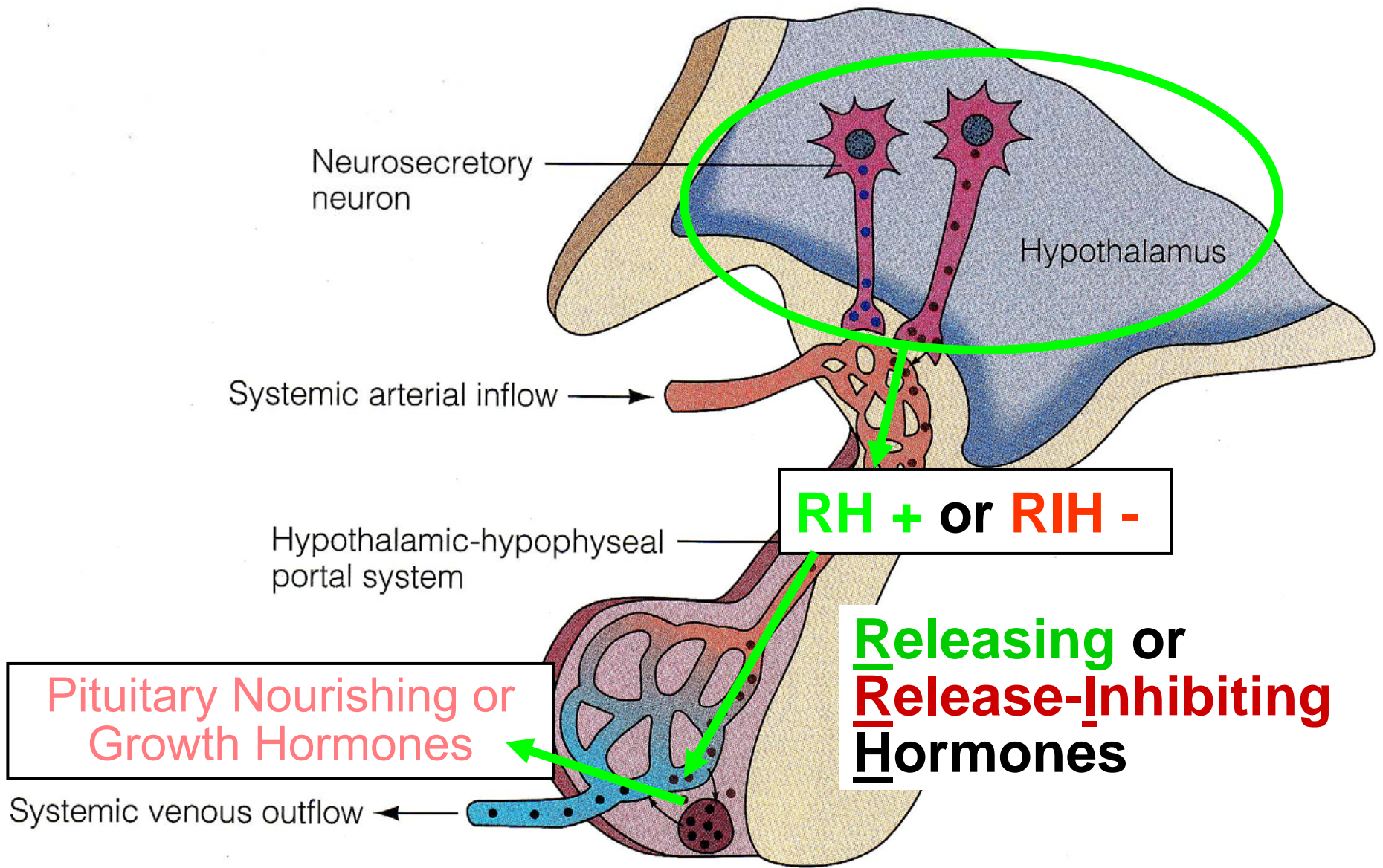


Hypothalamus-Anterior Pituitary Vascular Connection!



• = Hypophysiotropic hormones

• = Anterior pituitary hormone



RH + or RIH -

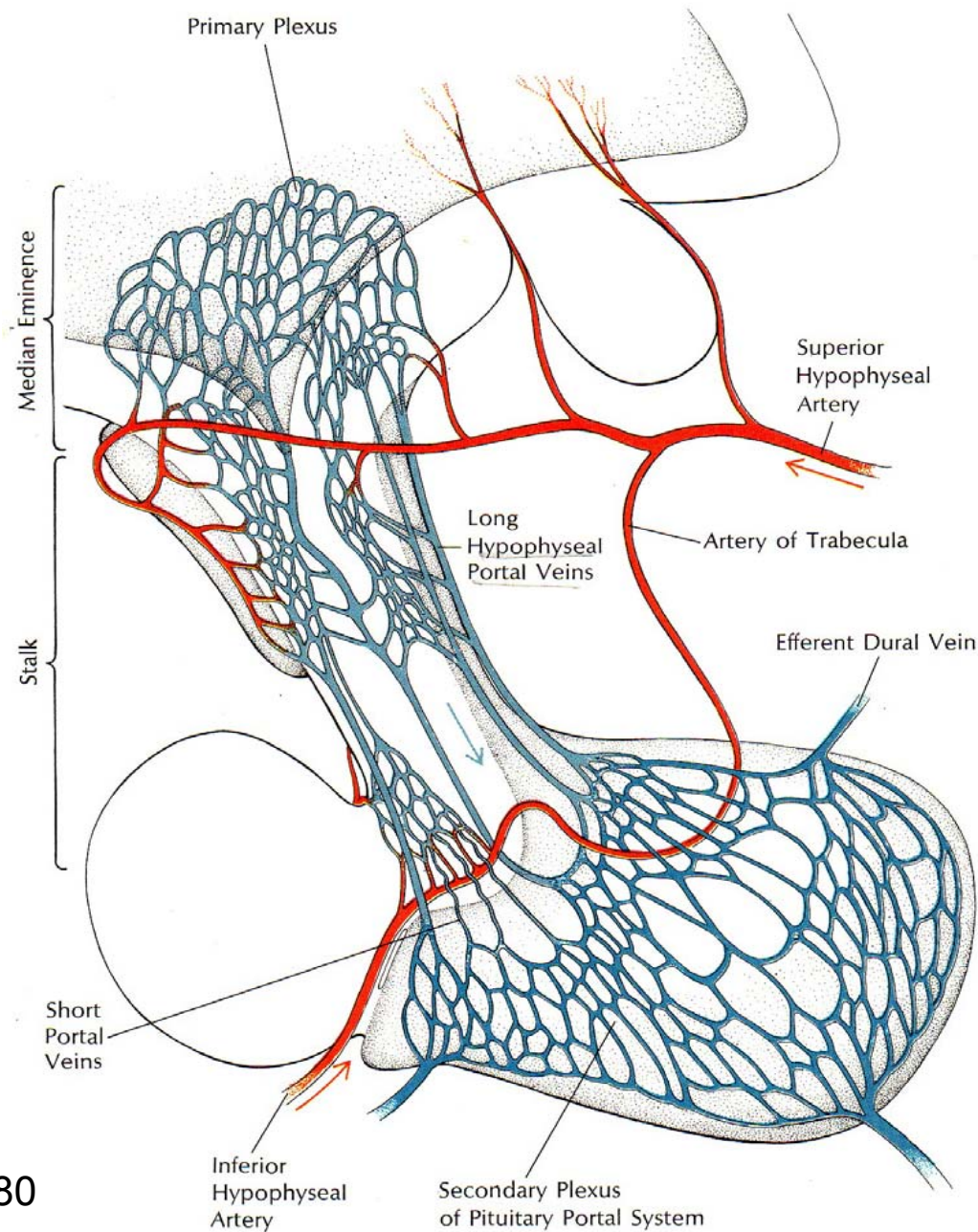
Releasing or Release-Inhibiting Hormones

Pituitary Nourishing or Growth Hormones

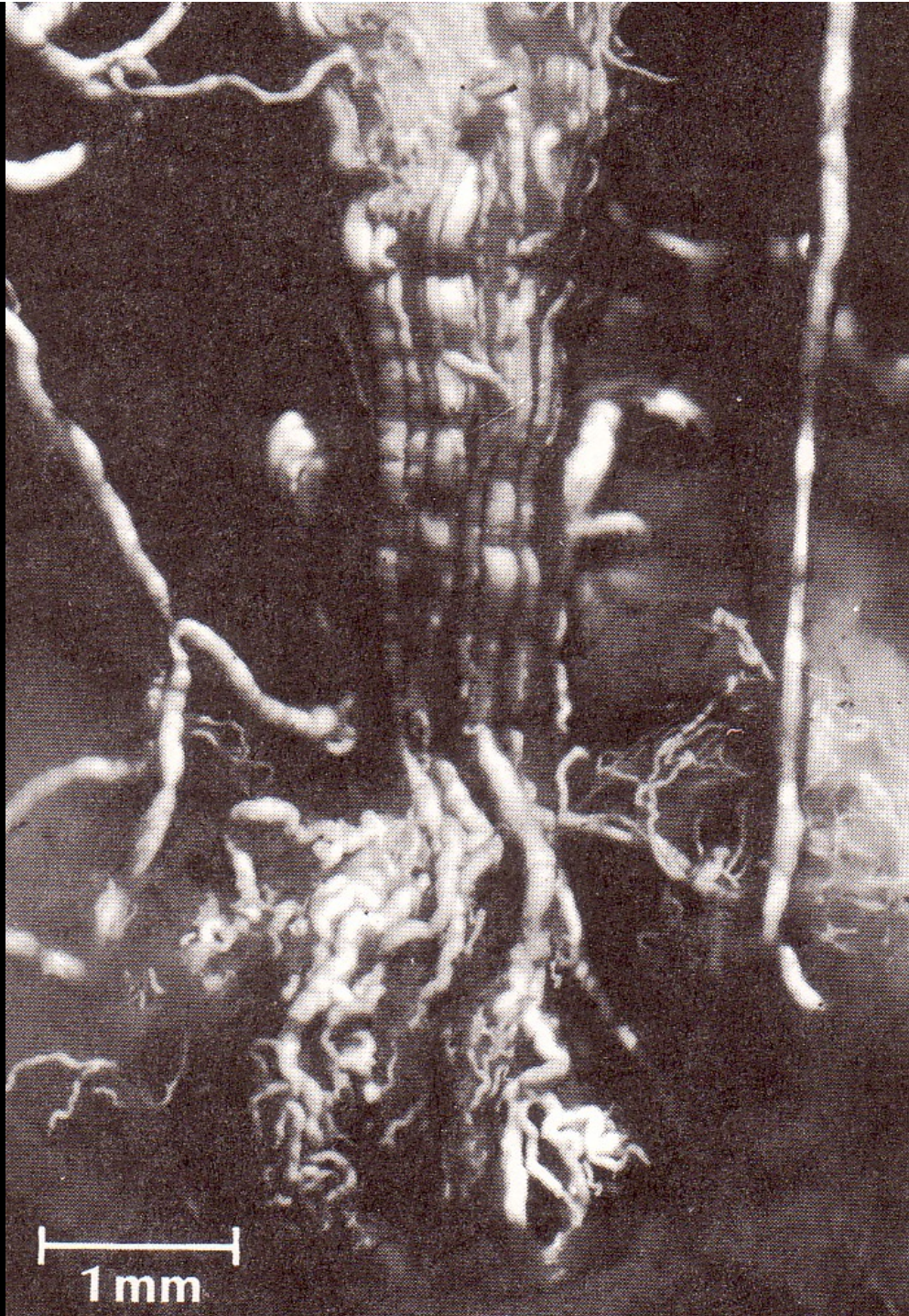
- = Hypophysiotropic hormones
- = Anterior pituitary hormone

Hypophysis = Pituitary

Capillary-Venule-Capillary Intimate Circulation



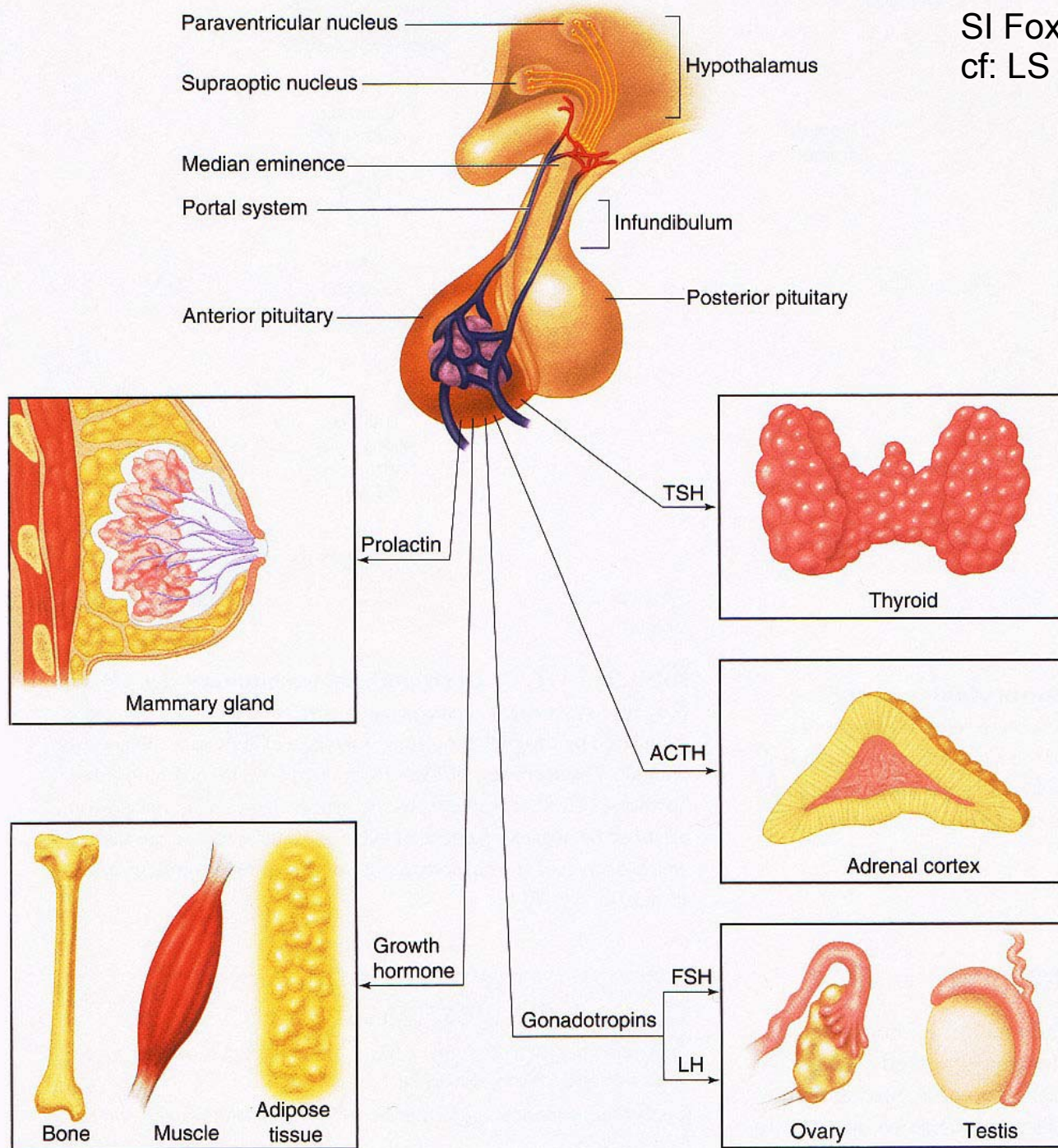
Krieger & Hughes 1980



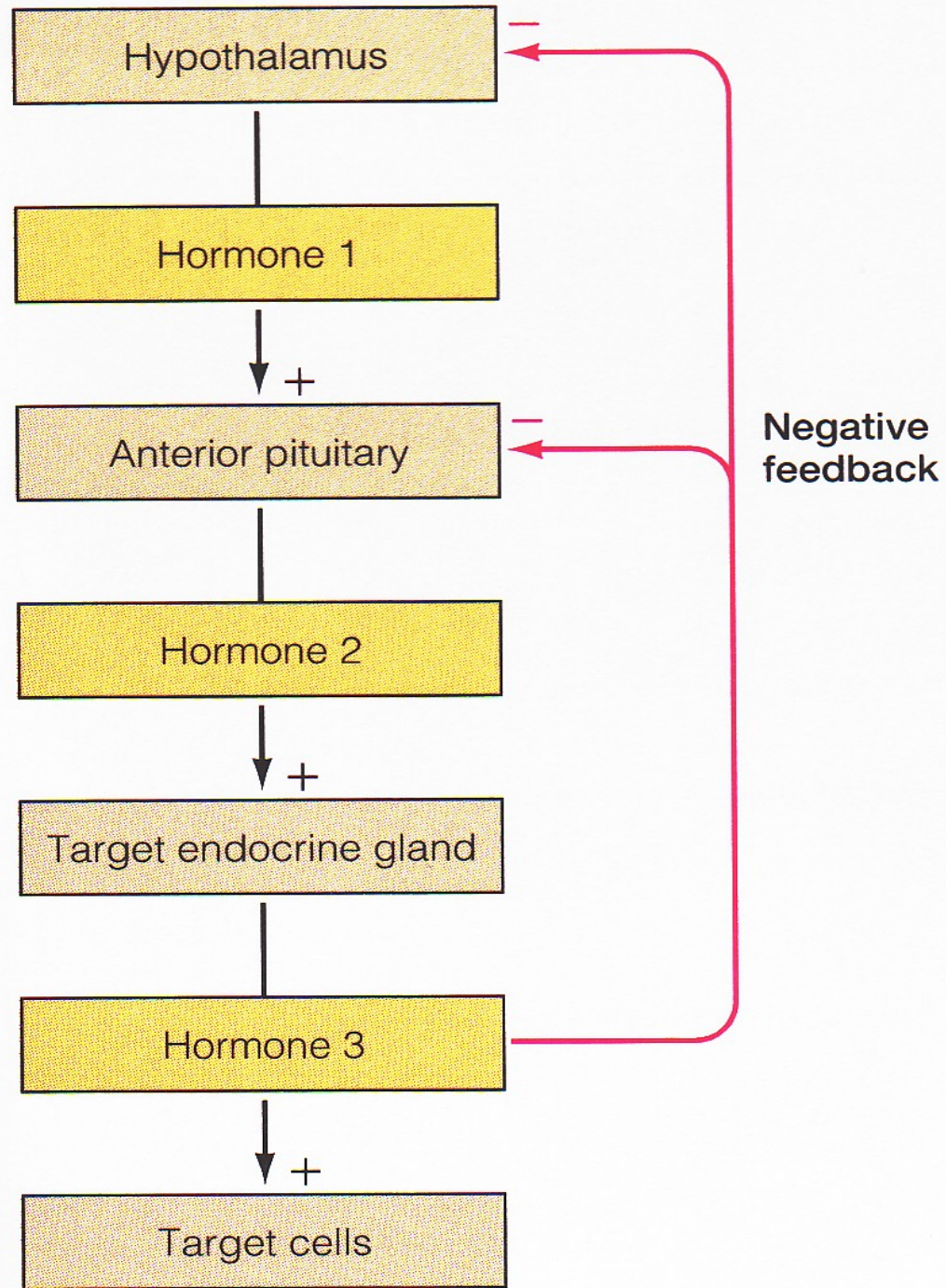
Krieger & Hughes 1980

1 mm

SI Fox 2008
cf: LS 2012 fig 17-5



**Discussion
&/or
Break?**





LS 2006, cf: LS 2012
fig 17-10

Progression & Development of Acromegaly

Age 13

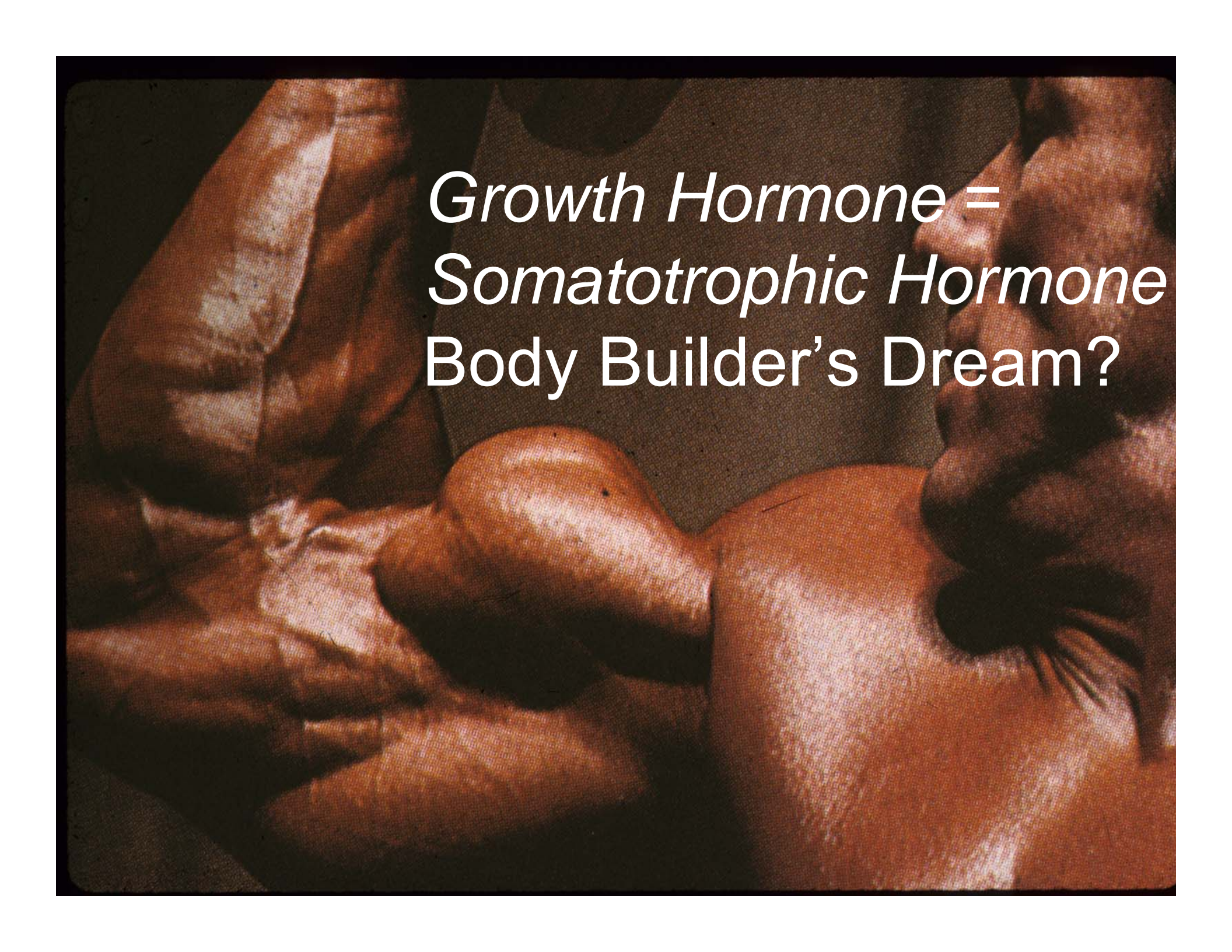


Age 21



Age 35



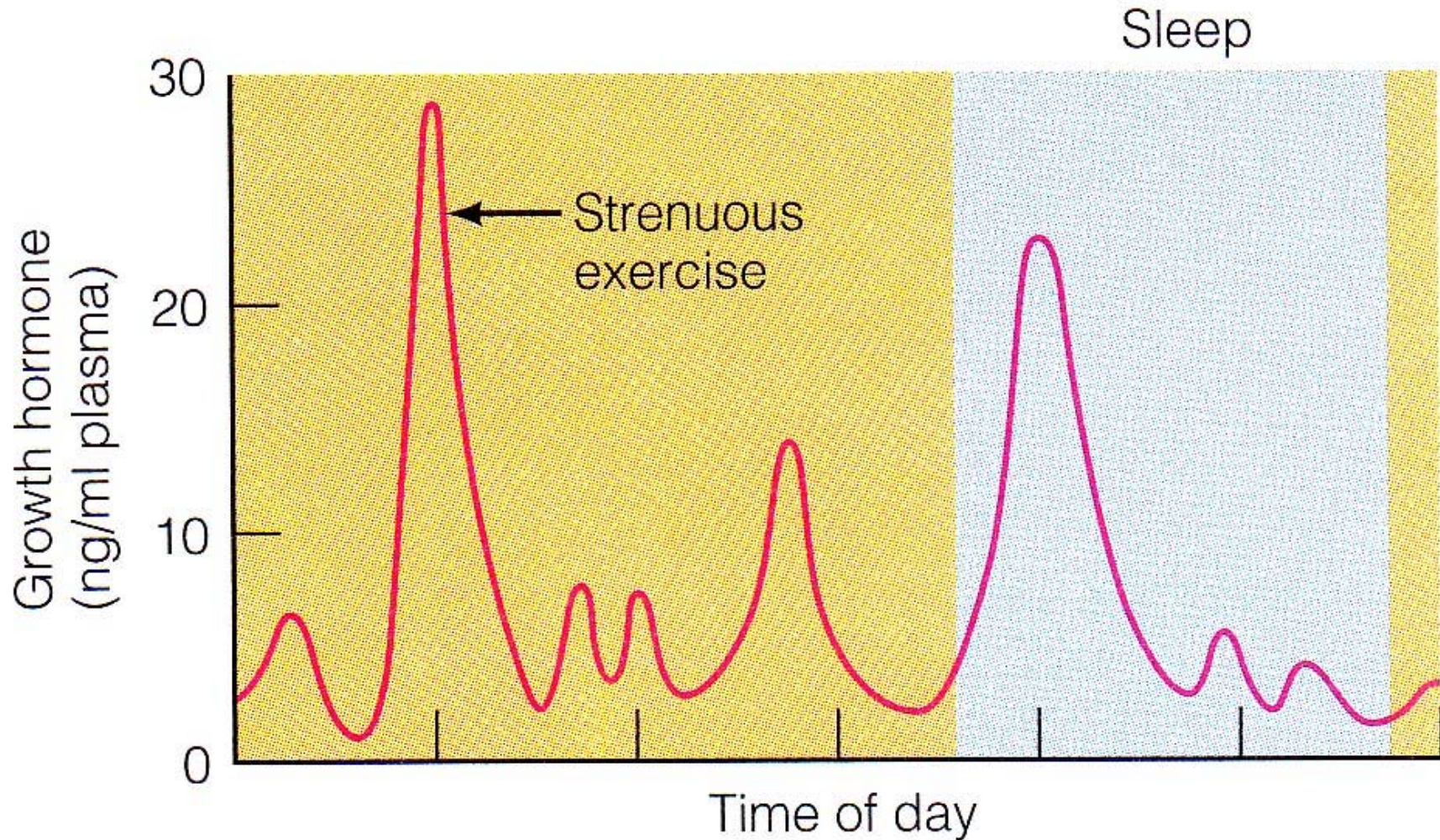


*Growth Hormone =
Somatotrophic Hormone*
Body Builder's Dream?

GH/STH Effects: Insulin Resistance/Type II Diabetes?

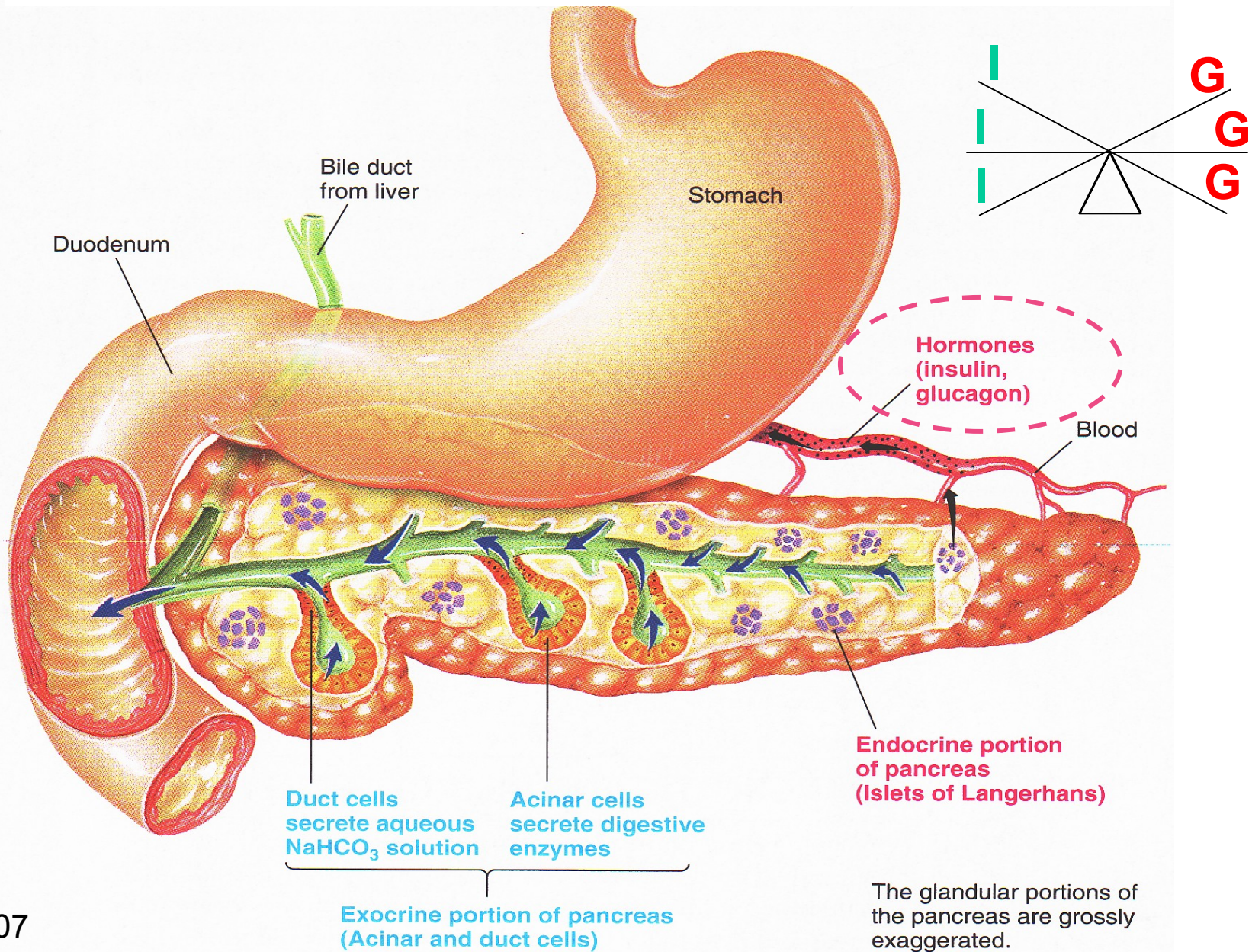
- ↑ Amino Acid uptake & Protein synthesis
- ↑ Lipolysis & Fatty Acid mobilization
- ↓ Glucose uptake
(skeletal muscle & adipocytes)
- ↑ Glucose production
(liver glycogenolysis)
- ↑ Insulin secretion

Increase GH naturally with exercise & sleep!!



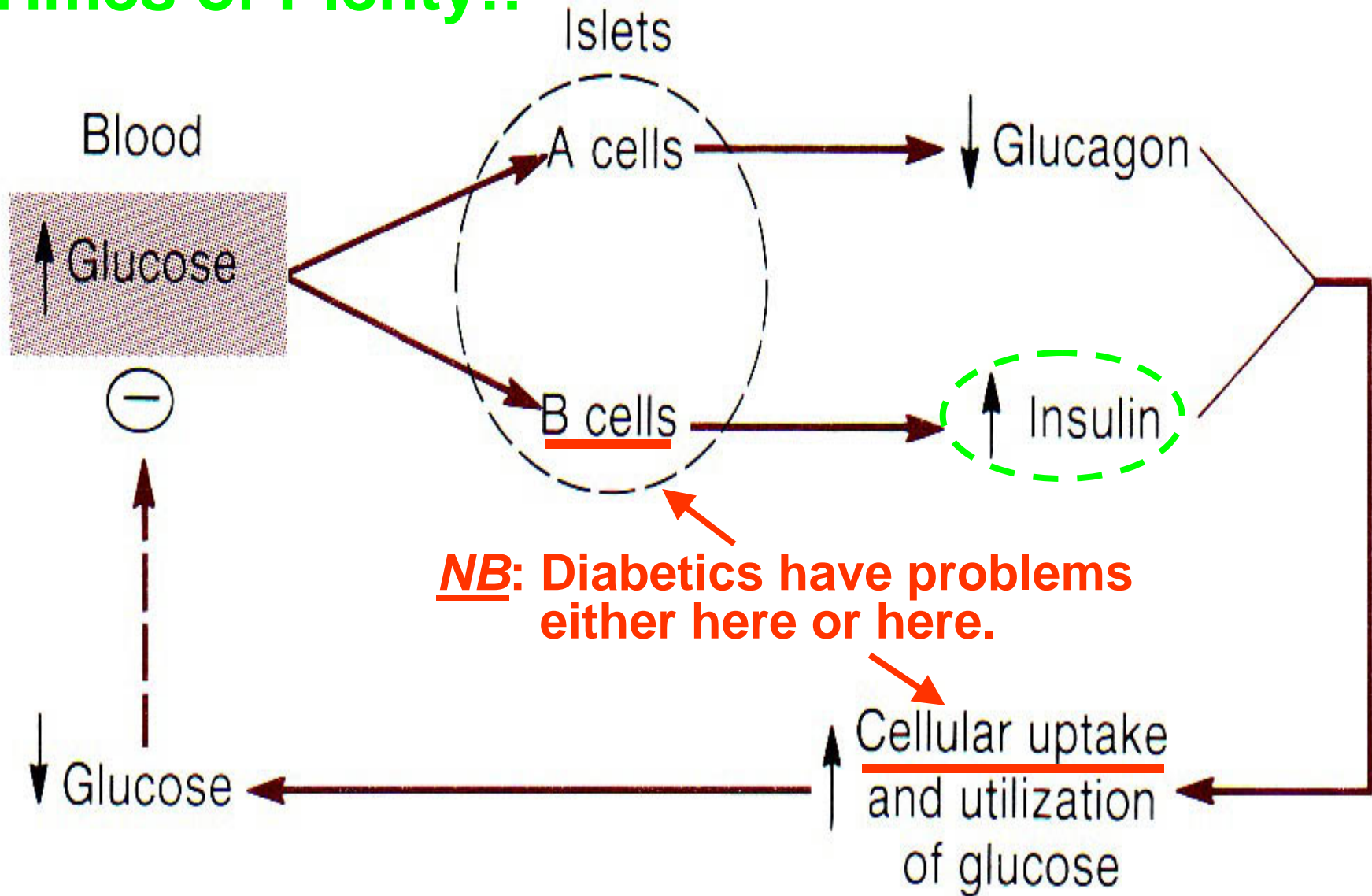
ng/ml = nanograms per milliliter

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



The glandular portions of the pancreas are grossly exaggerated.

Times of Plenty!!

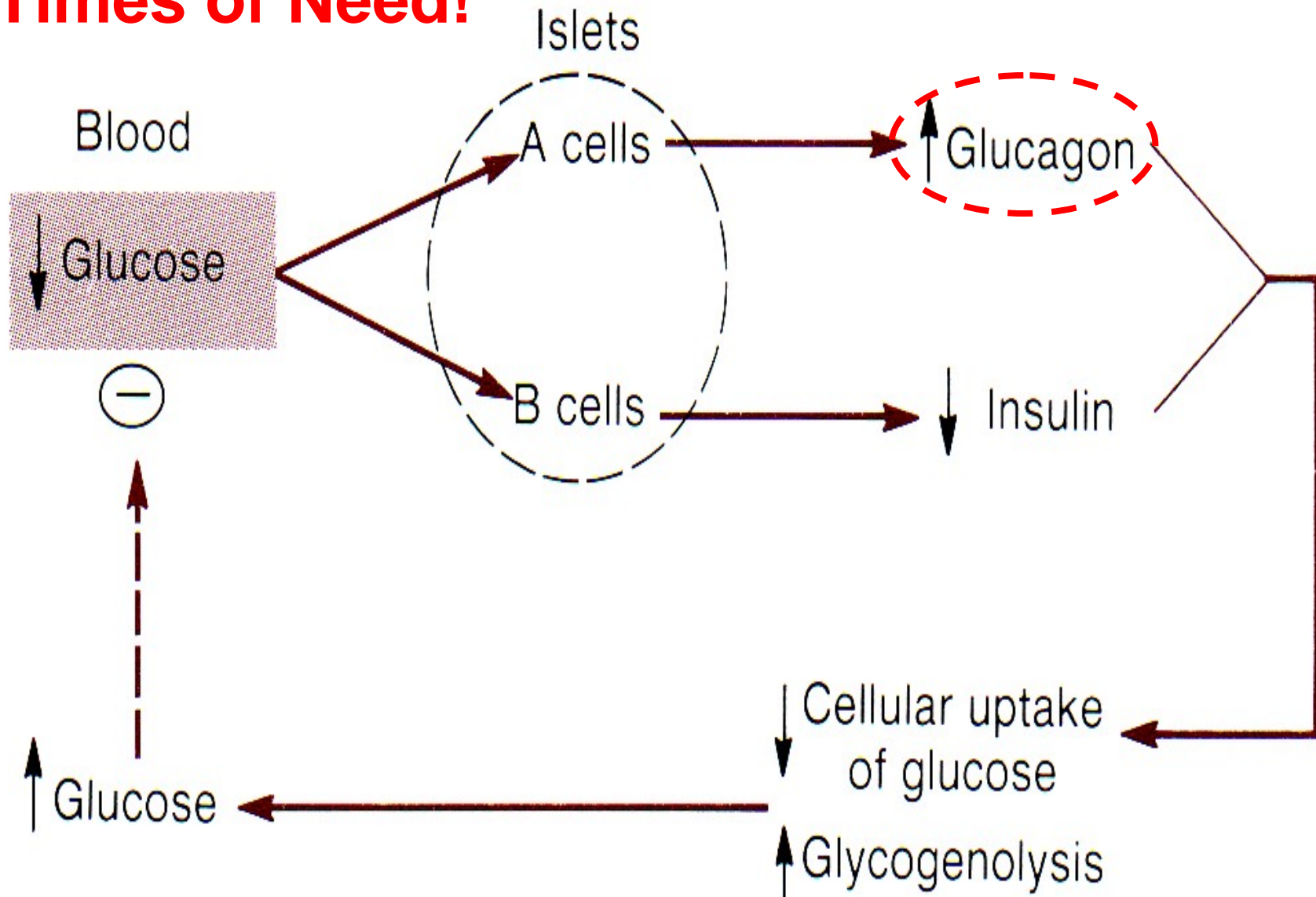


NB: Diabetics have problems either here or here.

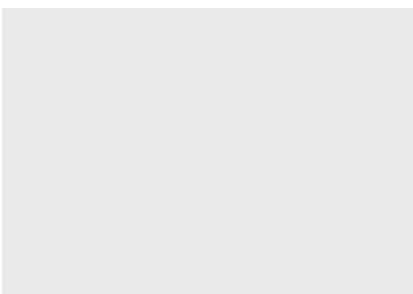
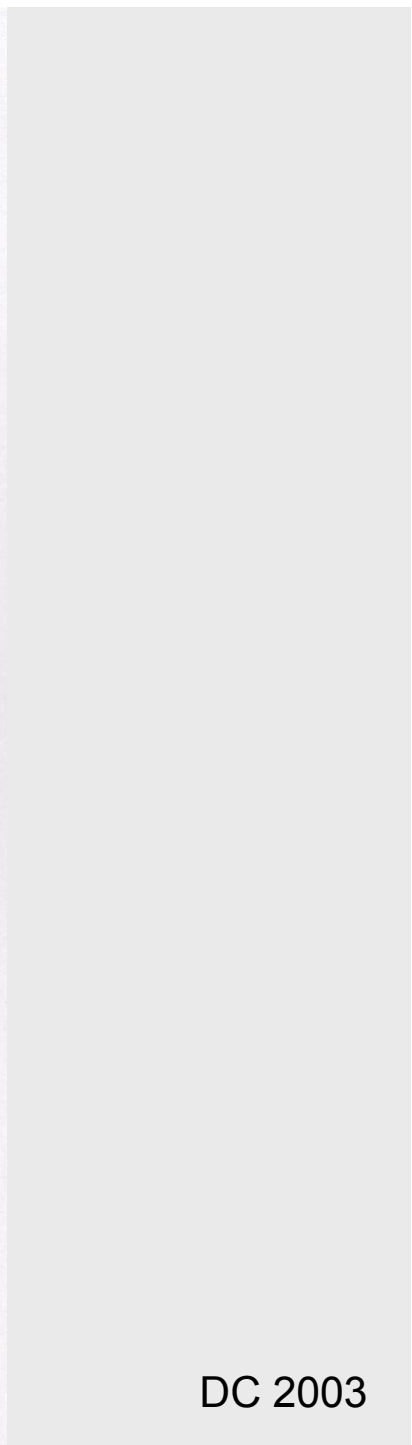
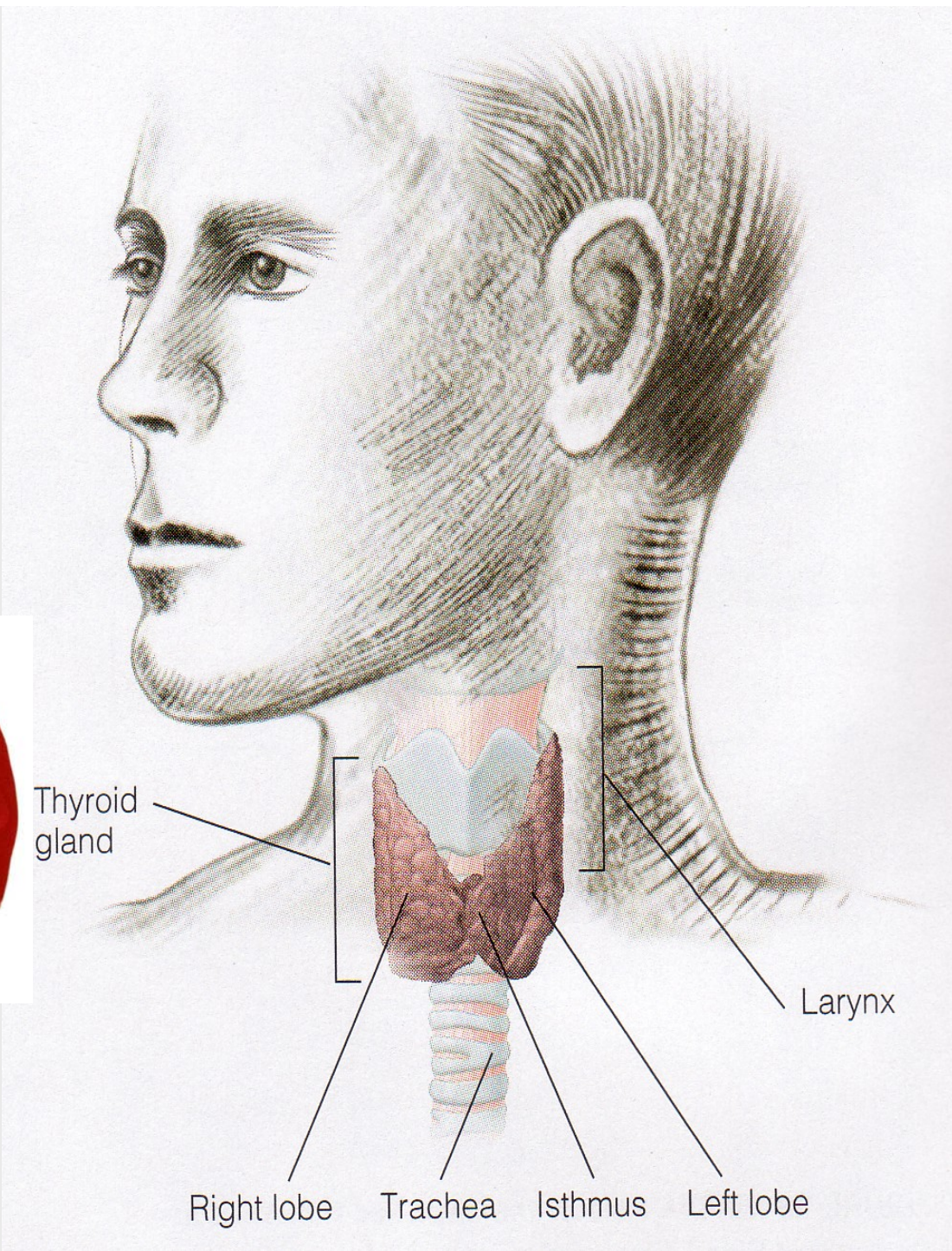
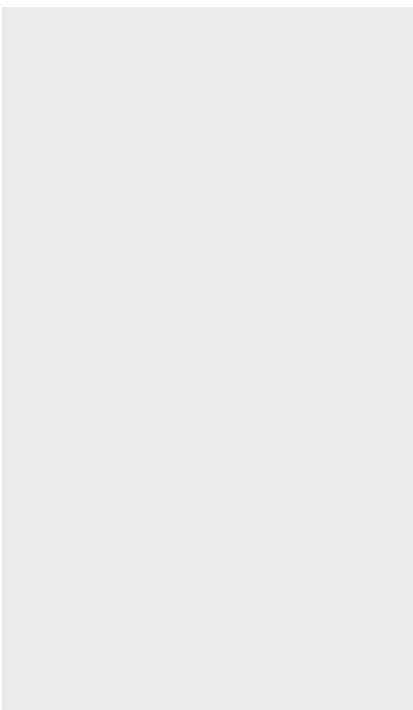
Cellular uptake and utilization of glucose

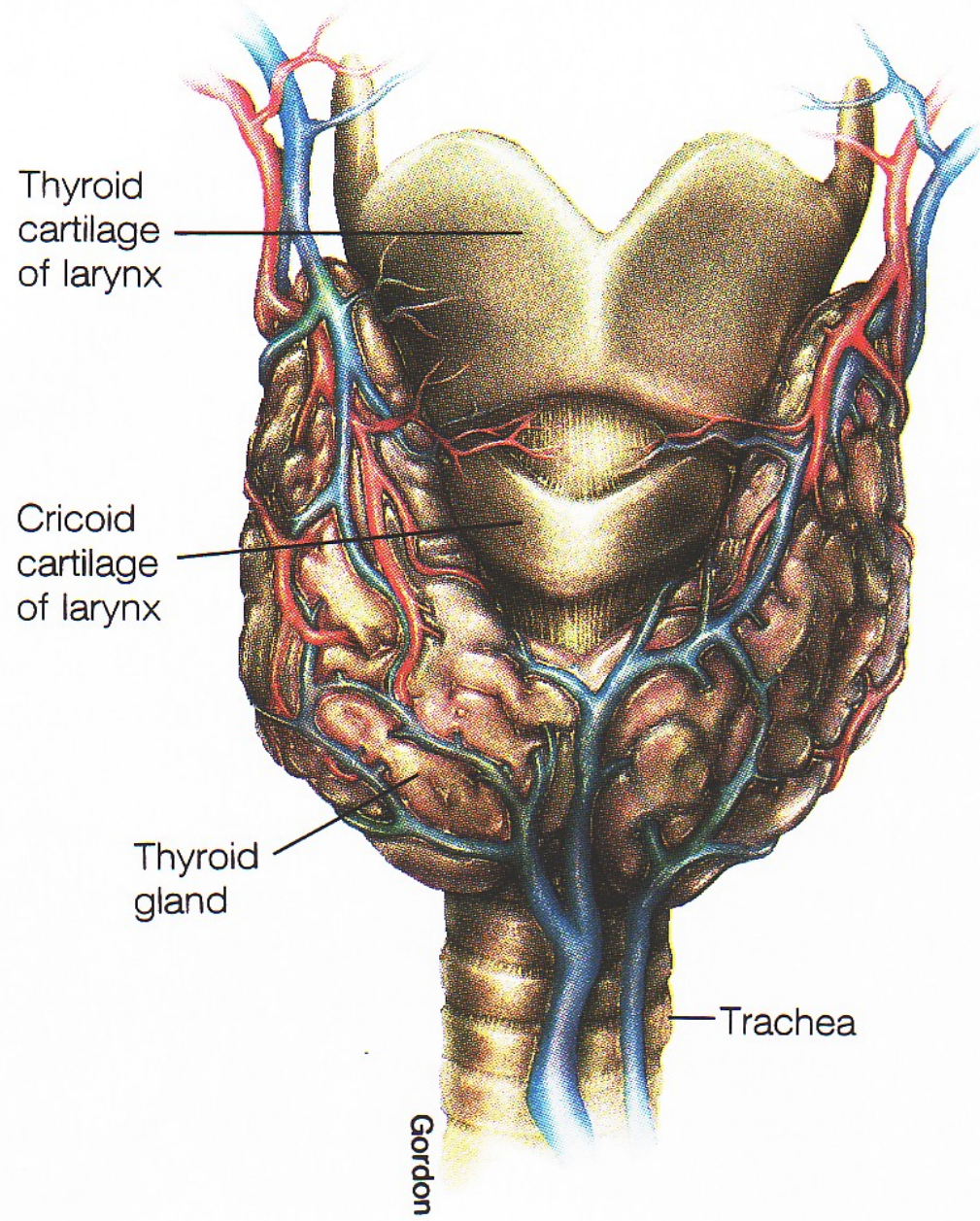
Store!

Times of Need!

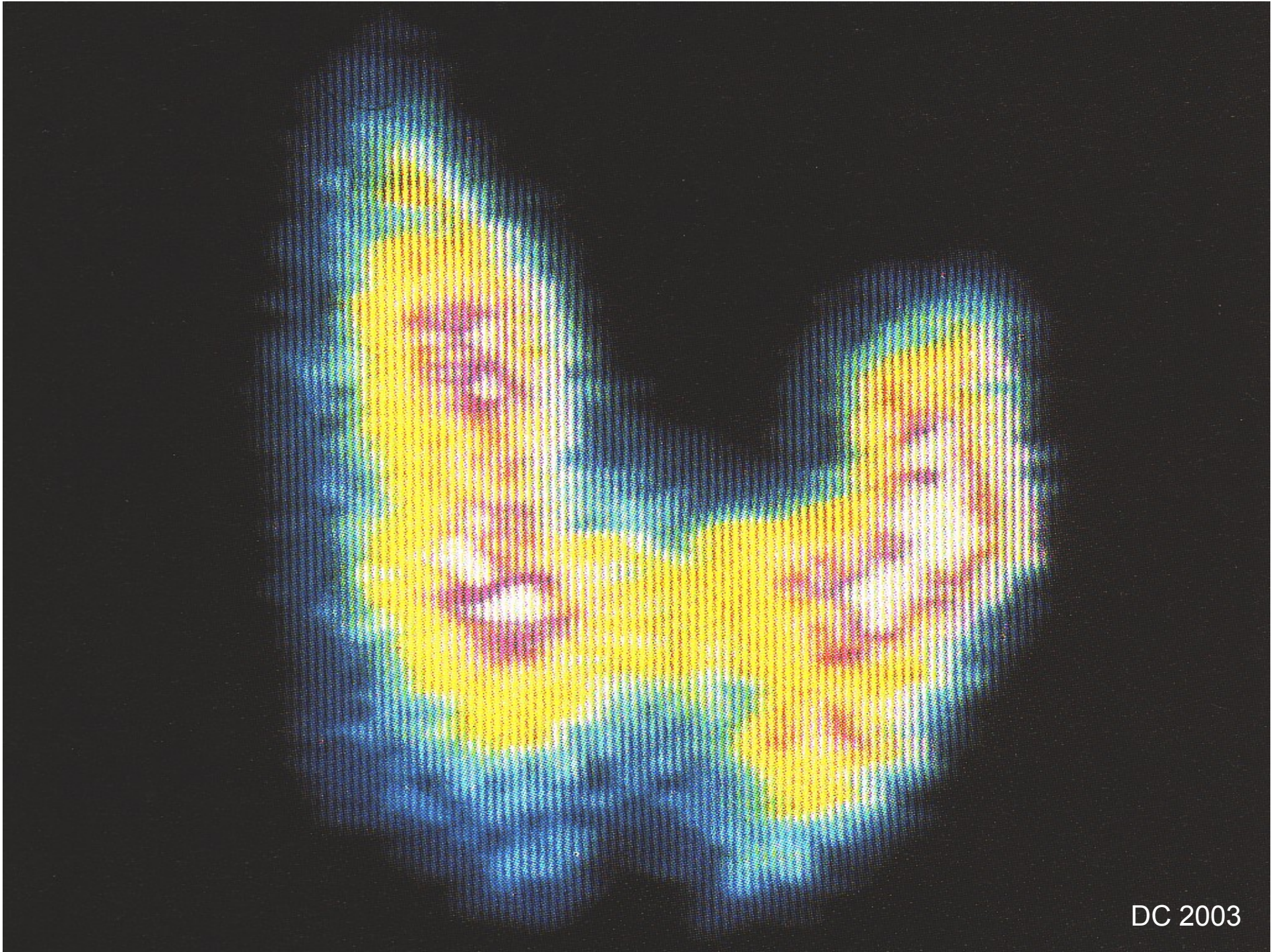


Mobilize!!





(a)





LS 2012 fig 17-16





Guyton & Hall 2000

Adrenal gland

Adrenal cortex

Adrenal medulla

Kidney

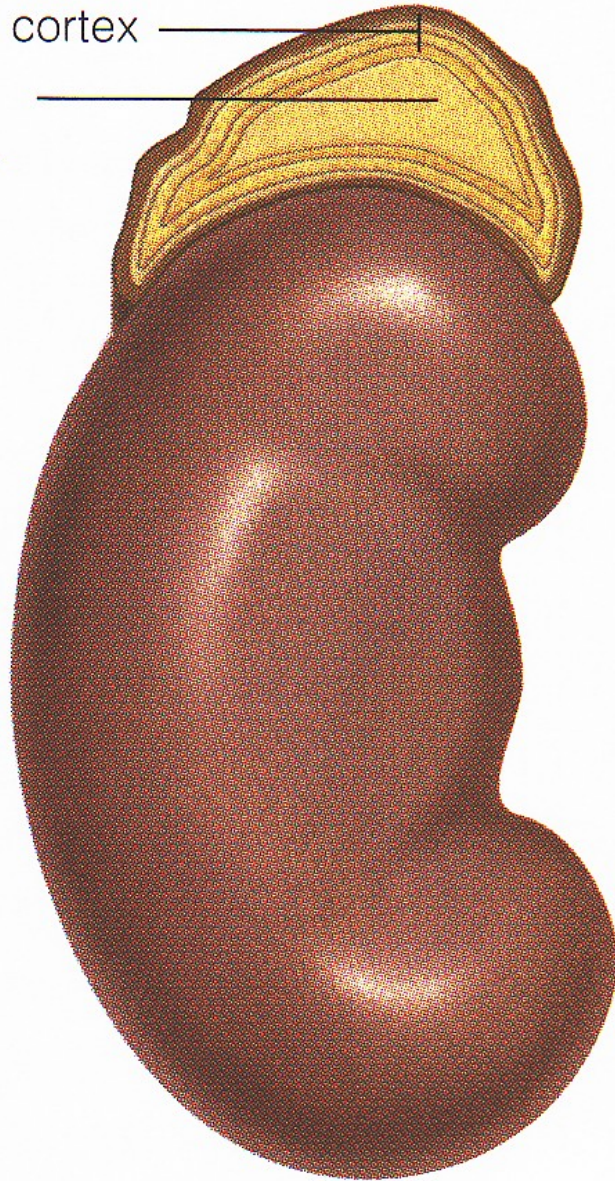


FIGURE 13-12

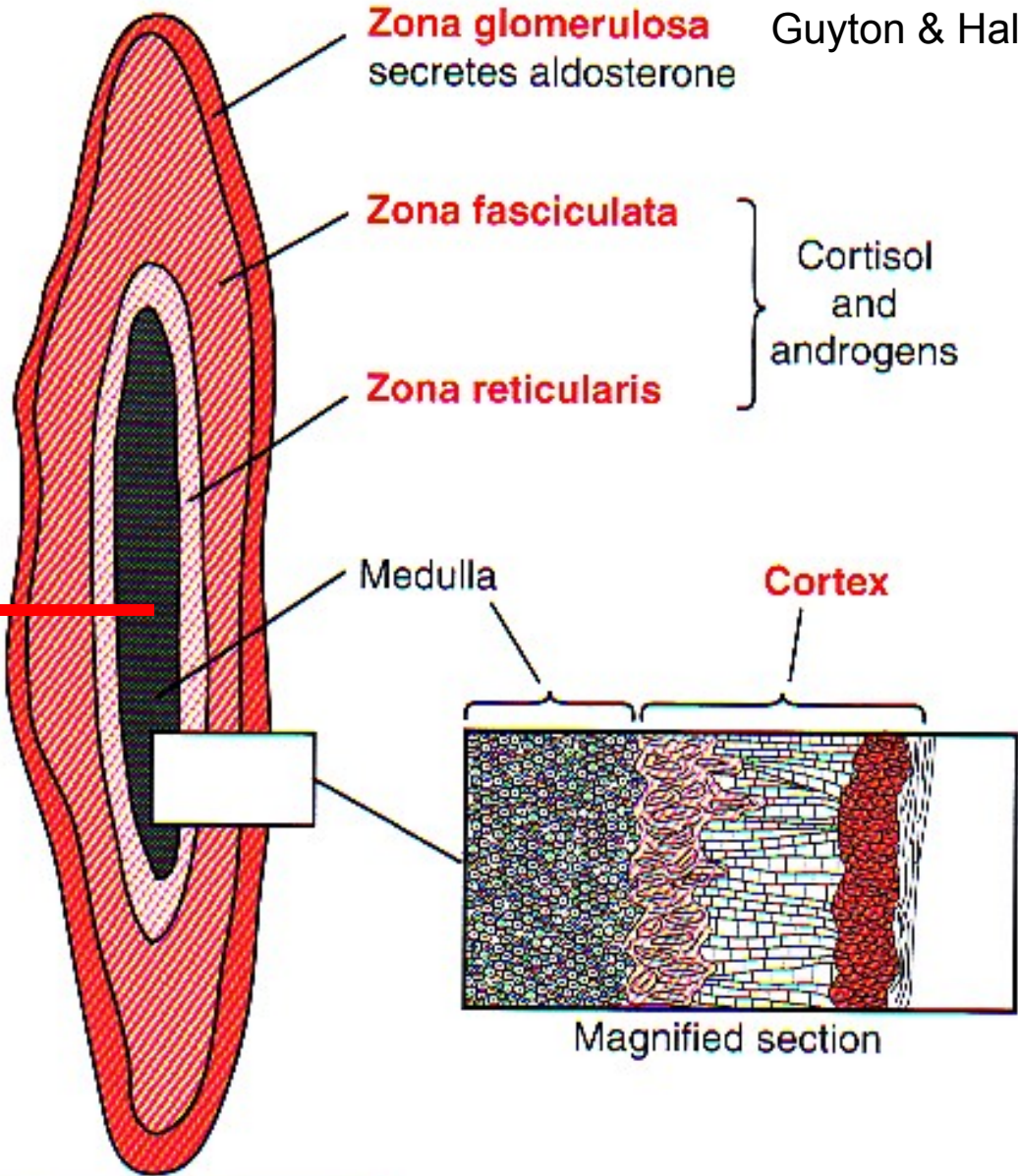
Adrenal Gland

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.

BI 121!!



**Epinephrine
80%
Norepinephrine
20%**

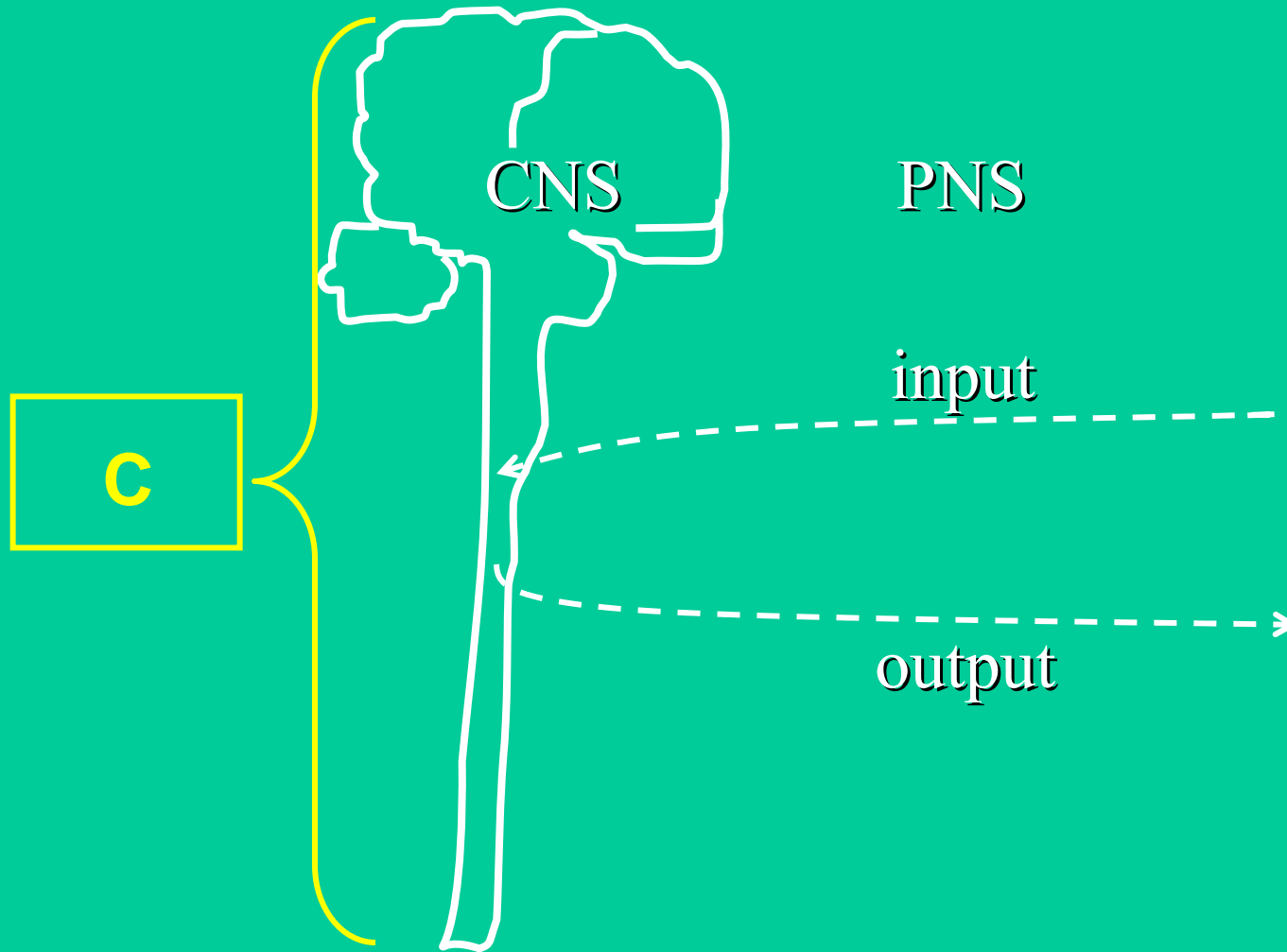


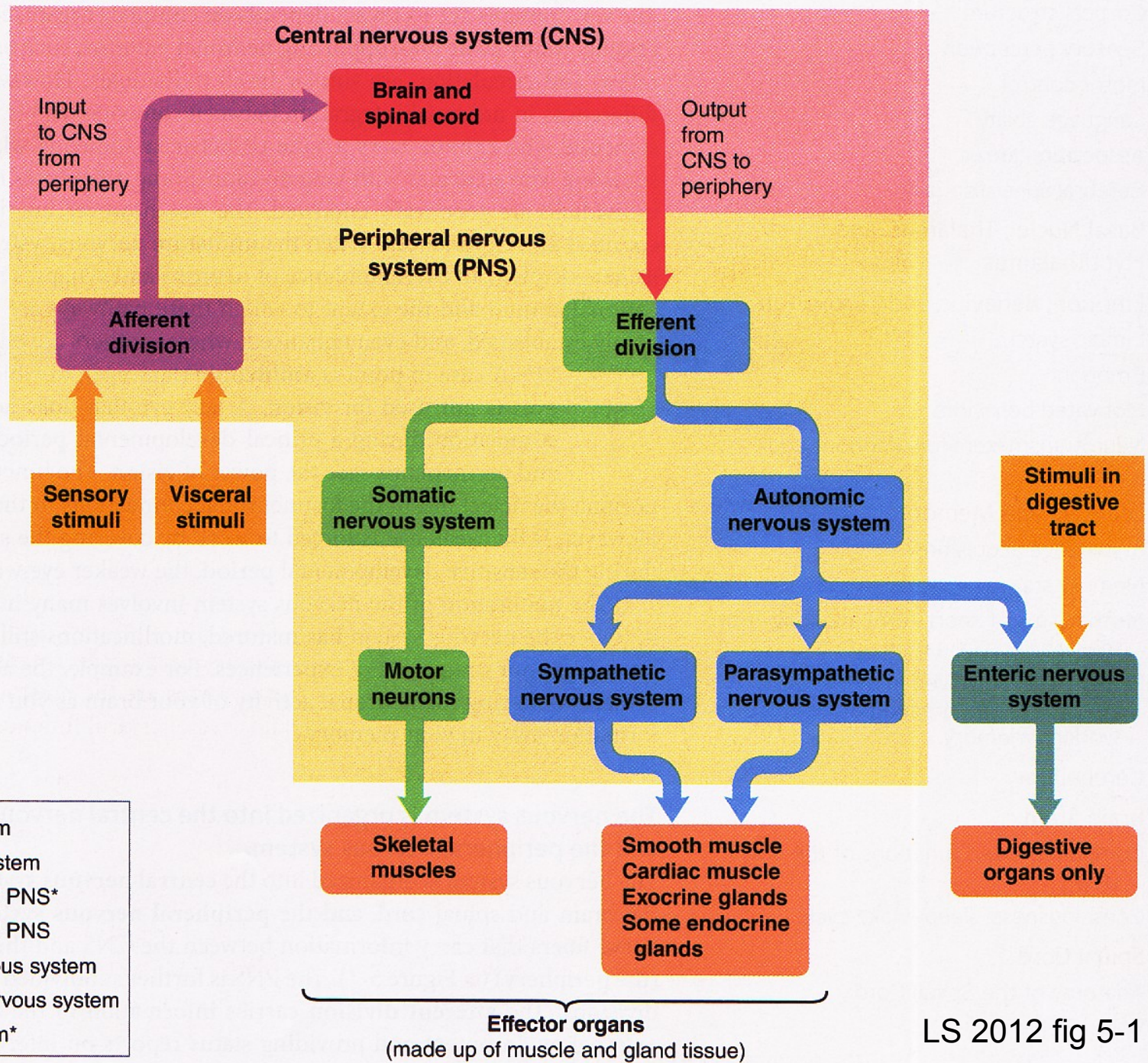
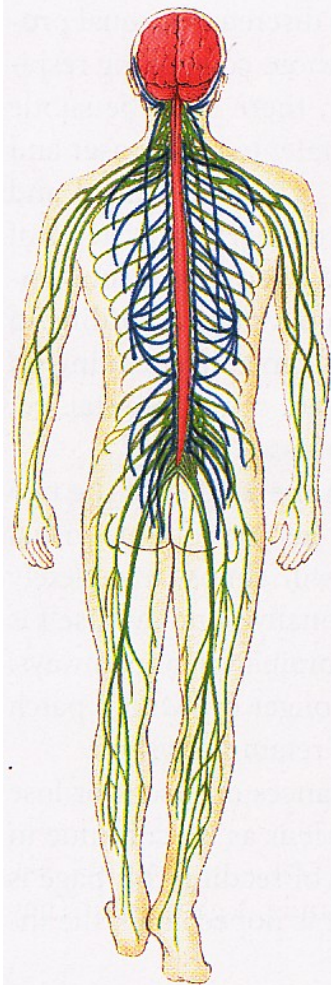
Guyton & Hall 2000

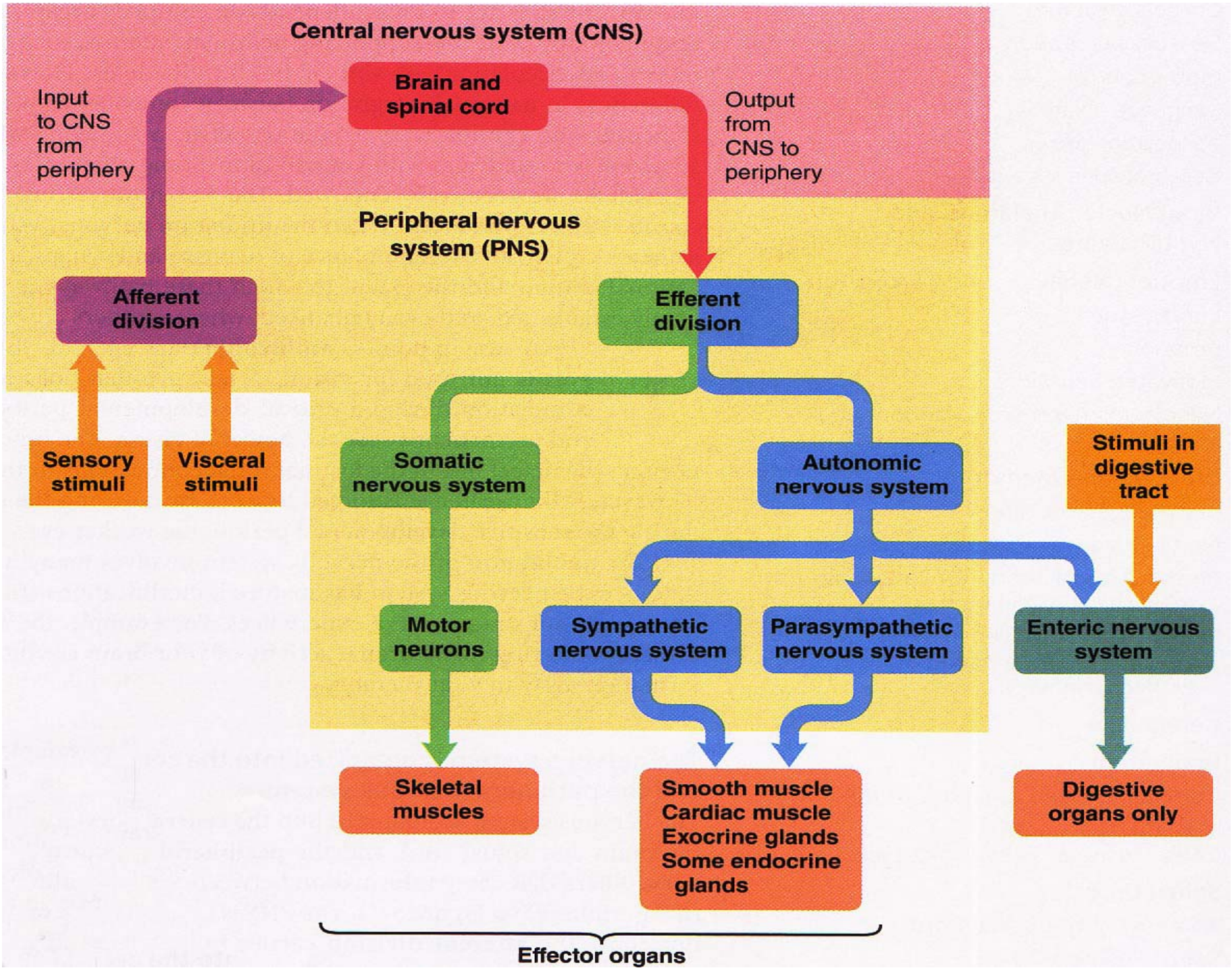
FIGURE 77 - 1

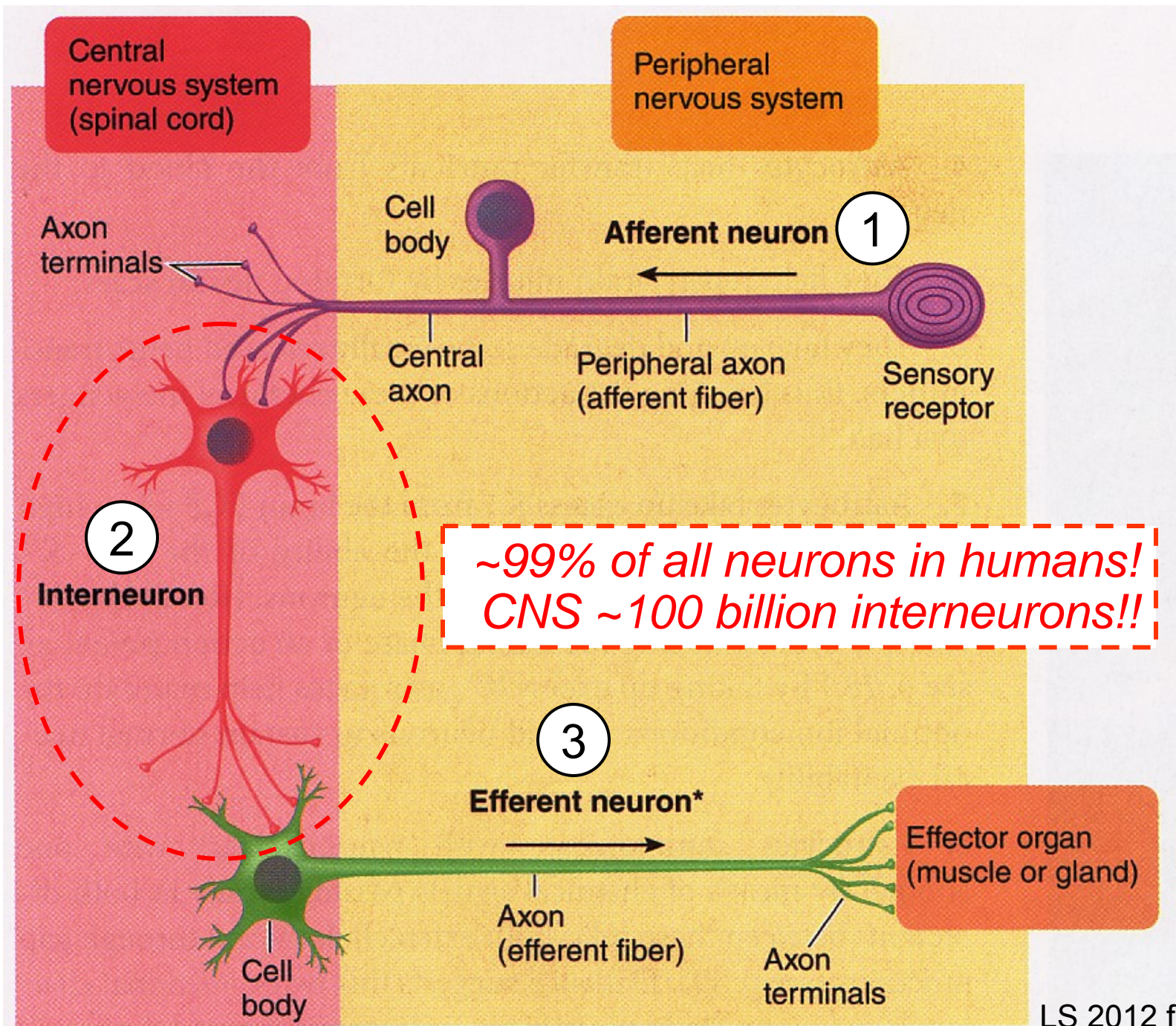
Secretion of adrenocortical hormones by the different zones of the adrenal cortex.

Nervous System

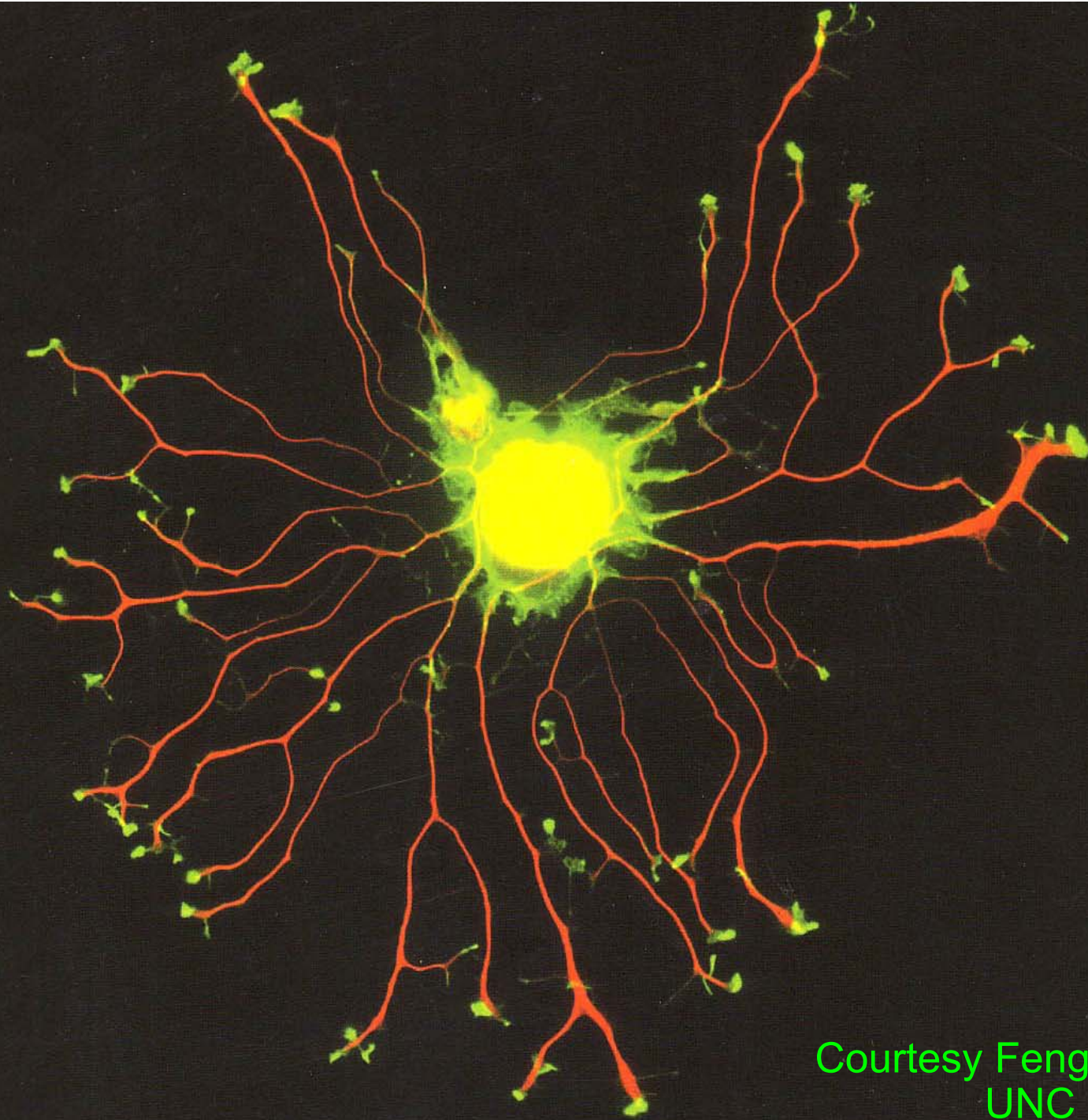




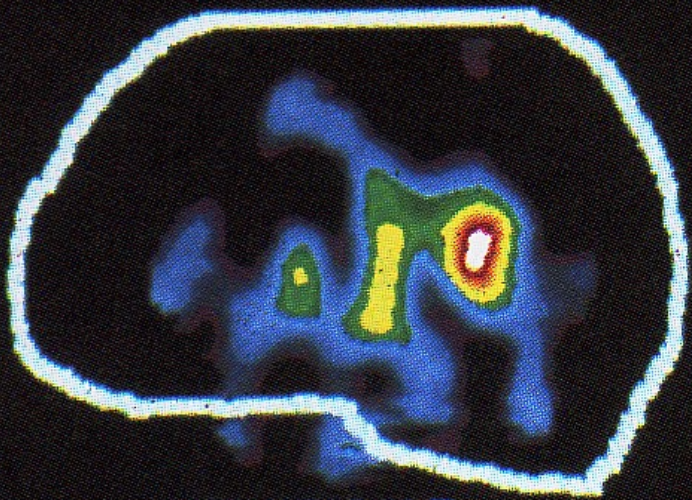




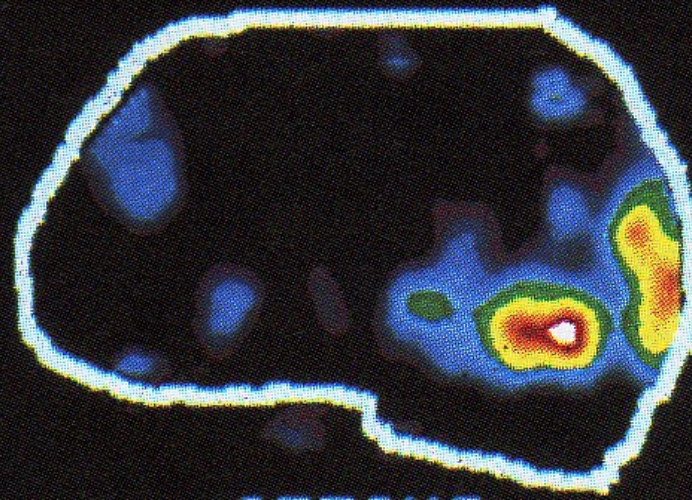
LS 2012 fig 5-2



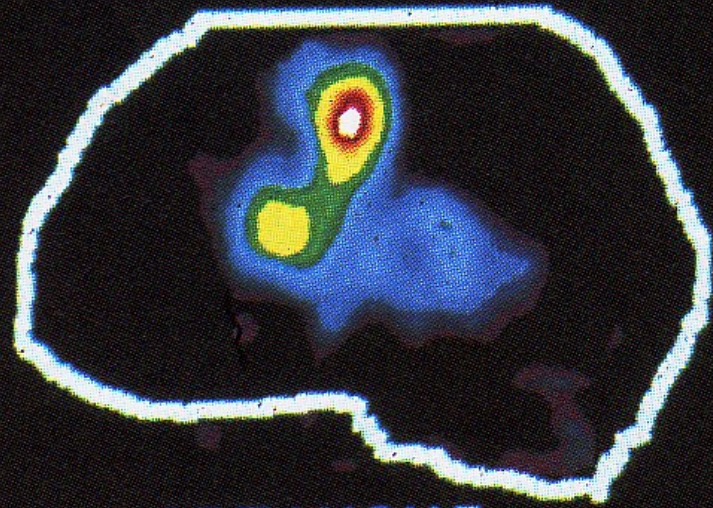
Courtesy Fengquan Zhou
UNC Chapel Hill



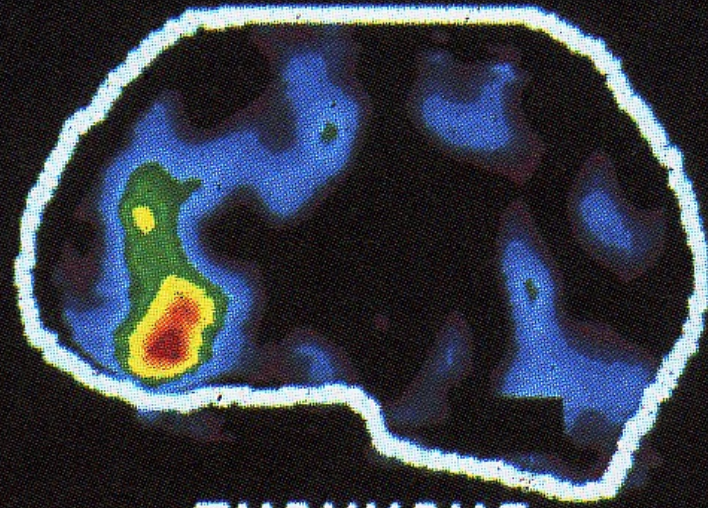
HEARING



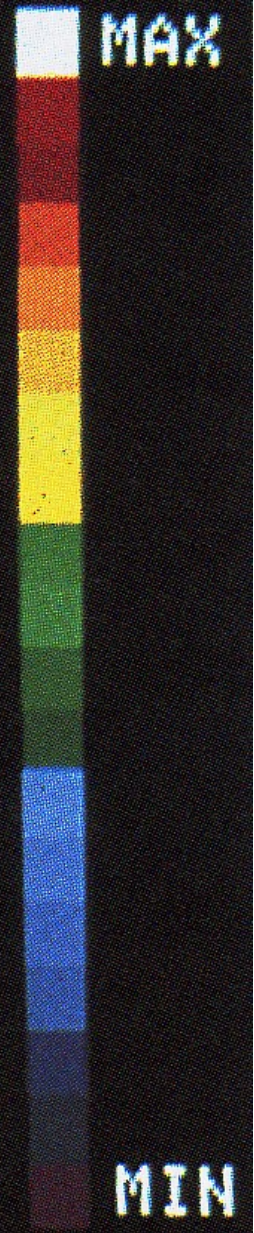
SEEING

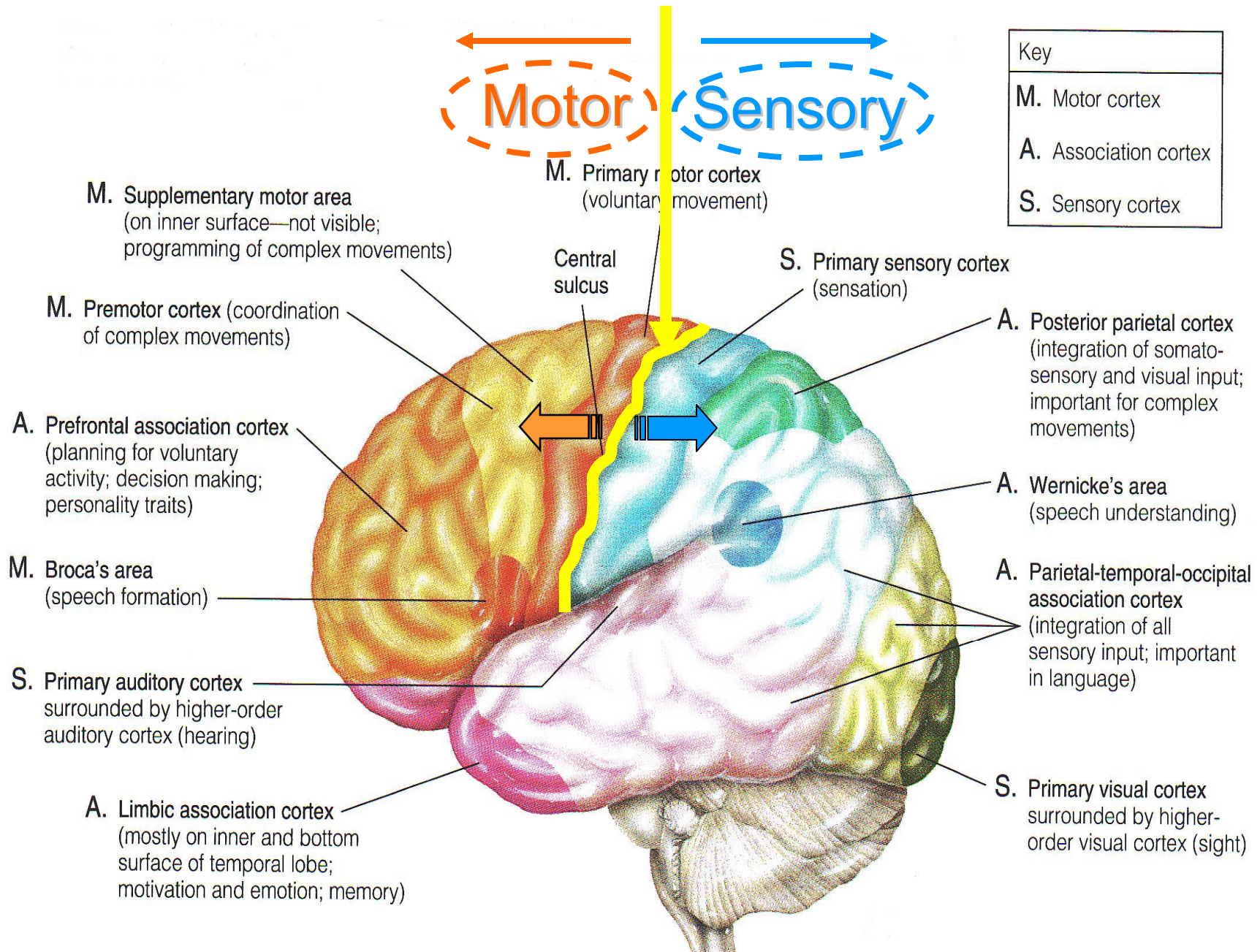


SPEAKING



THINKING







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



<http://www-nrd.nhtsa.dot.gov/pubs/811156.pdf>

<http://www.bhsi.org/stats.htm>

~540,000 bicyclists/yr visit emergency rooms

67,000 head injuries, 1 in 8 brain injuries

716 cyclists died in 2008 \equiv 2% of all traffic fatalities

1/2 of deaths children < 15 yr

53,000 cyclists have died since 1932

that's more than the population of

Springfield, OR 52,864

Bend, OR 52,029


Corvallis, OR 49,322



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

Helmets may prevent 45-88% of brain injuries!

~\$81 million/yr = direct injury costs from not using helmets!

A photograph of a cemetery. In the foreground, a large, dark tree trunk is visible on the left. In the middle ground, a dark, rectangular gravestone stands on a grassy slope. In the foreground, a small American flag is planted in the grass. A single rose lies on a flat, light-colored gravestone in the lower right. The background is filled with green trees and foliage.

The "typical" bicyclist killed on our roads is a sober male over 16 not wearing a helmet riding on a major road between intersections in an urban area on a summer evening when hit by a car. Please wear a helmet – it can make the difference between life and death.

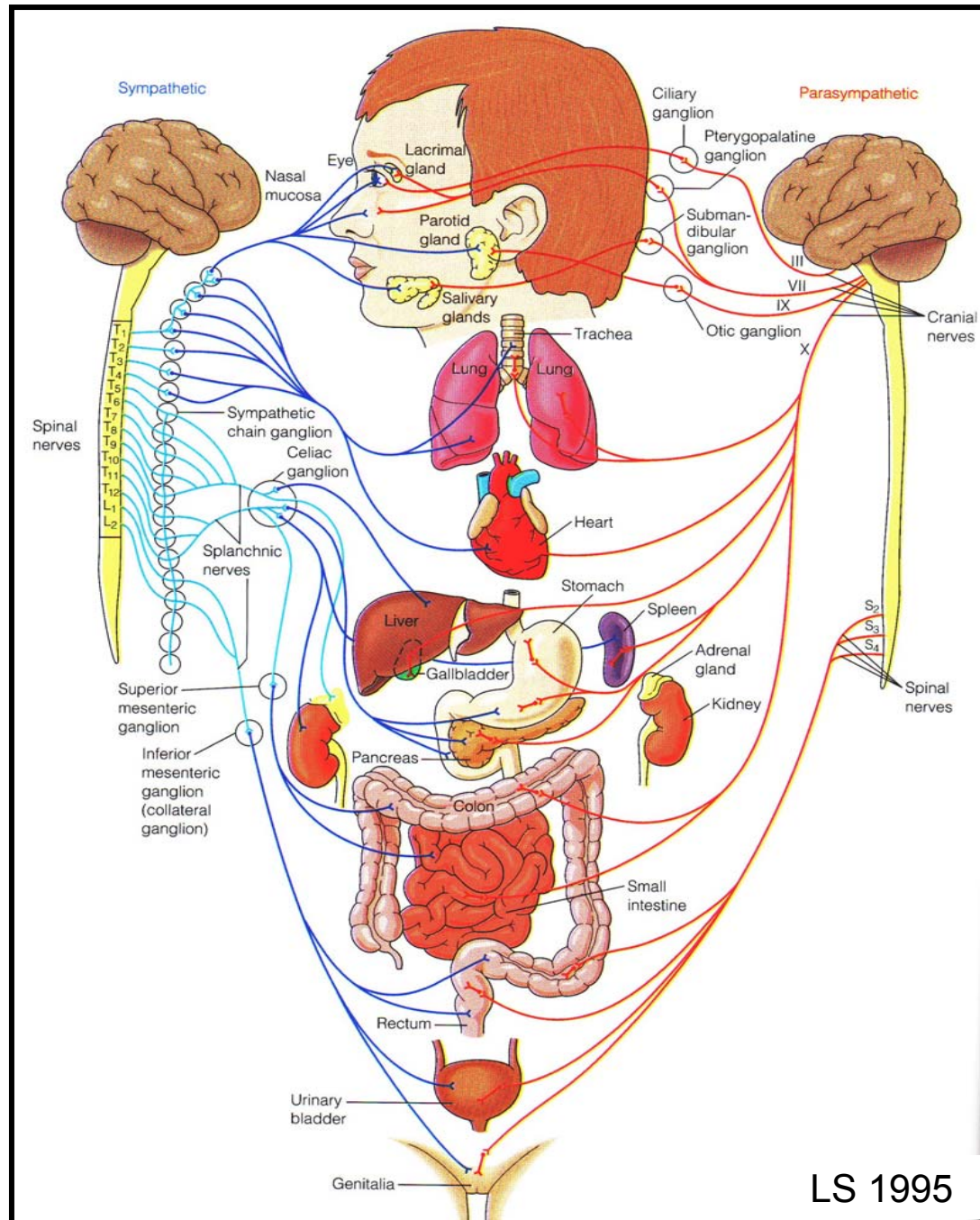
**Discussion
&/or
Break?**

Autonomic Nervous System

Why overlap or dual innervation?

Fine-tune control & safety!

cf: LS 2012 fig 7-3



LS 1995

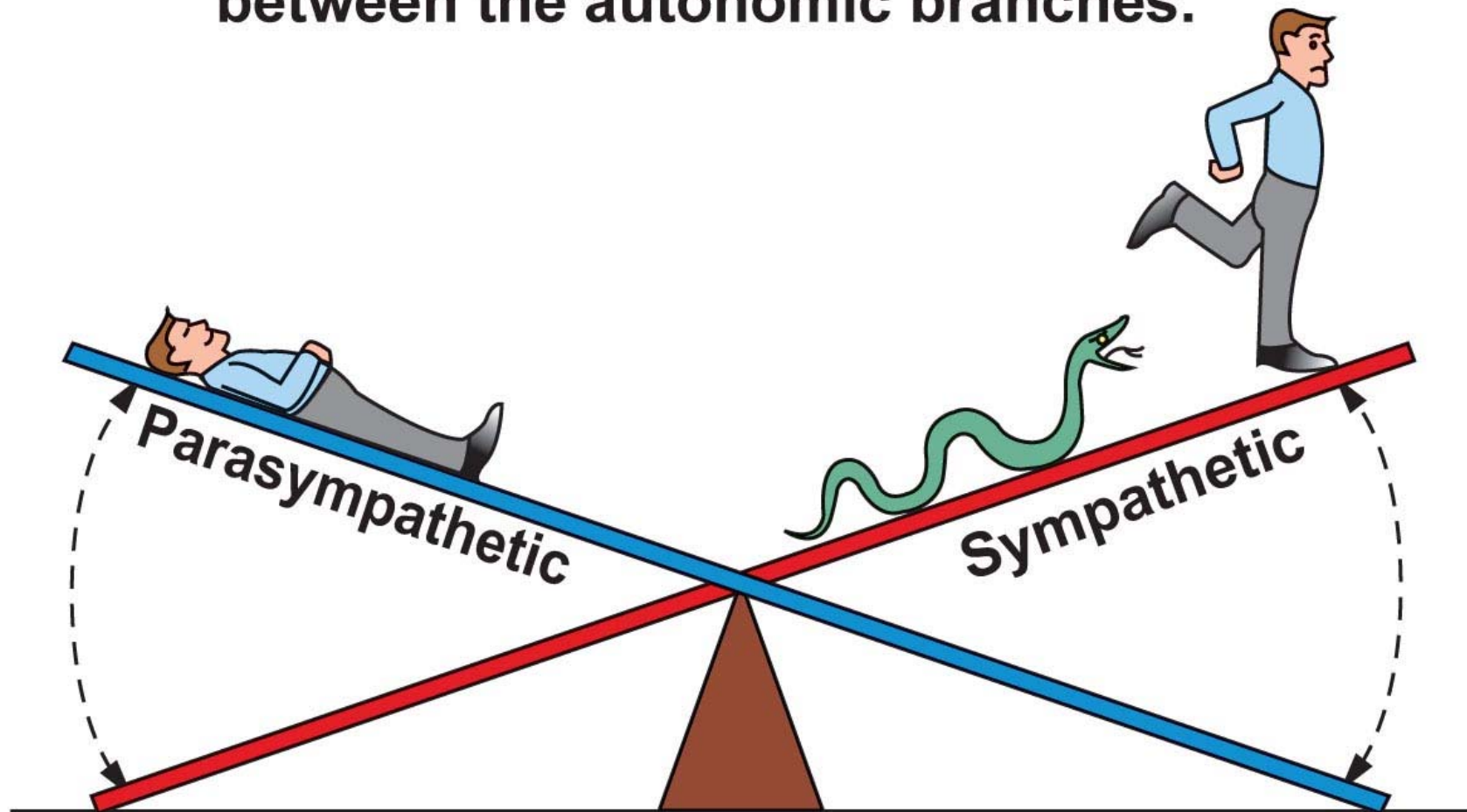
PARASYMPATHETIC = RESTING, DIGESTIVE,
HOUSEKEEPING FUNCTIONS



FIGHT/FLIGHT/ALARM REACTION!!



Homeostasis is a dynamic balance between the autonomic branches.



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

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

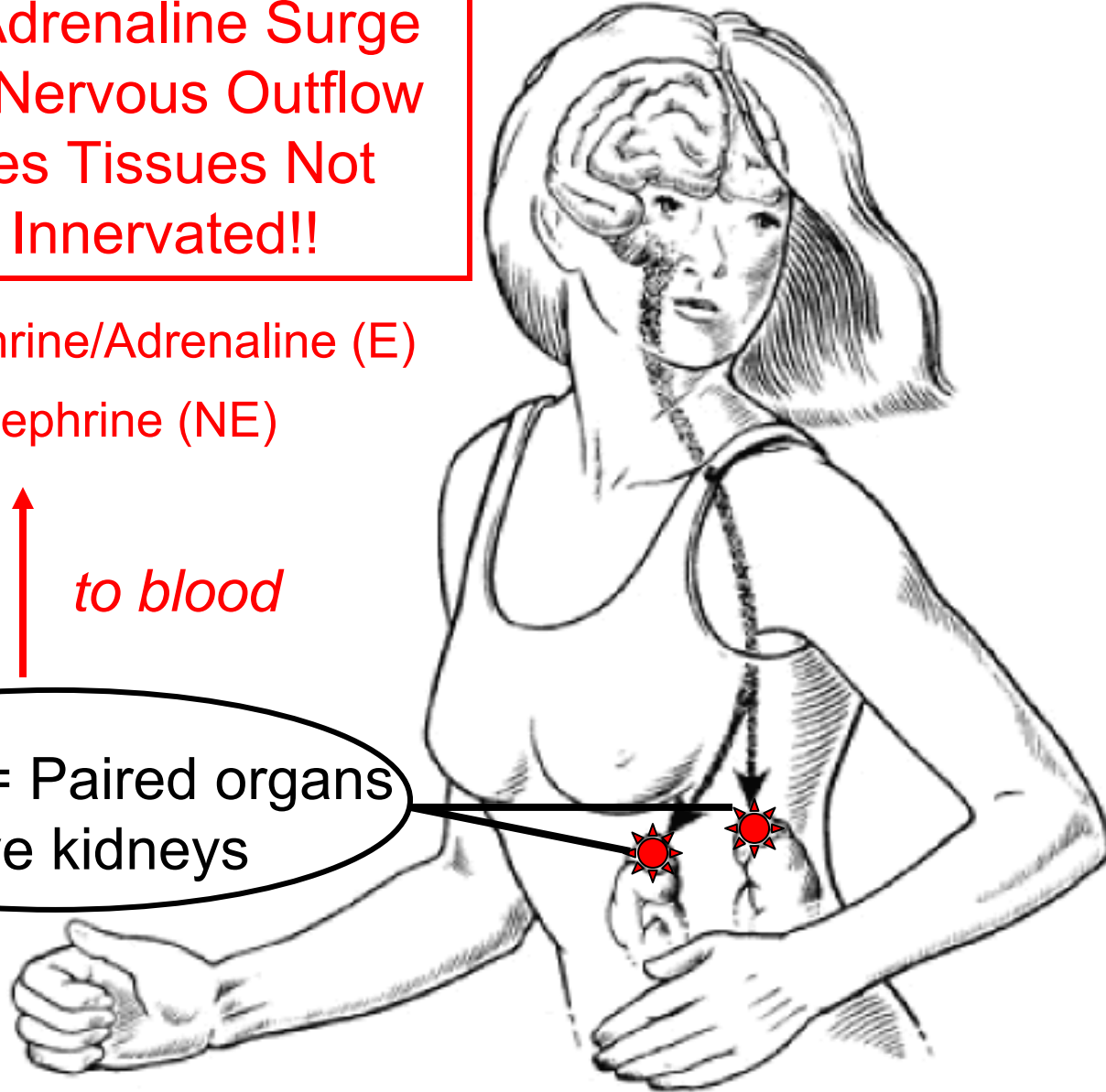
***Why adrenal
activation &
response
important?***

Hormonal Adrenaline Surge
Reinforces Nervous Outflow
& Accesses Tissues Not
Directly Innervated!!

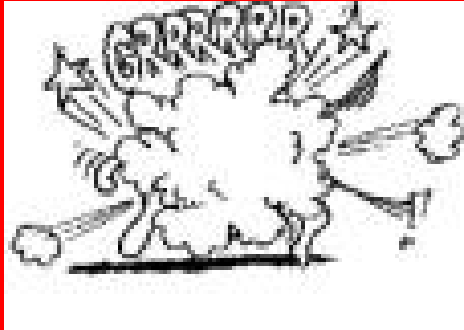
80% Epinephrine/Adrenaline (E)
20% Norepinephrine (NE)

Output ↑ *to blood*

Adrenals = Paired organs
above kidneys



Fight-or-Flight Stories!



or



...choose this!!



▲ **Table 7-1** Effects of Autonomic Nervous System on Various Organs

Organ	Effect of Sympathetic Stimulation	Effect of Parasympathetic Stimulation
Heart	Increases heart rate and increases force of contraction of the whole heart	Decreases heart rate and decreases force of contraction of the atria only
Blood Vessels	Constricts	Dilates vessels supplying the penis and the clitoris only
Lungs	Dilates the bronchioles (airways)	Constricts the bronchioles
Digestive Tract	Decreases motility (movement) Contracts sphincters (to prevent forward movement of tract contents) Inhibits digestive secretions	Increases motility Relaxes sphincters (to permit forward movement of tract contents) Stimulates digestive secretions
Urinary Bladder	Relaxes	Contracts (emptying)
Eye	Dilates the pupil Adjusts the eye for far vision	Constricts the pupil Adjusts the eye for near vision
Liver (glycogen stores)	Glycogenolysis (glucose is released)	None
Adipose Cells (fat stores)	Lipolysis (fatty acids are released)	None
Exocrine Glands		
<i>Exocrine pancreas</i>	Inhibits pancreatic exocrine secretion	Stimulates pancreatic exocrine secretion (important for digestion)
<i>Sweat glands</i>	Stimulates secretion by sweat glands important in cooling the body	Stimulates secretion by specialized sweat glands in the armpits and genital area
<i>Salivary glands</i>	Stimulates a small volume of thick saliva rich in mucus	Stimulates a large volume of watery saliva rich in enzymes
Endocrine Glands		
<i>Adrenal medulla</i>	Stimulates epinephrine and norepinephrine secretion	None
<i>Endocrine pancreas</i>	Inhibits insulin secretion	Stimulates insulin secretion
Genitals	Controls ejaculation (males) and orgasm contractions (both sexes)	Controls erection (penis in males and clitoris in females)
Brain Activity	Increases alertness	None