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, Sl 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***

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

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

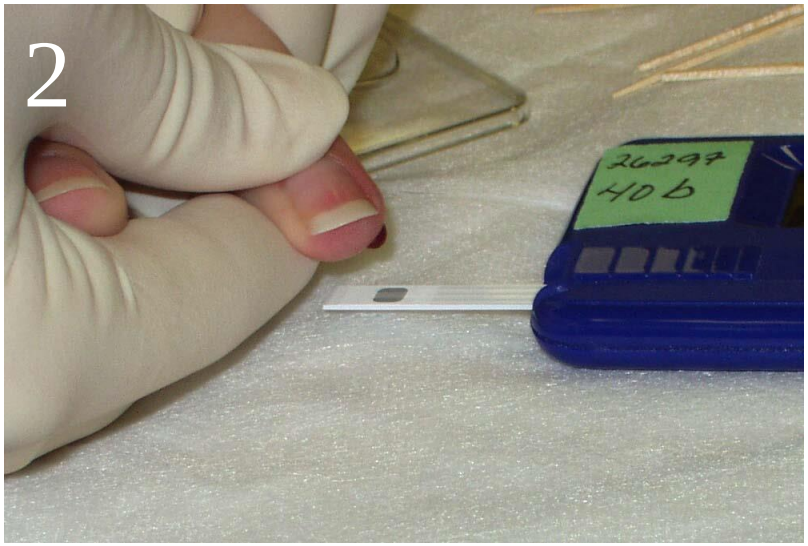
PREPARATION

WASH & DRY

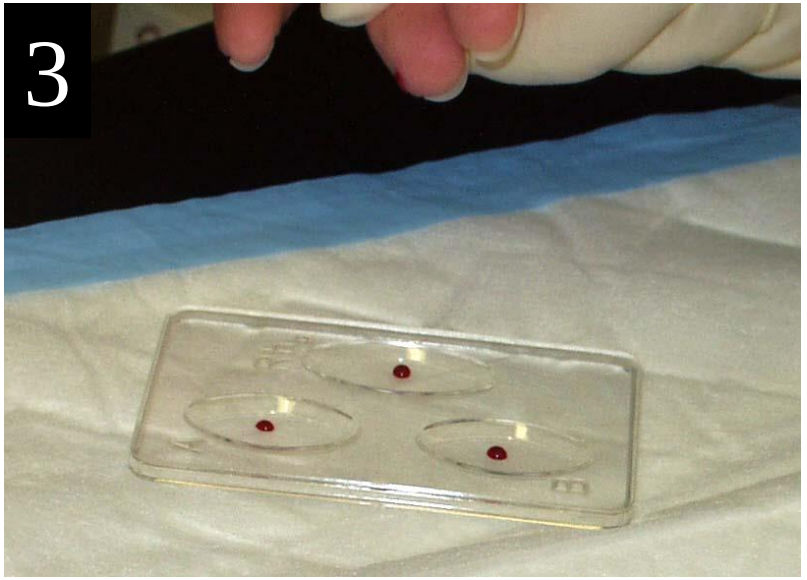
ALCOHOL

SAMPLE+TESTS

OBTAIN μSAMPLE



BLOOD GLUCOSE

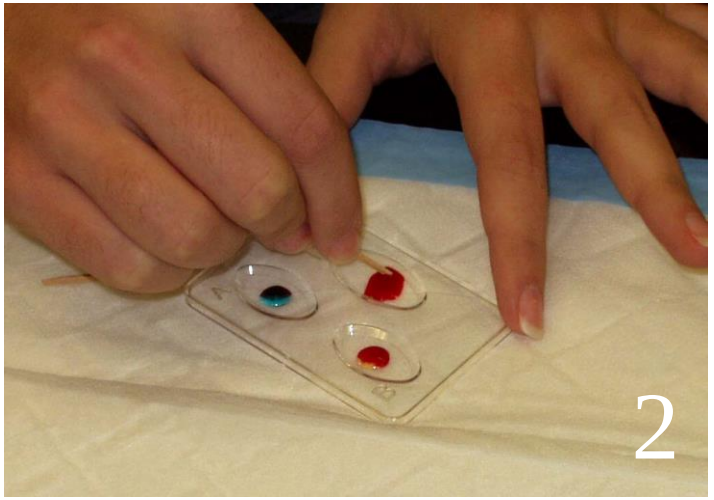


BLOOD TYPING

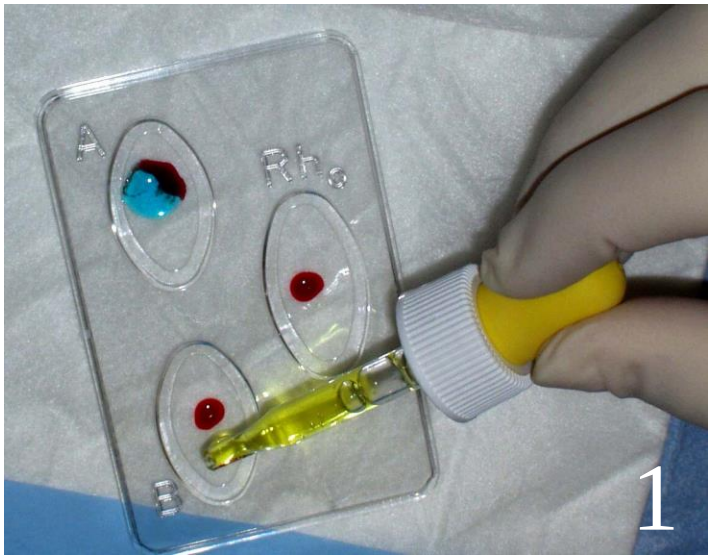
Glucose:
Sugar in Blood

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

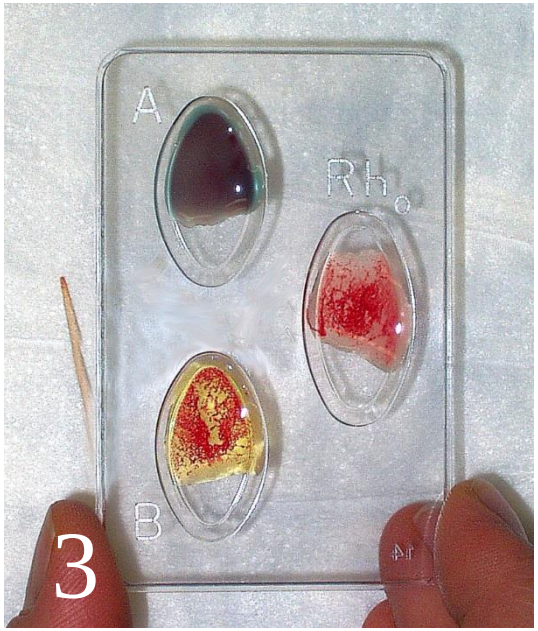
BLOOD TYPING



MIX W/TOOTHPICKS



ADD ANTISERA



READ & RECORD!!

CLEAN-UP!

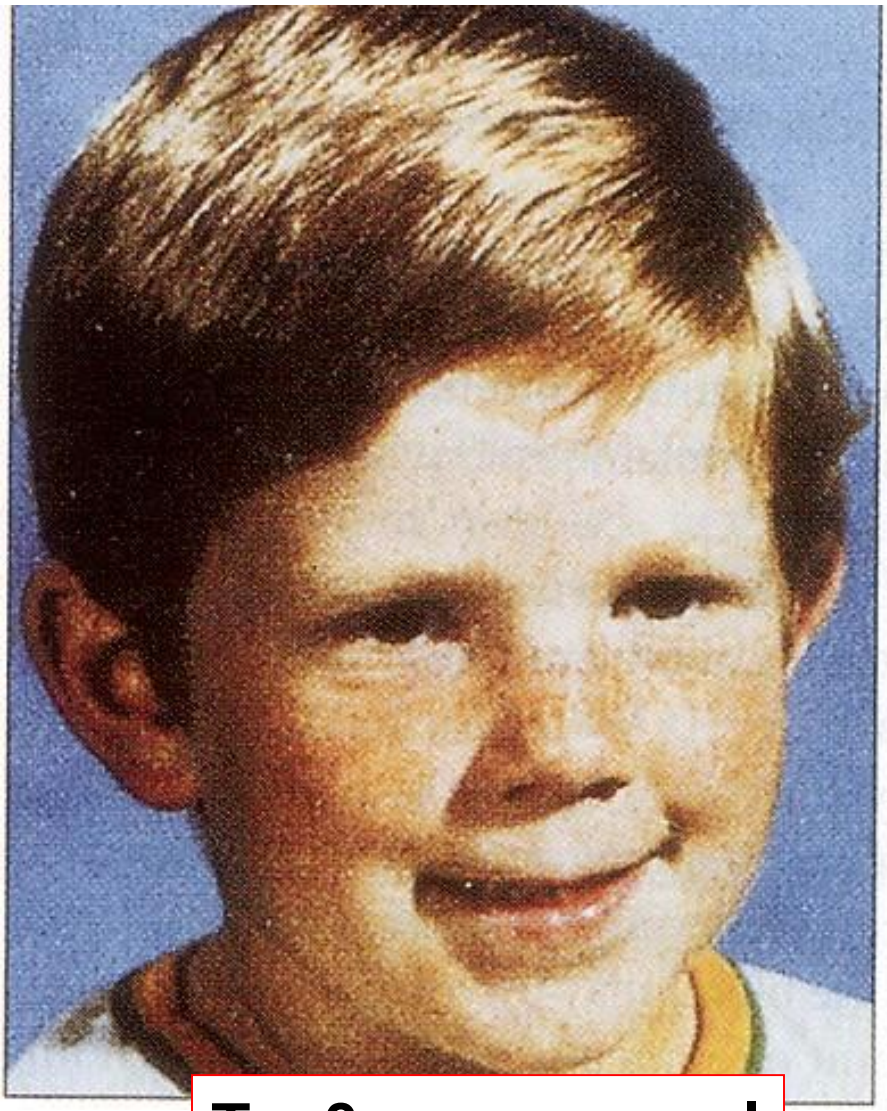
FOLD DIAPER

BLOOD PRODUCTS

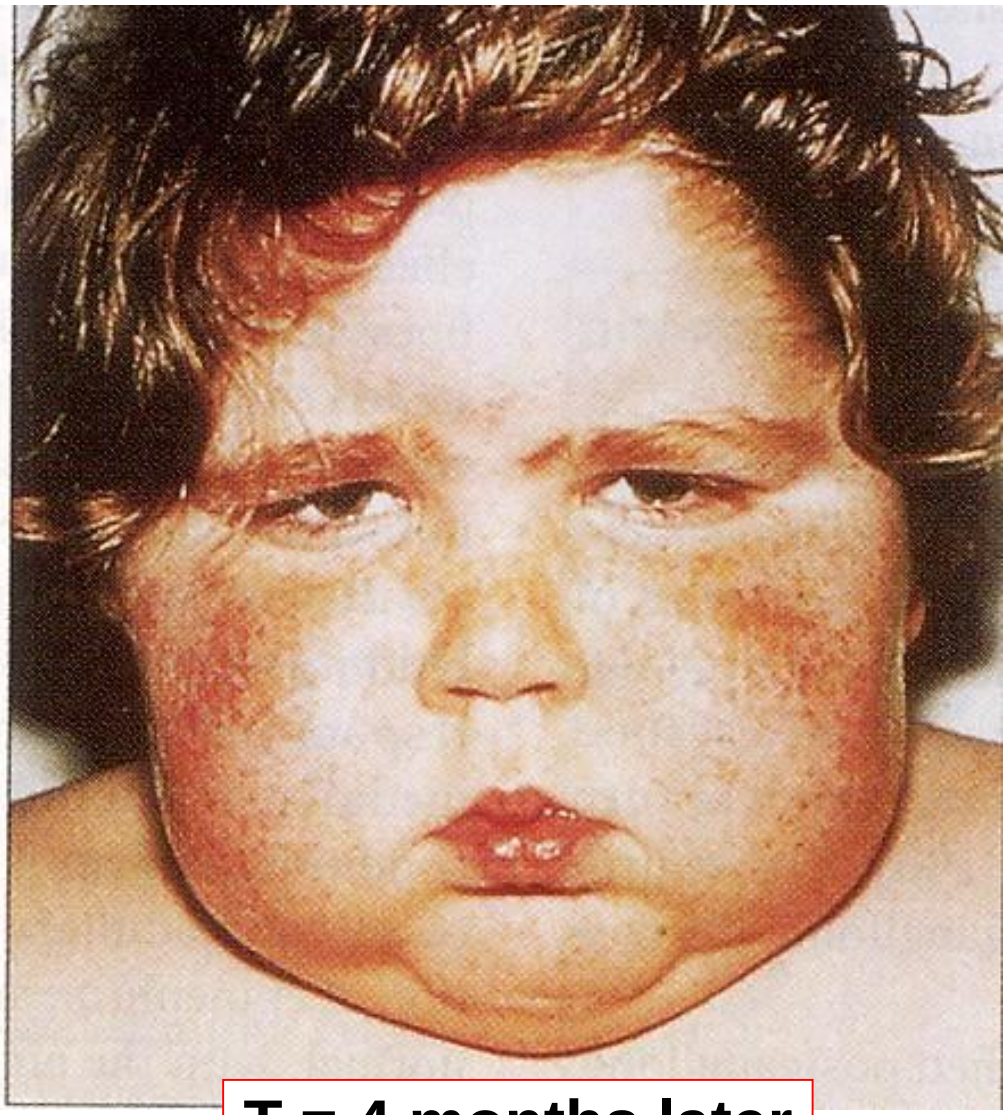
REWASH!!

Blood Chem Lab Q?

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



T = 0, near normal

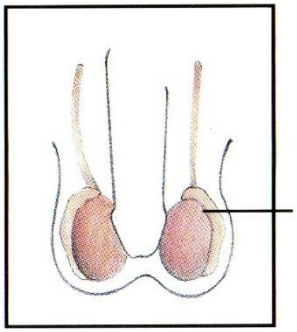


T = 4 months later

Endocrine System

ANP = Atrial Natriuretic Polypeptide

- Solely endocrine function
- Mixed function
- Complete function uncertain

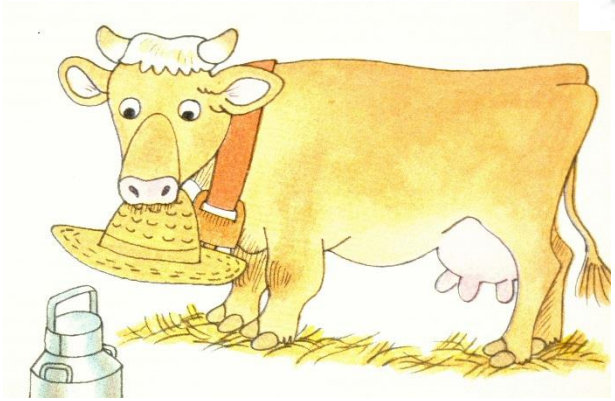


Testes in male

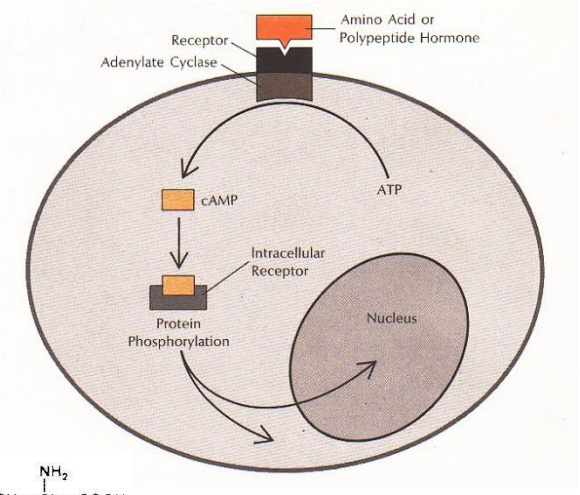
Pineal
Hypothalamus
Pituitary
Parathyroid
Thyroid
Thymus
Heart
Stomach
Adrenal gland
Pancreas
Duodenum
Kidney
Skin
Ovaries in female
Placenta in pregnant female

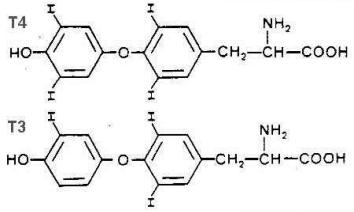
Hormone/Endocrine Classifications

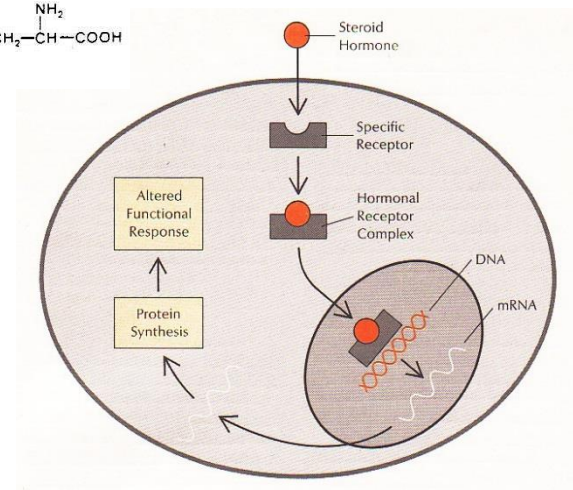
Exogenous



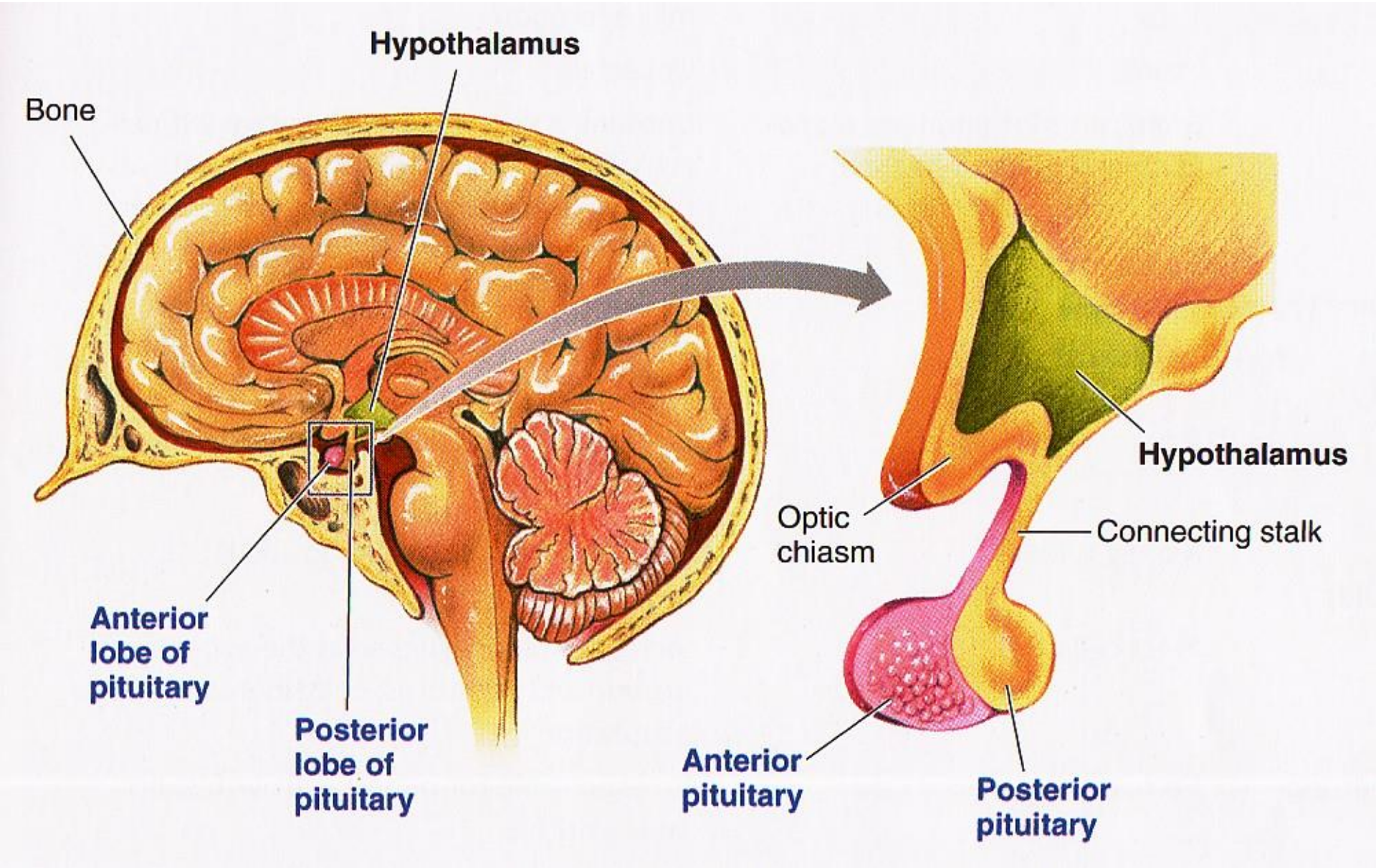
Endogenous





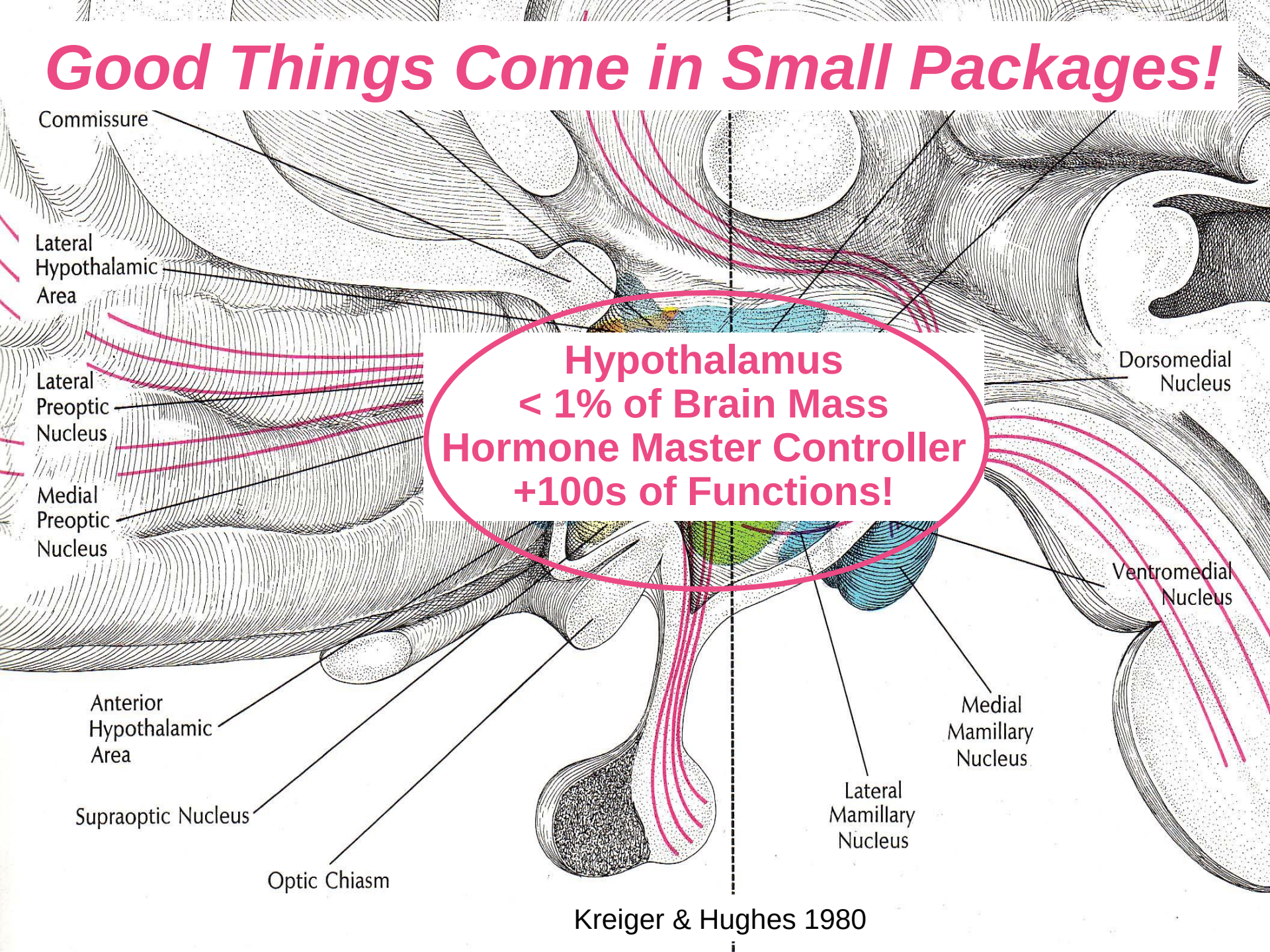


Hypothalamus & Pituitary: Intimate Relationship



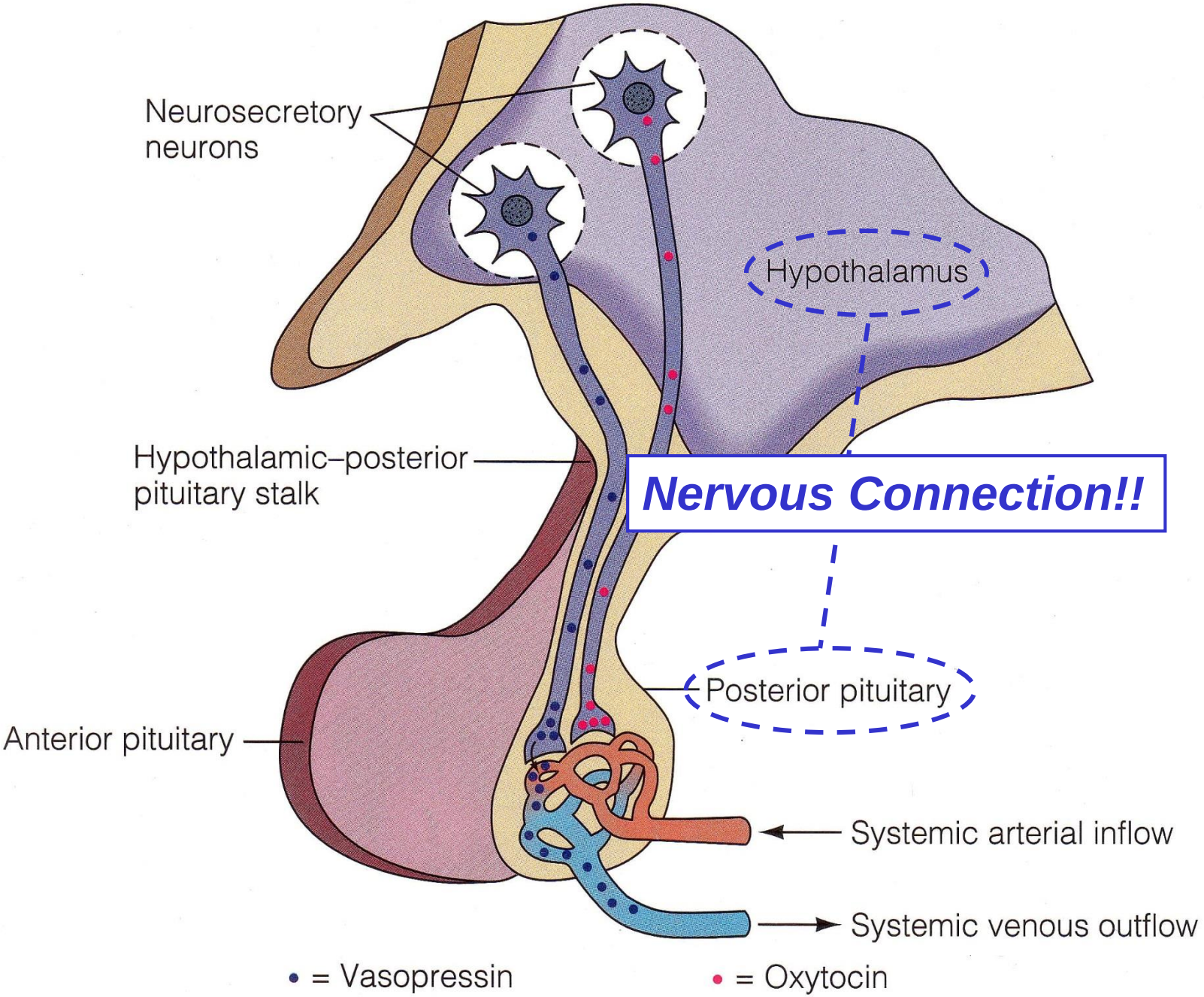
LS 2012 fig 17-3

Good Things Come in Small Packages!



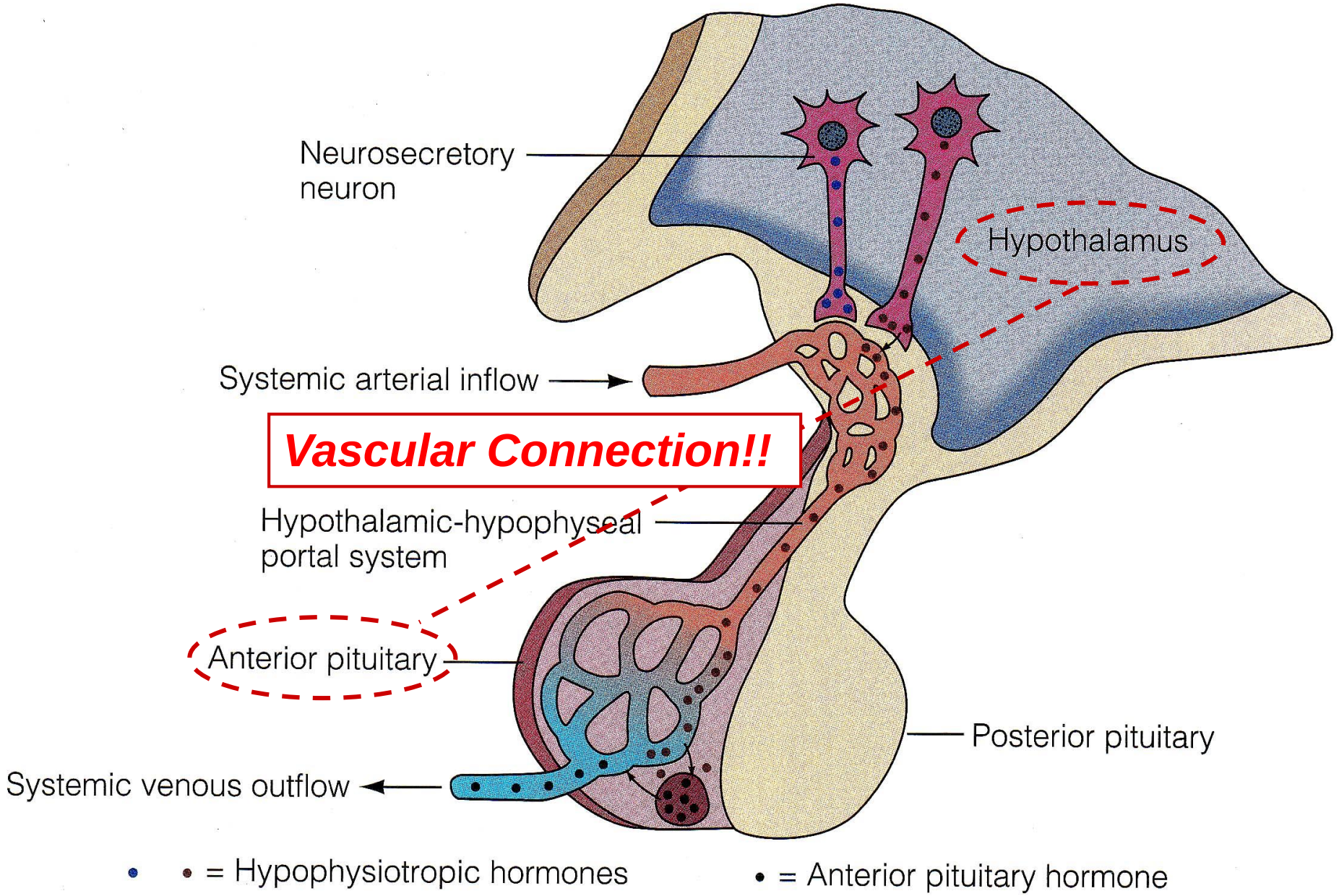
Hypothalamus
< 1% of Brain Mass
Hormone Master Controller
+100s of Functions!

Kreiger & Hughes 1980

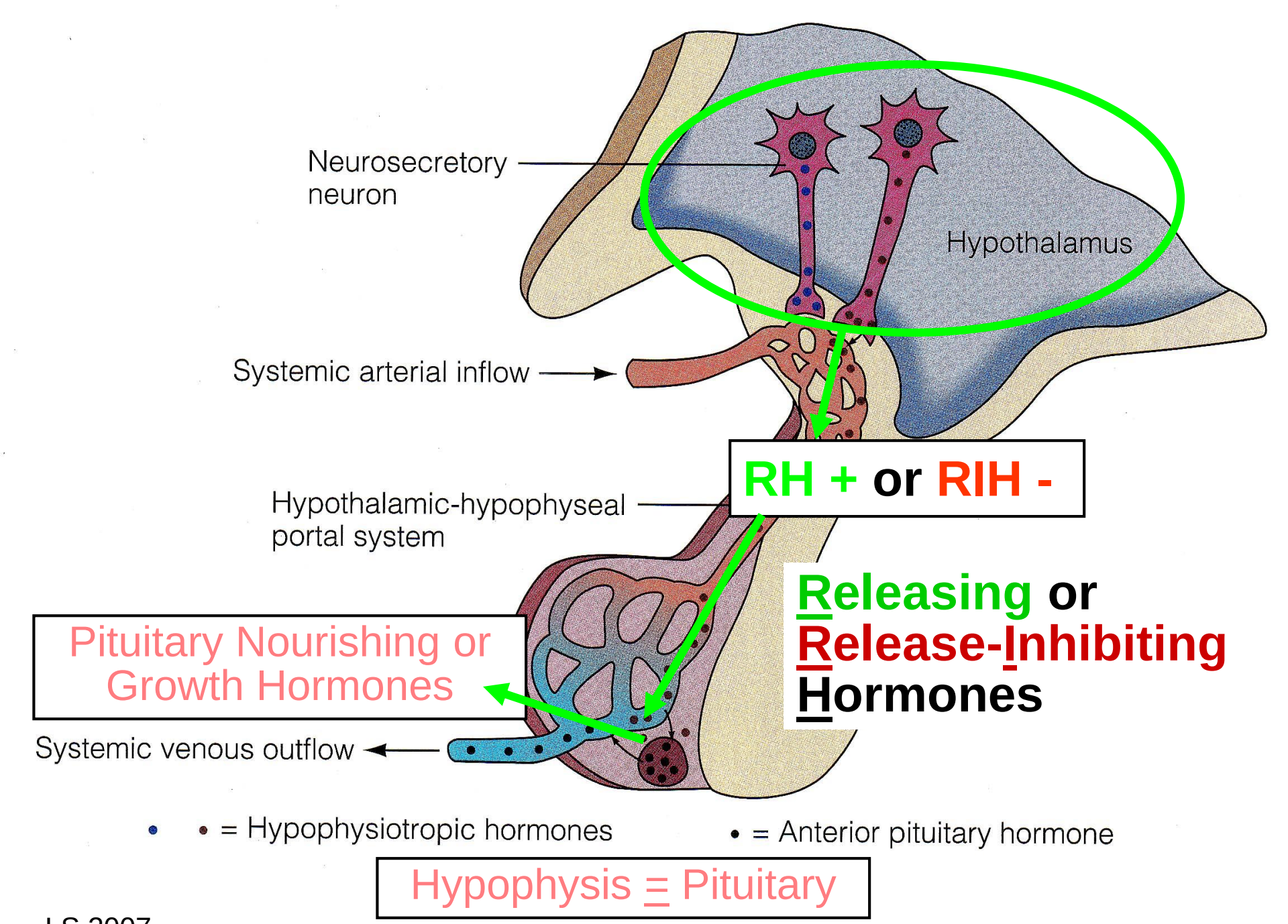

Neurosecretory neurons
Hypothalamus
Hypothalamic–posterior pituitary stalk
Nervous Connection!!
Posterior pituitary
Anterior pituitary
Systemic arterial inflow
Systemic venous outflow
• = Vasopressin
• = Oxytocin

LS 2007

Hypothalamus-Anterior Pituitary Vascular Connection!

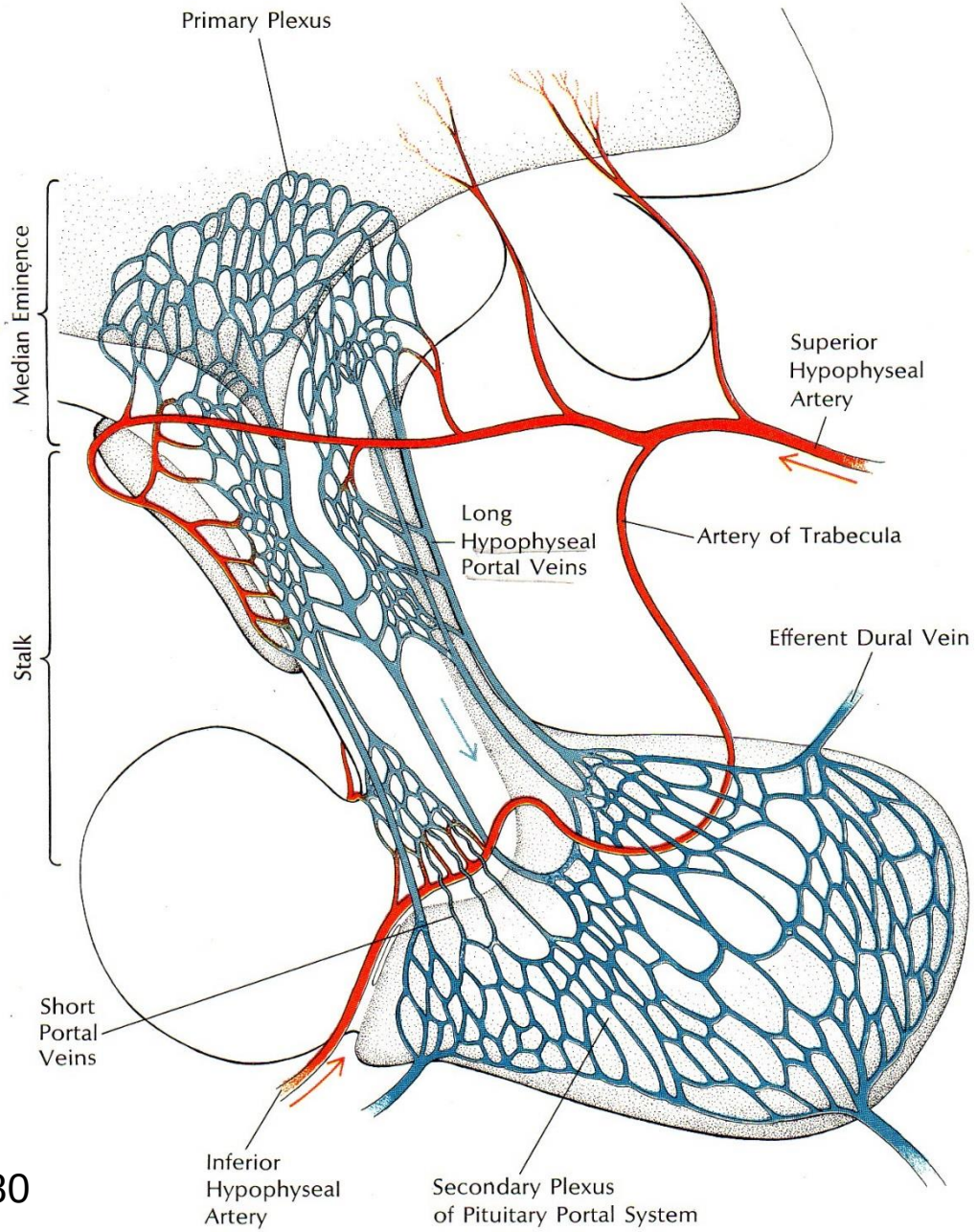


LS 2007

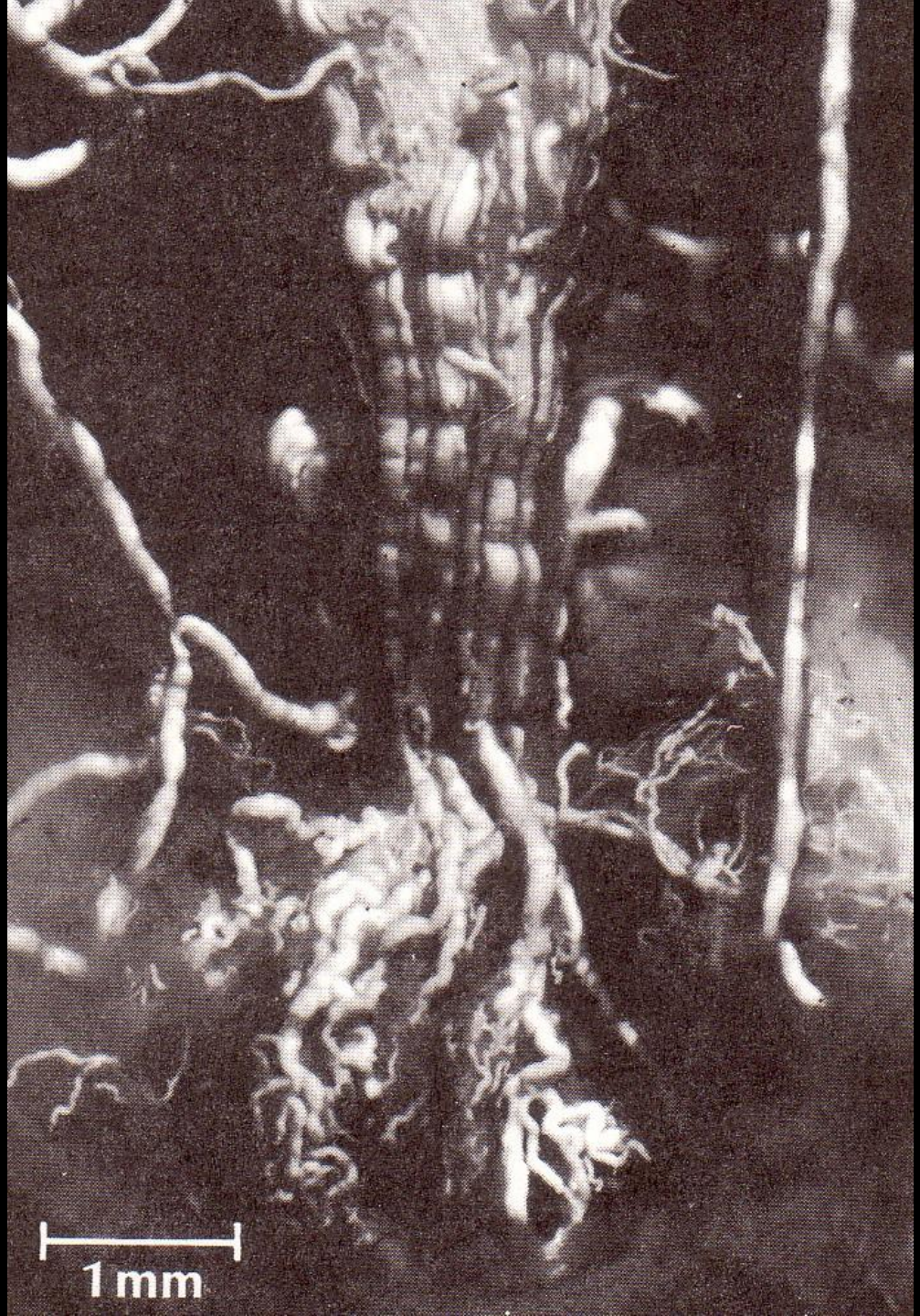

Neurosecretory neuron
Hypothalamus
Systemic arterial inflow
RH + or RIH -
Hypothalamic-hypophyseal portal system
Releasing or Release-Inhibiting Hormones
Pituitary Nourishing or Growth Hormones
Systemic venous outflow
• • = Hypophysiotropic hormones
• = Anterior pituitary hormone
Hypophysis = Pituitary

LS 2007

Capillary-Venule-Capillary Intimate Circulation

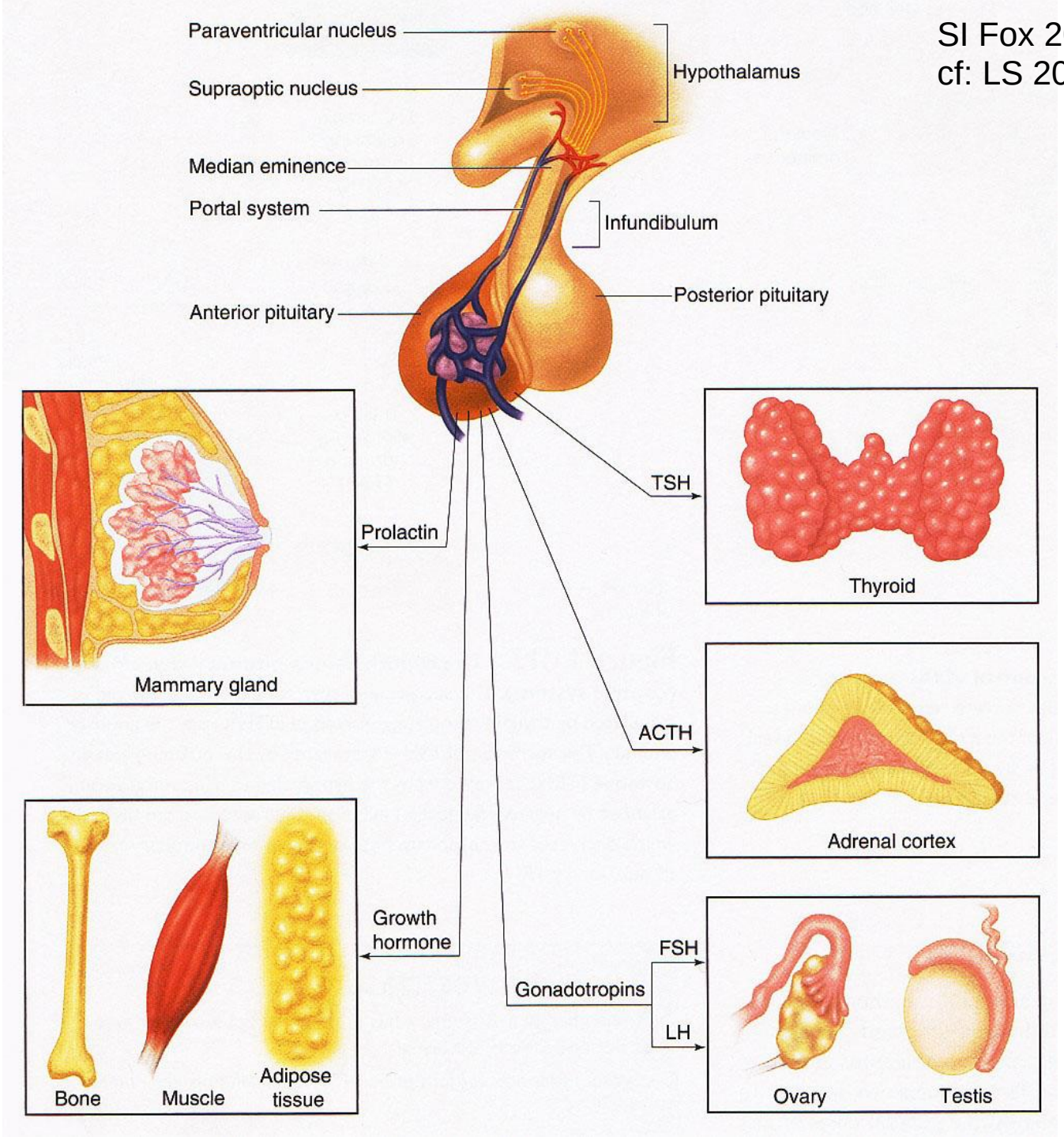


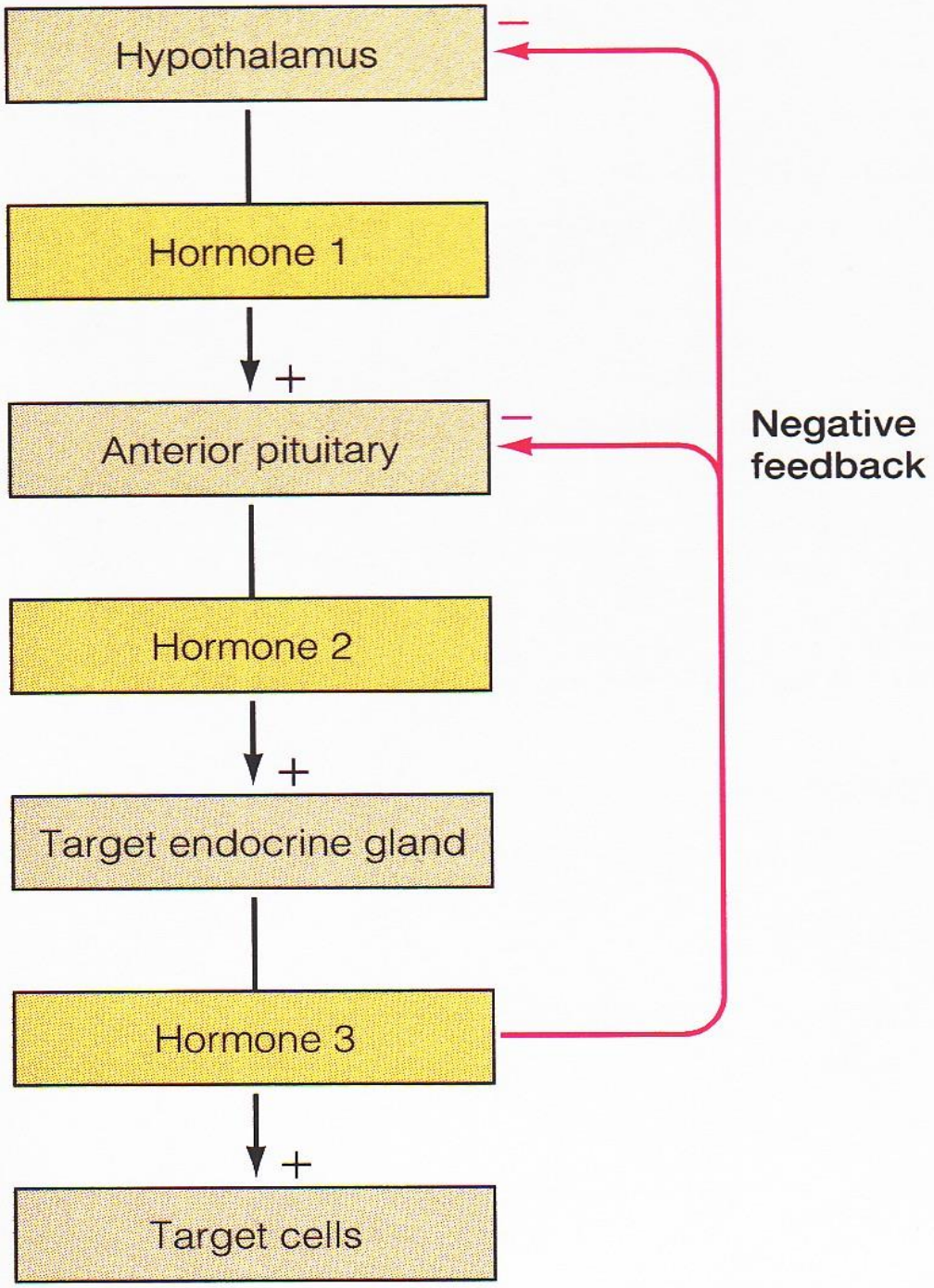
Krieger & Hughes 1980



Krieger & Hughes 1980

SI Fox 2008
cf: LS 2012 fig 17-5

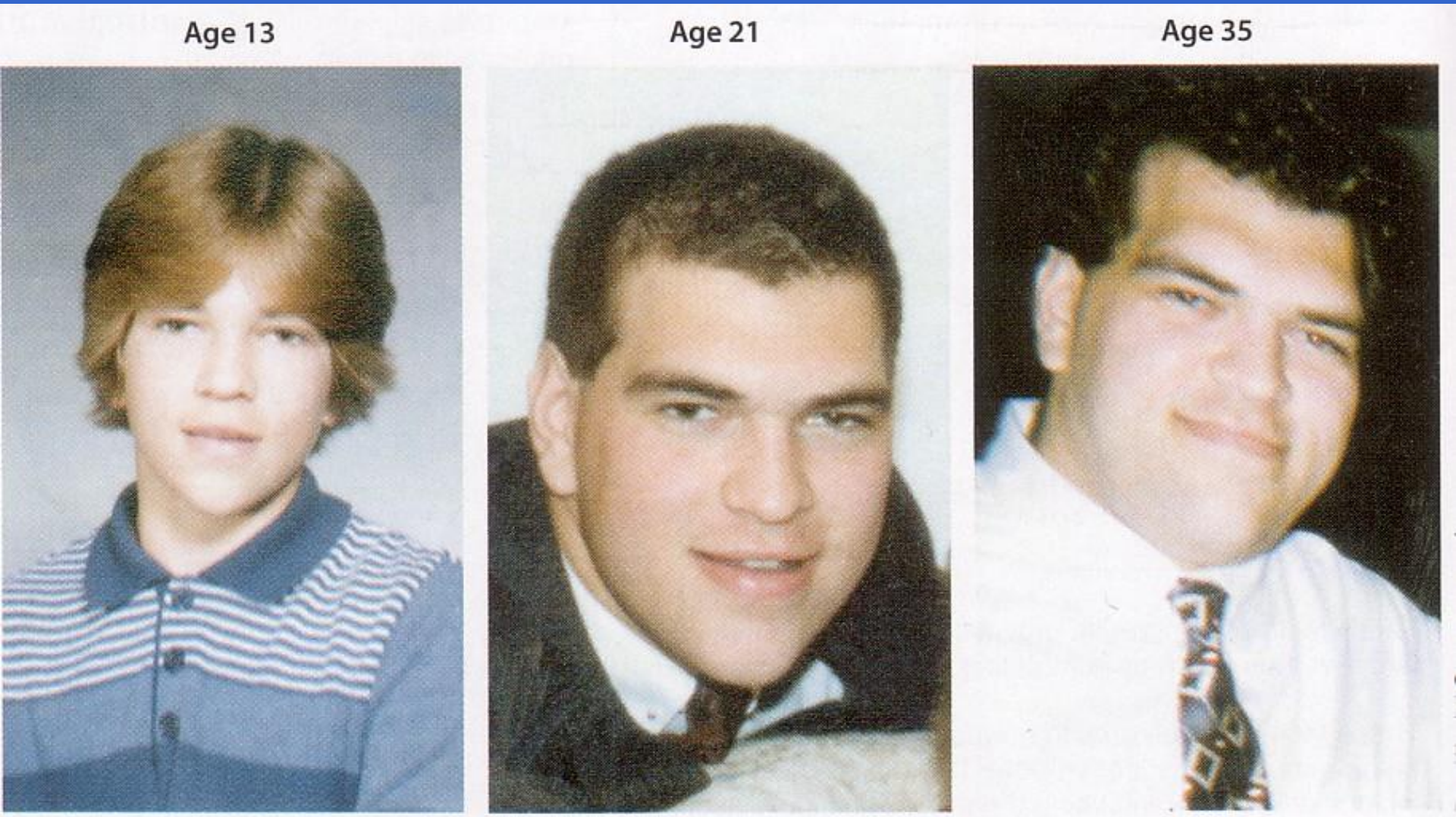



Hypothalamus
Hormone 1
+
Anterior pituitary
Hormone 2
+
Target endocrine gland
Hormone 3
+
Target cells
−
−
Negative feedback

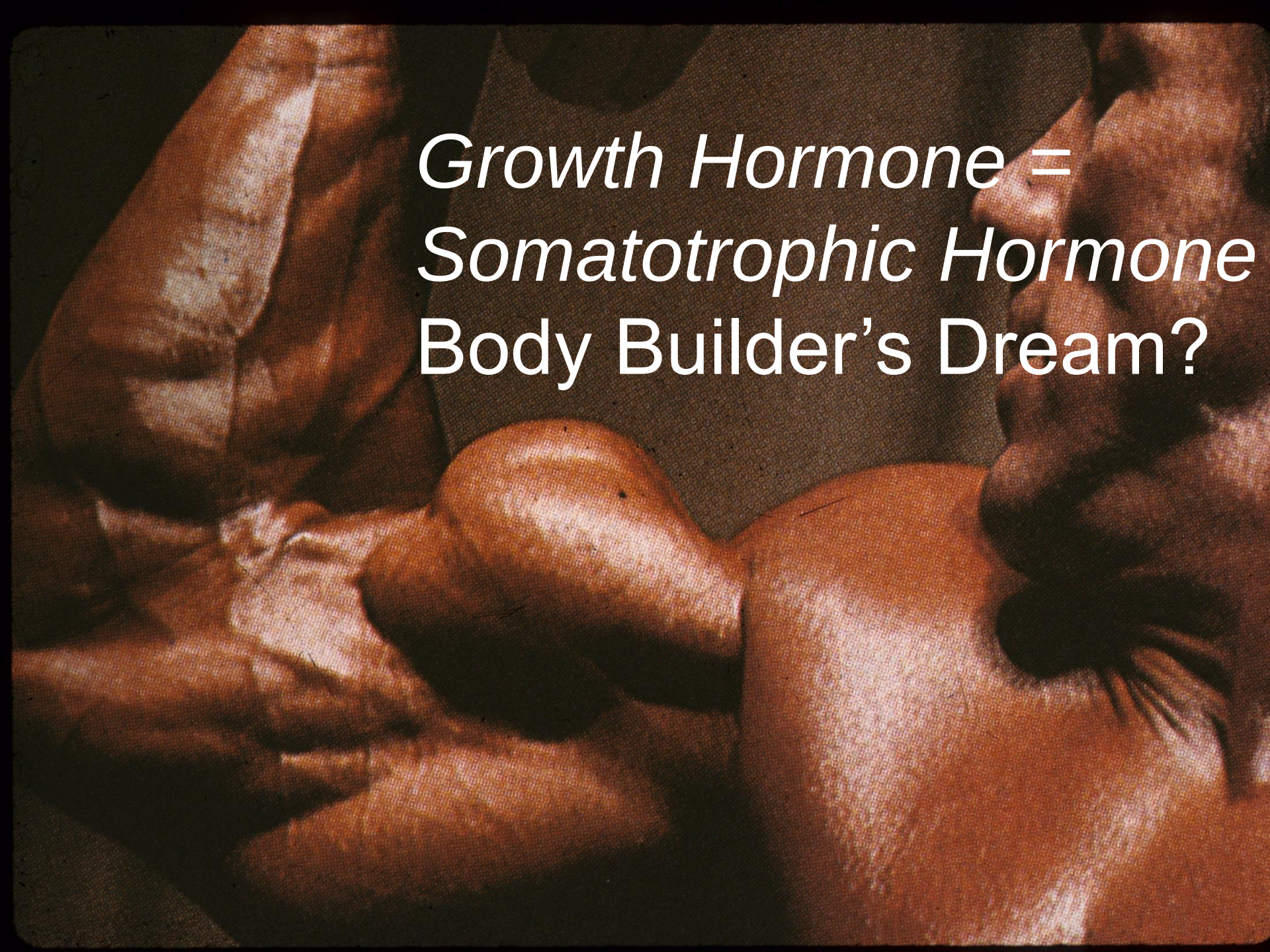
LS 1991

LS 2006, cf: LS 2012
fig 17-10

Progression & Development of Acromegaly



LS 2012 fig 17-11


Growth Hormone =
Somatotrophic Hormone
Body Builder's Dream?

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

↑ Amino Acid uptake & Protein synthesis

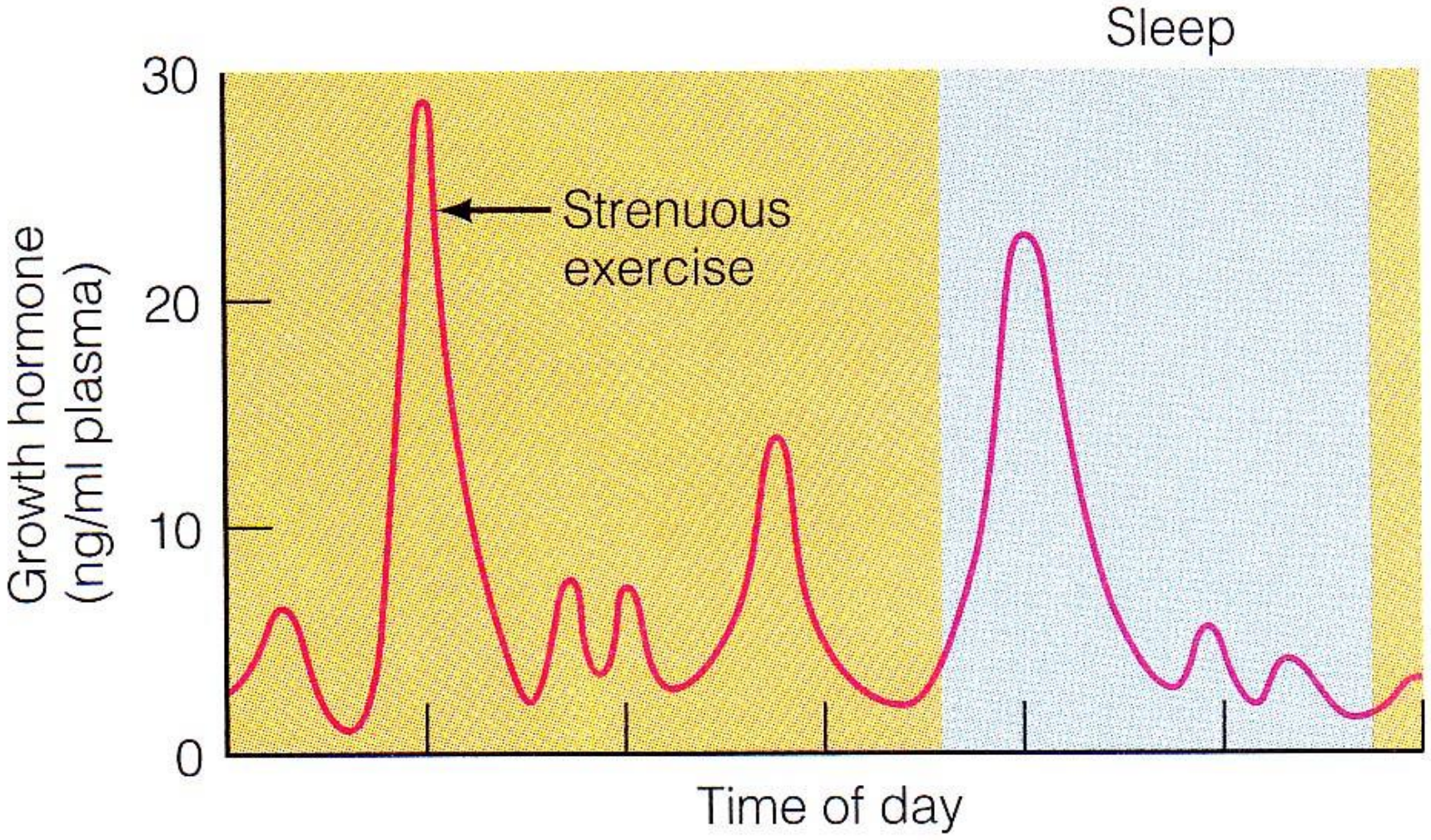
↑ Lipolysis & Fatty Acid mobilization

↓ Glucose uptake
(skeletal muscle & adipocytes)

↑ Glucose production
(liver glycogenolysis)

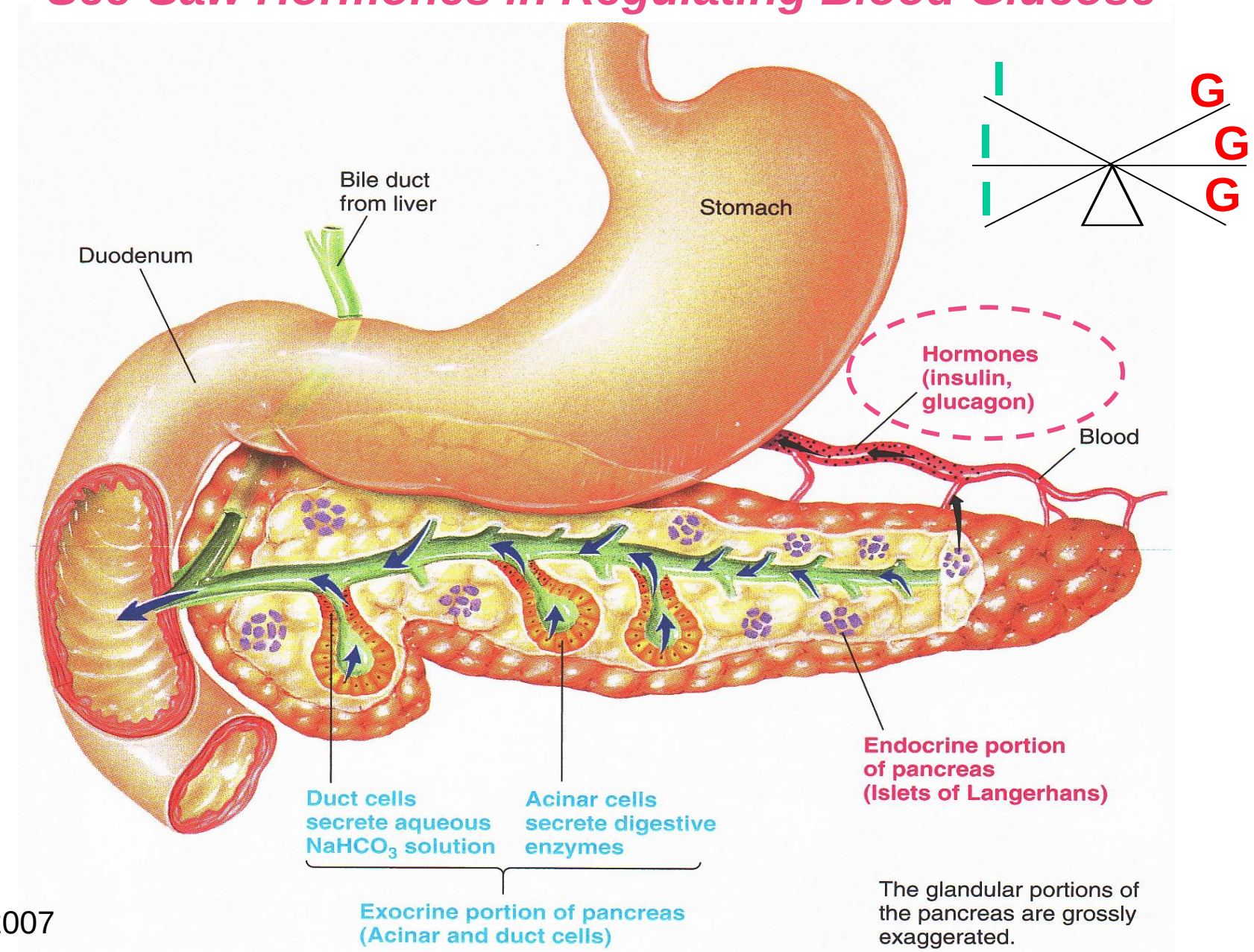
↑ Insulin secretion

Increase GH naturally with exercise & sleep!!

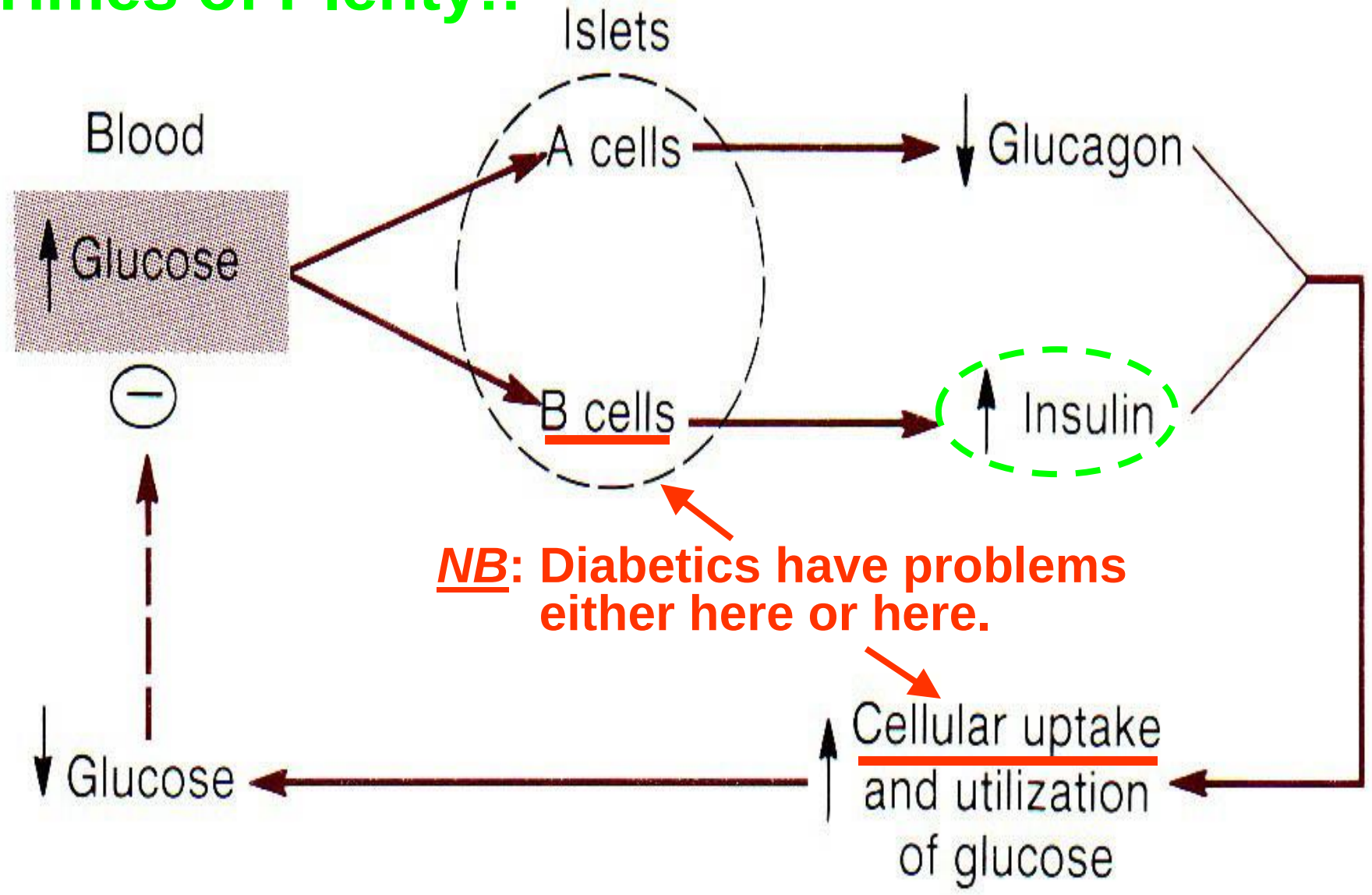


ng/ml = nanograms per mililiter

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



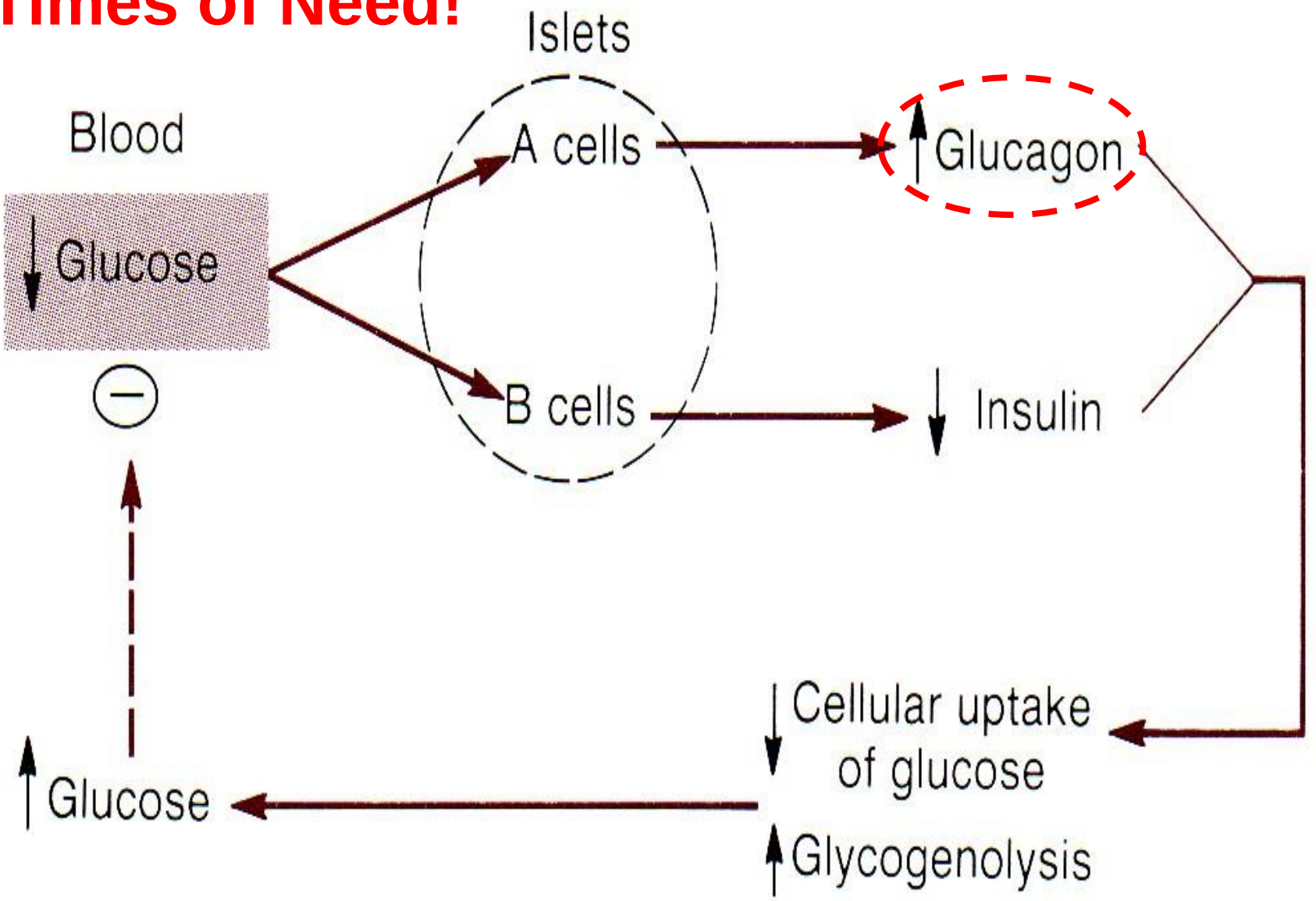
Times of Plenty!!



Fox 1987

Store!

Times of Need!



Fox 1987

Mobilize!!

TABLE 4-7

Warning Signs of Diabetes

These signs appear reliably in type 1 diabetes and, often, in the later stages of type 2 diabetes.

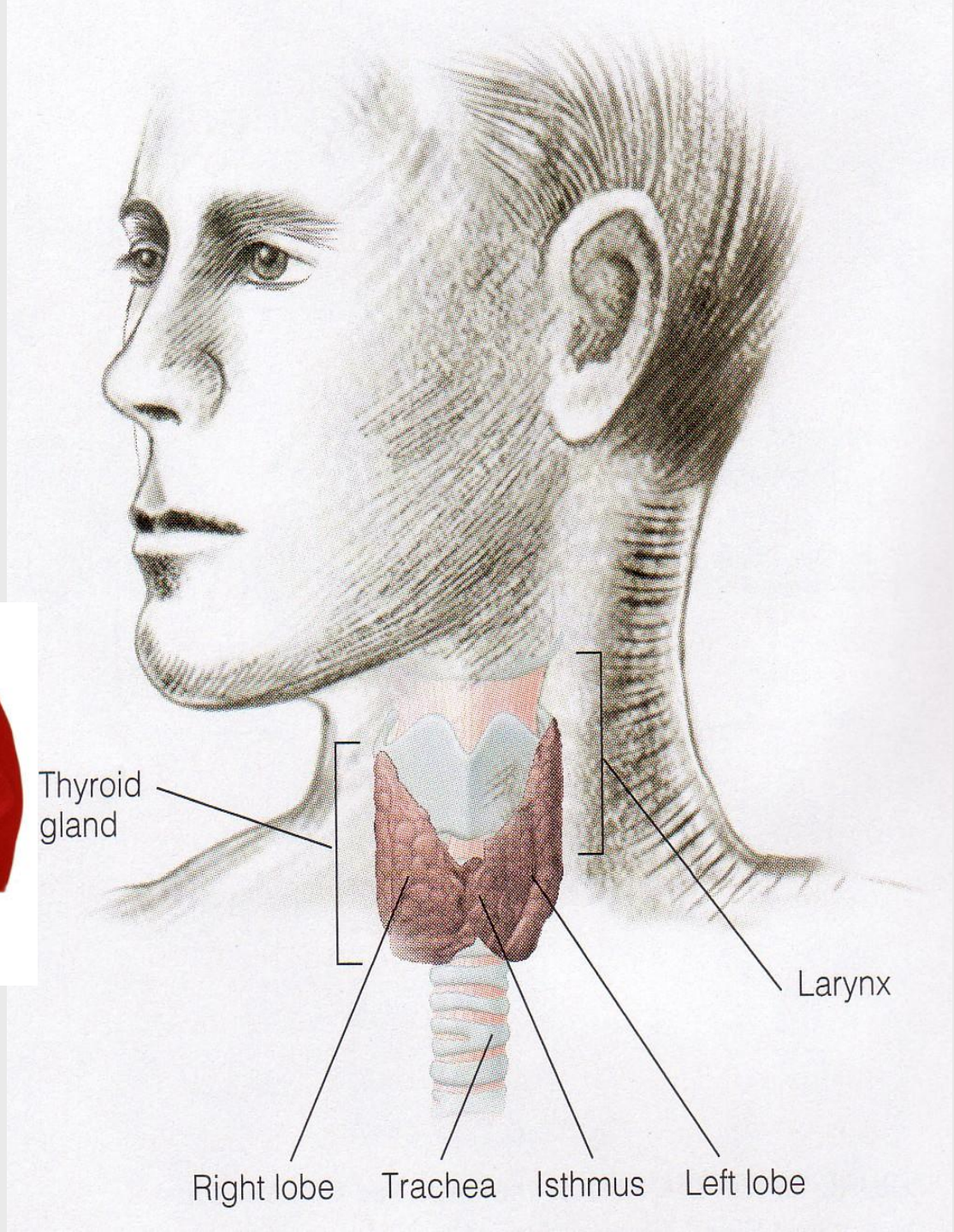
- Excessive urination and thirst
- Glucose in the urine
- Weight loss with nausea, easy tiring, weakness, or irritability
- Cravings for food, especially for sweets
- Frequent infections of the skin, gums, vagina, or urinary tract
- Vision disturbances; blurred vision
- Pain in the legs, feet, or fingers
- Slow healing of cuts and bruises
- Itching
- Drowsiness
- Abnormally high glucose in the blood

S&W 2011 tab 4-7 p 131

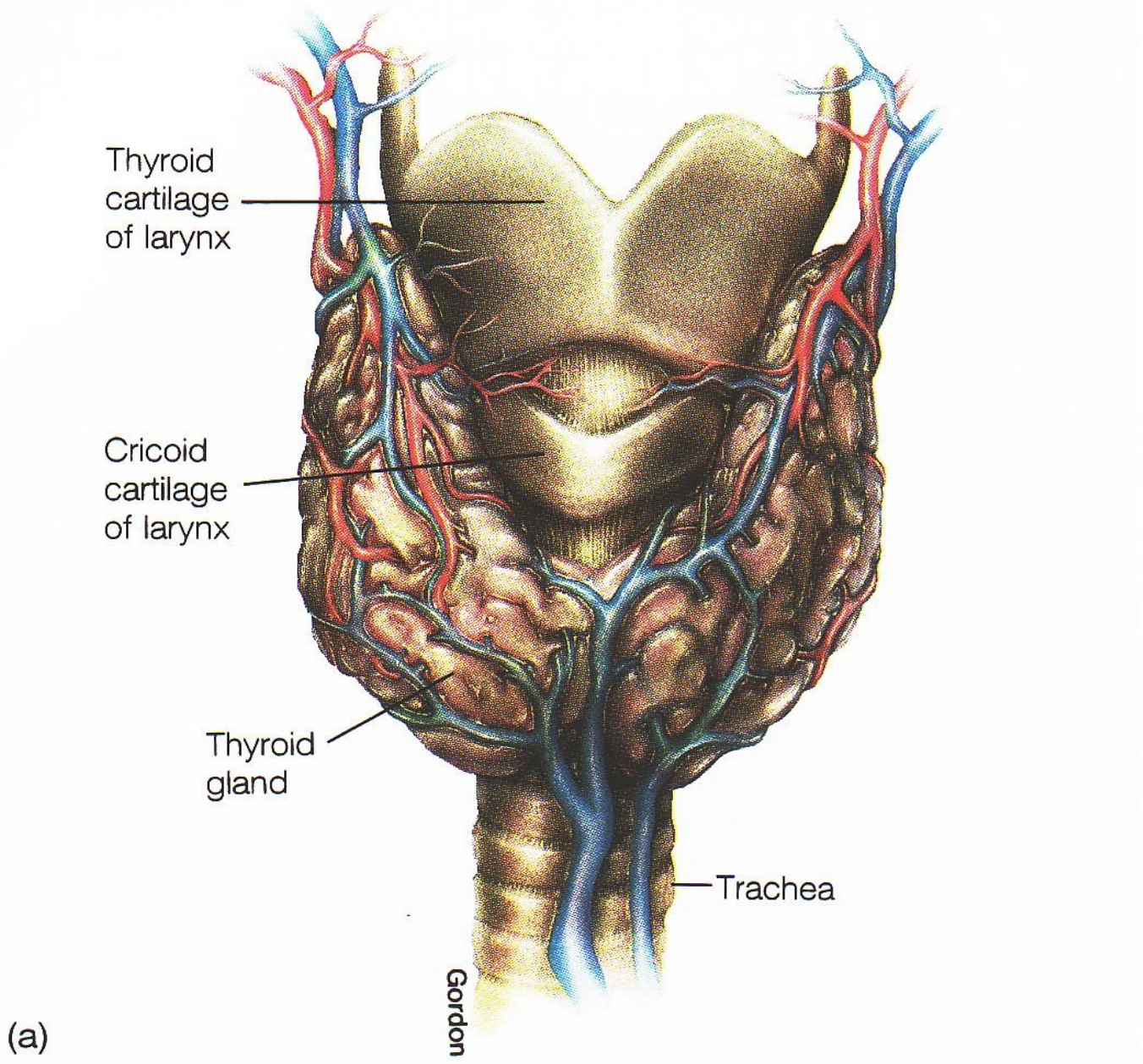
Diabetics must constantly juggle diet, exercise & medication to control blood glucose!

Like others, diabetics benefit from whole grains, vegetables, fruits, legumes & non-/low-fat milk products!

S&W p 133



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

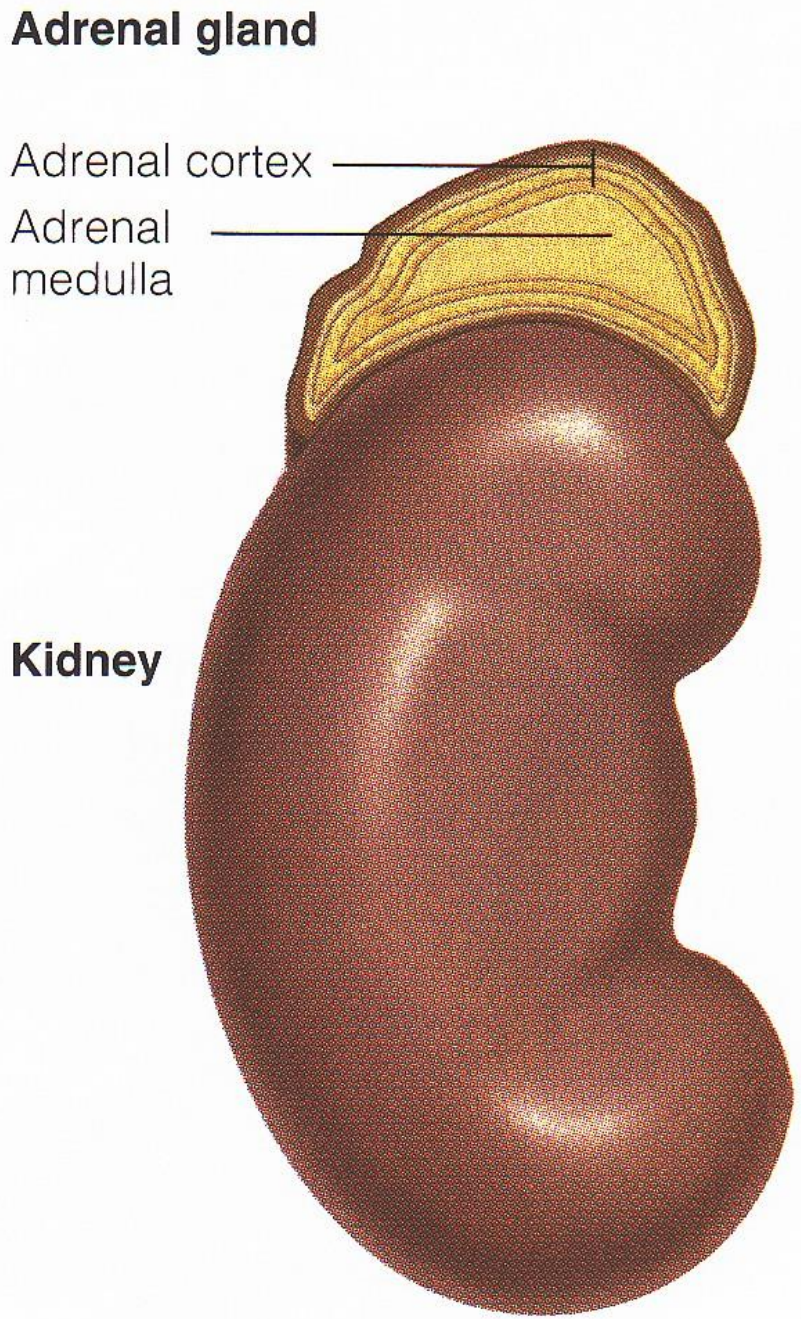
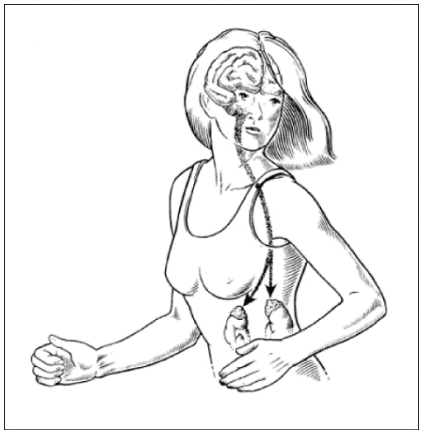


FIGURE 13-12
Adrenal Gland The adrenal glands sit atop the kidney and consist of an outer zone of cells, the adrenal cortex, which produces a variety of steroid hormones, and an inner zone, the adrenal medulla. The adrenal medulla produces adrenalin and noradrenalin.

BI 121!!

Epinephrine 80%

Norepinephrine 20%



Guyton & Hall 2000

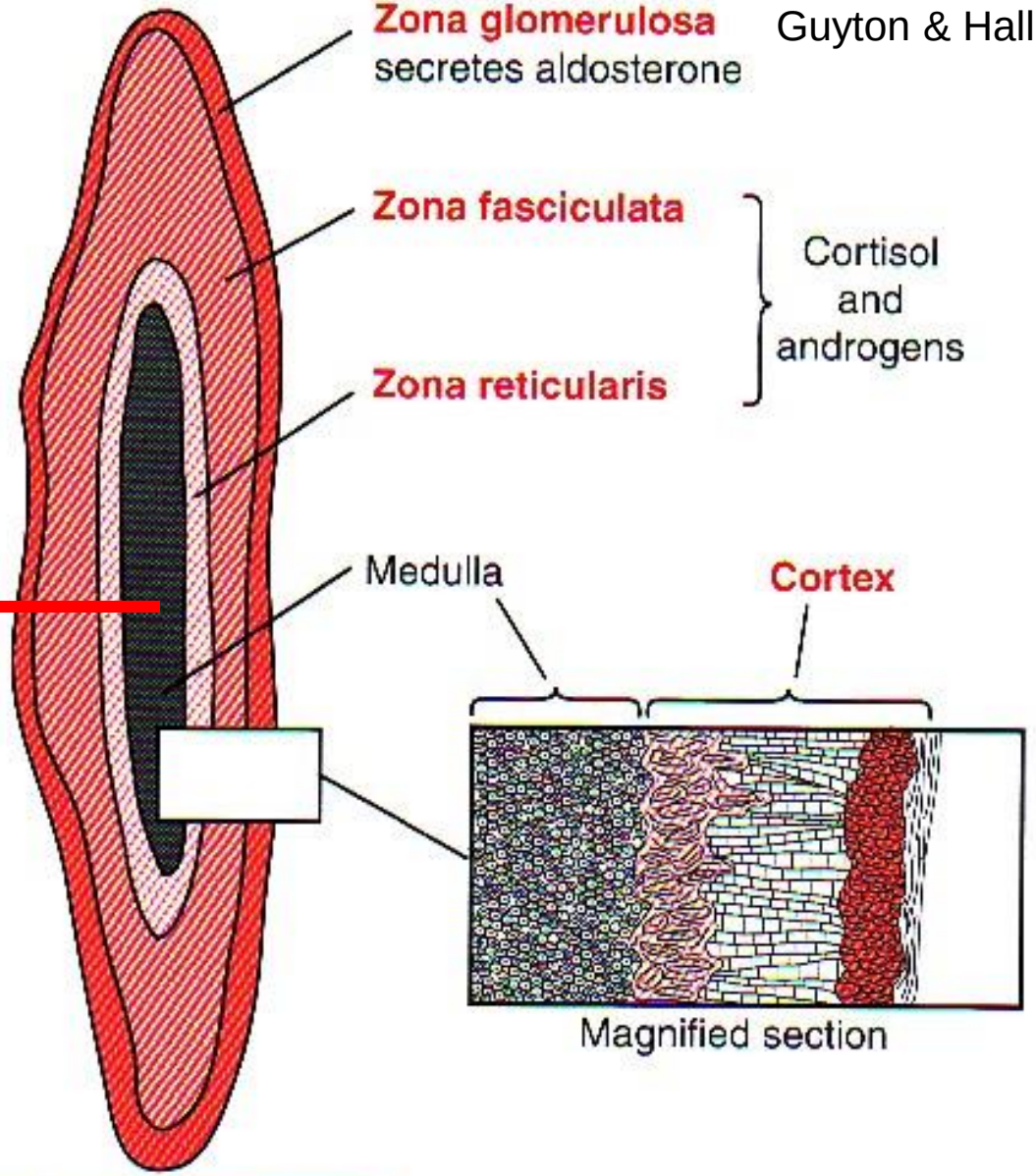
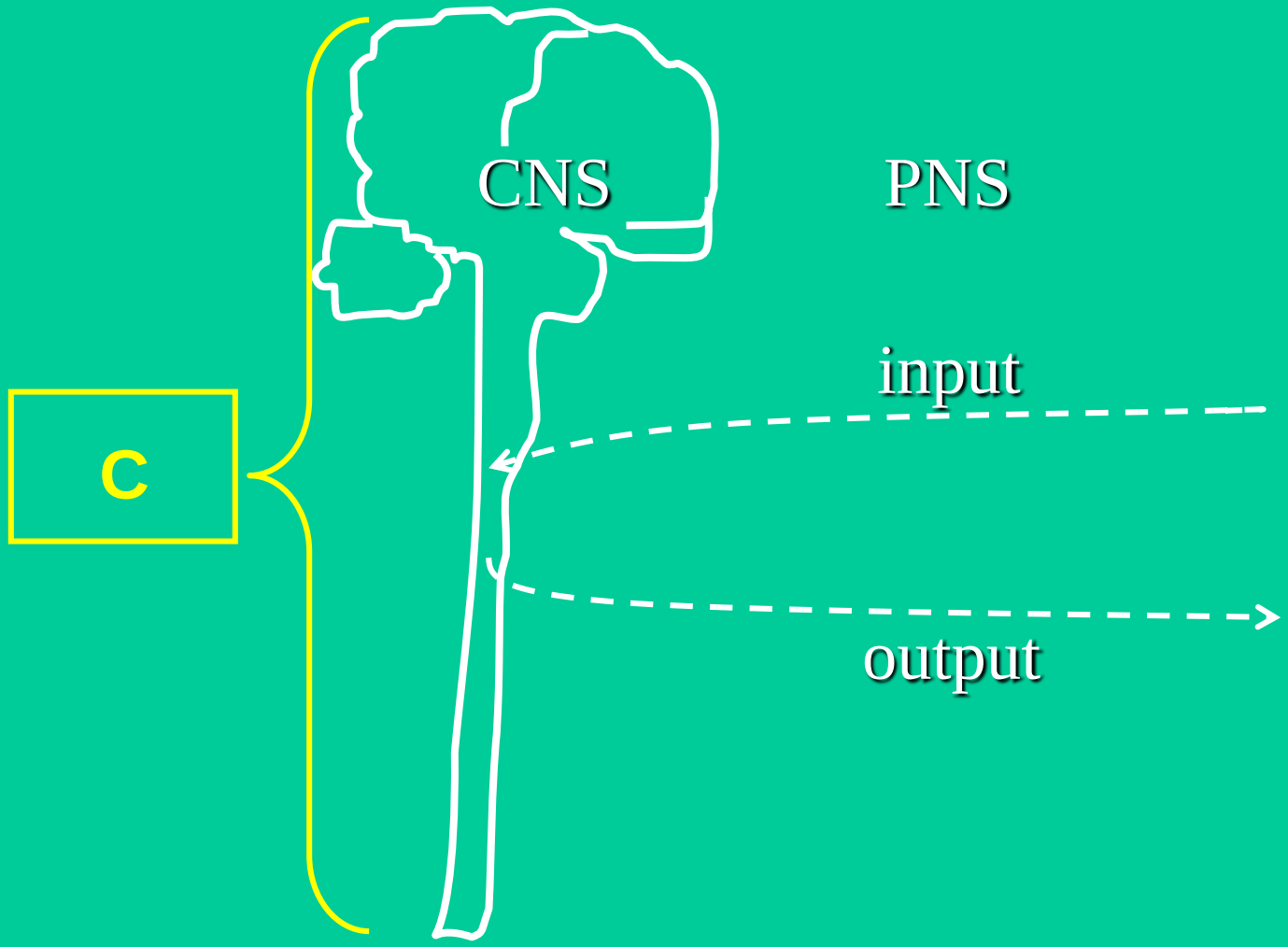
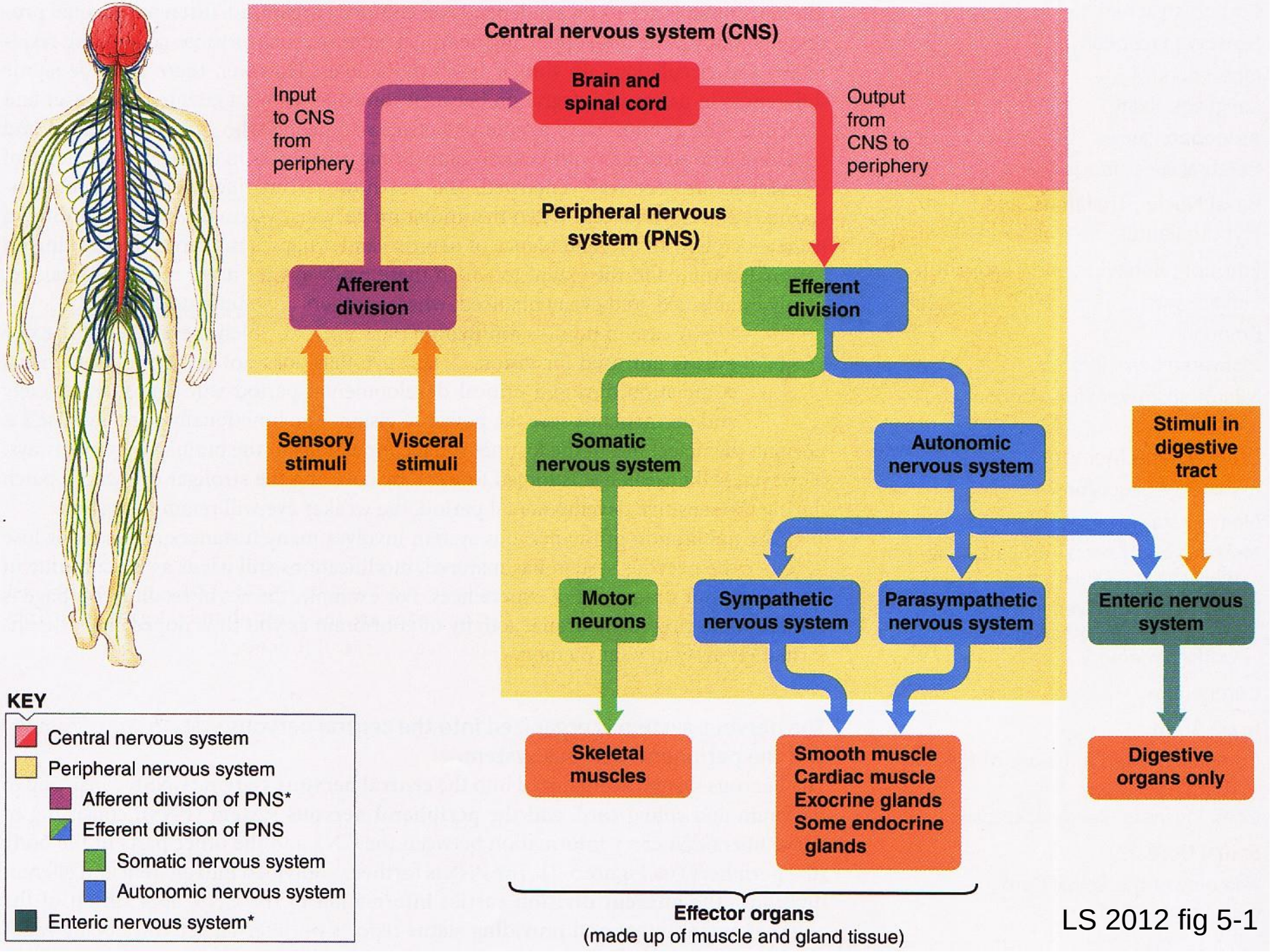


FIGURE 77-1

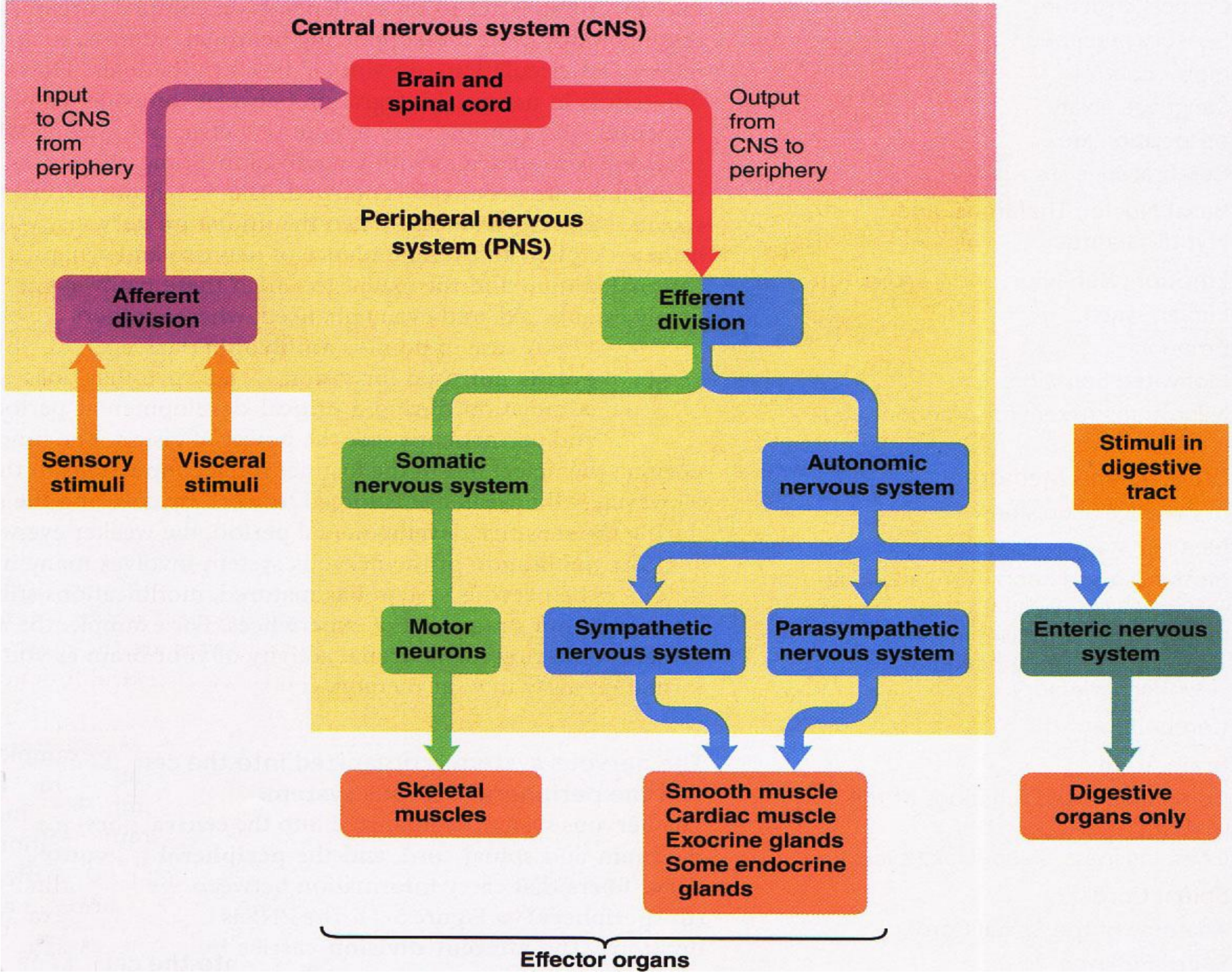
Secretion of adrenocortical hormones by the different zones of the adrenal cortex.

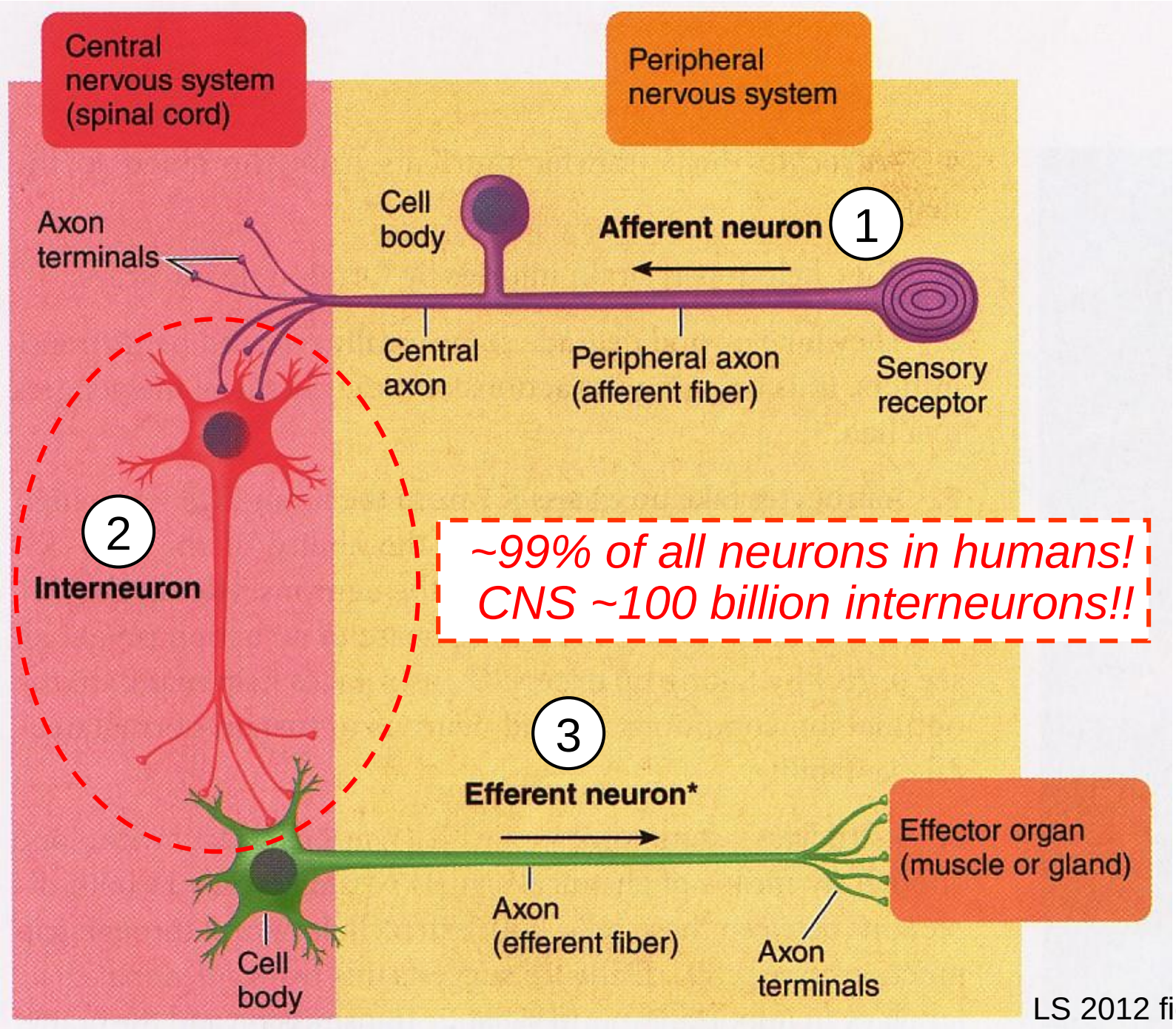
Nervous System



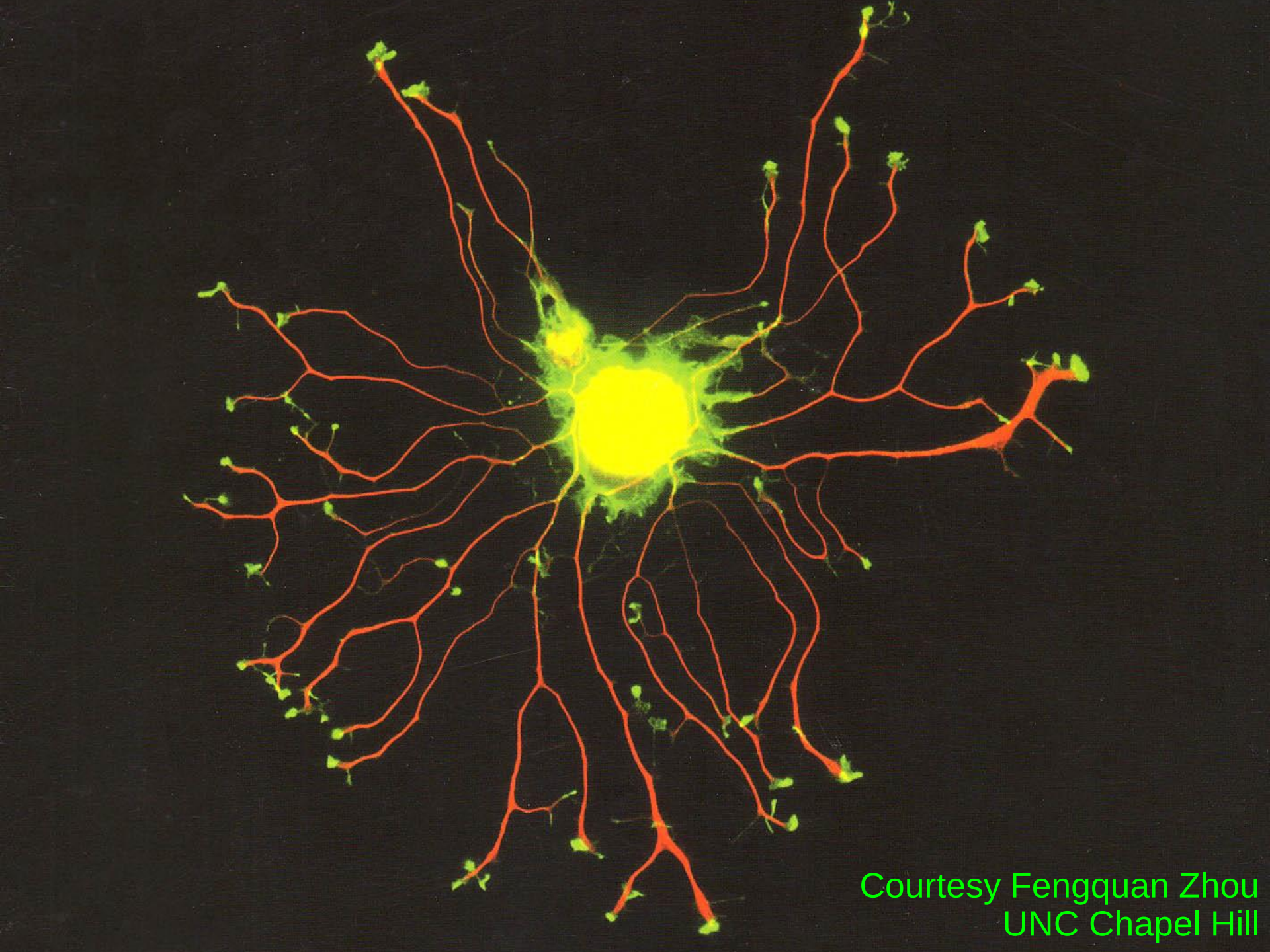


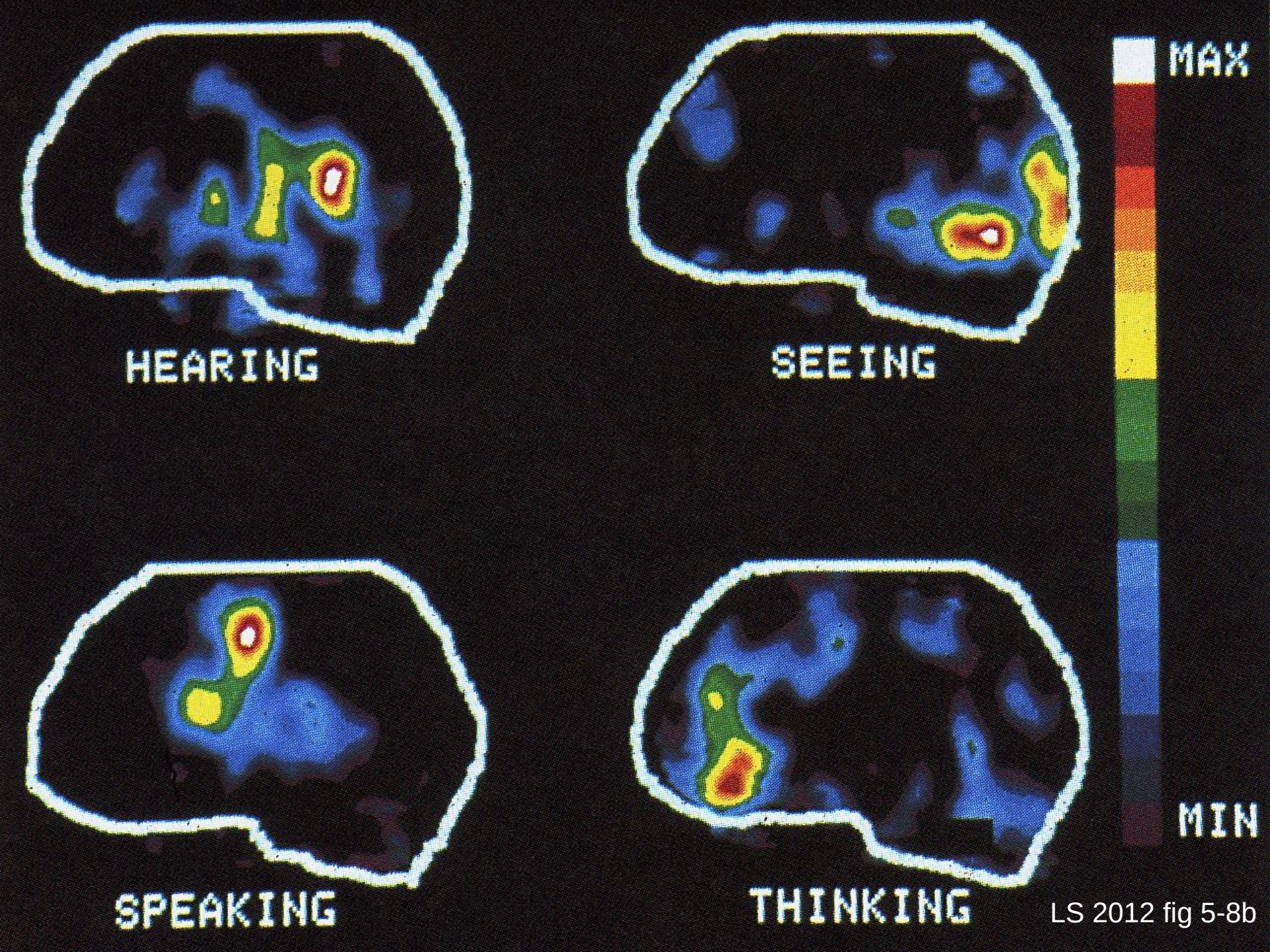
LS 2012 fig 5-1


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

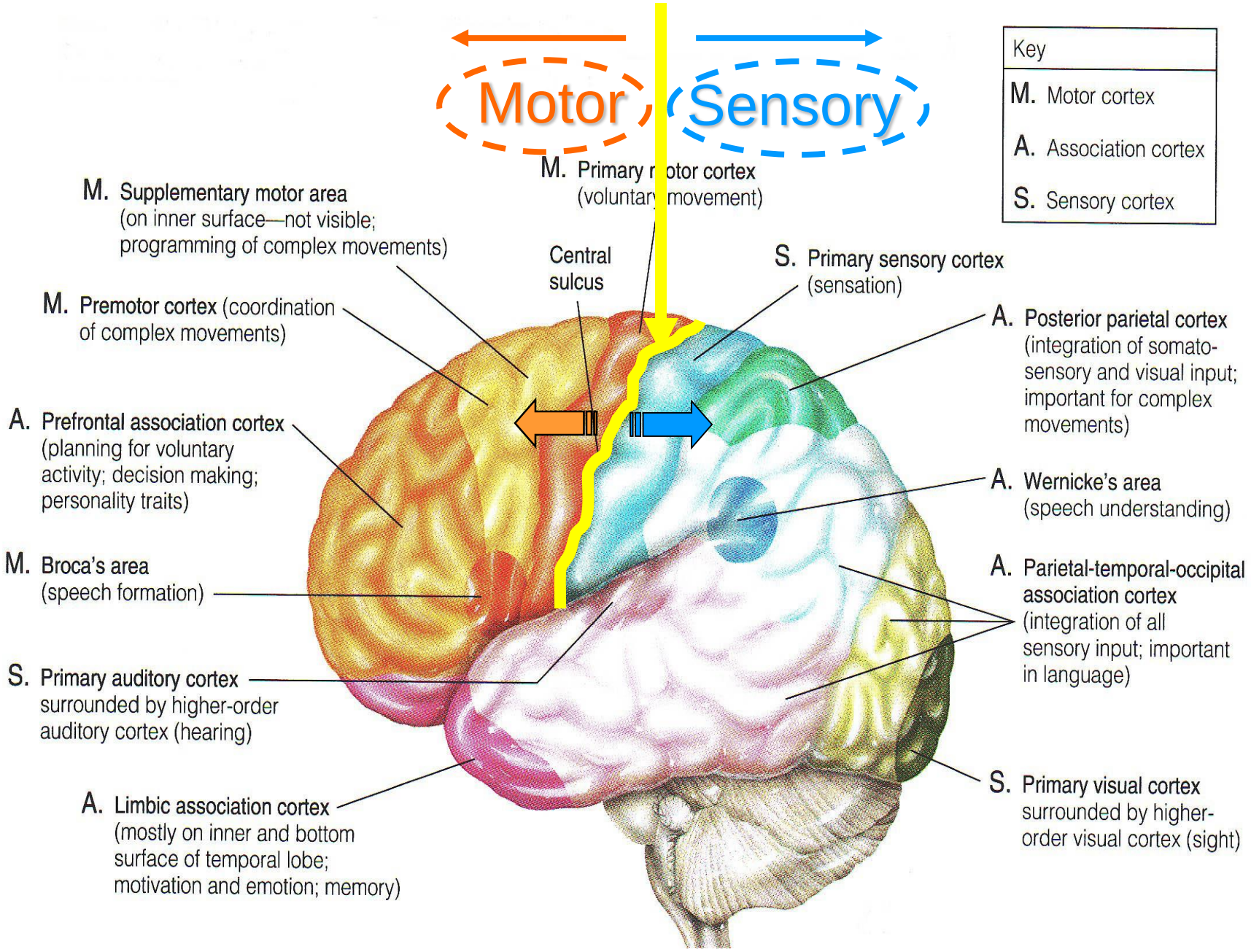


LS 2012 fig 5-2


Courtesy Fengquan Zhou
UNC Chapel Hill



LS 2012 fig 5-8b



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

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

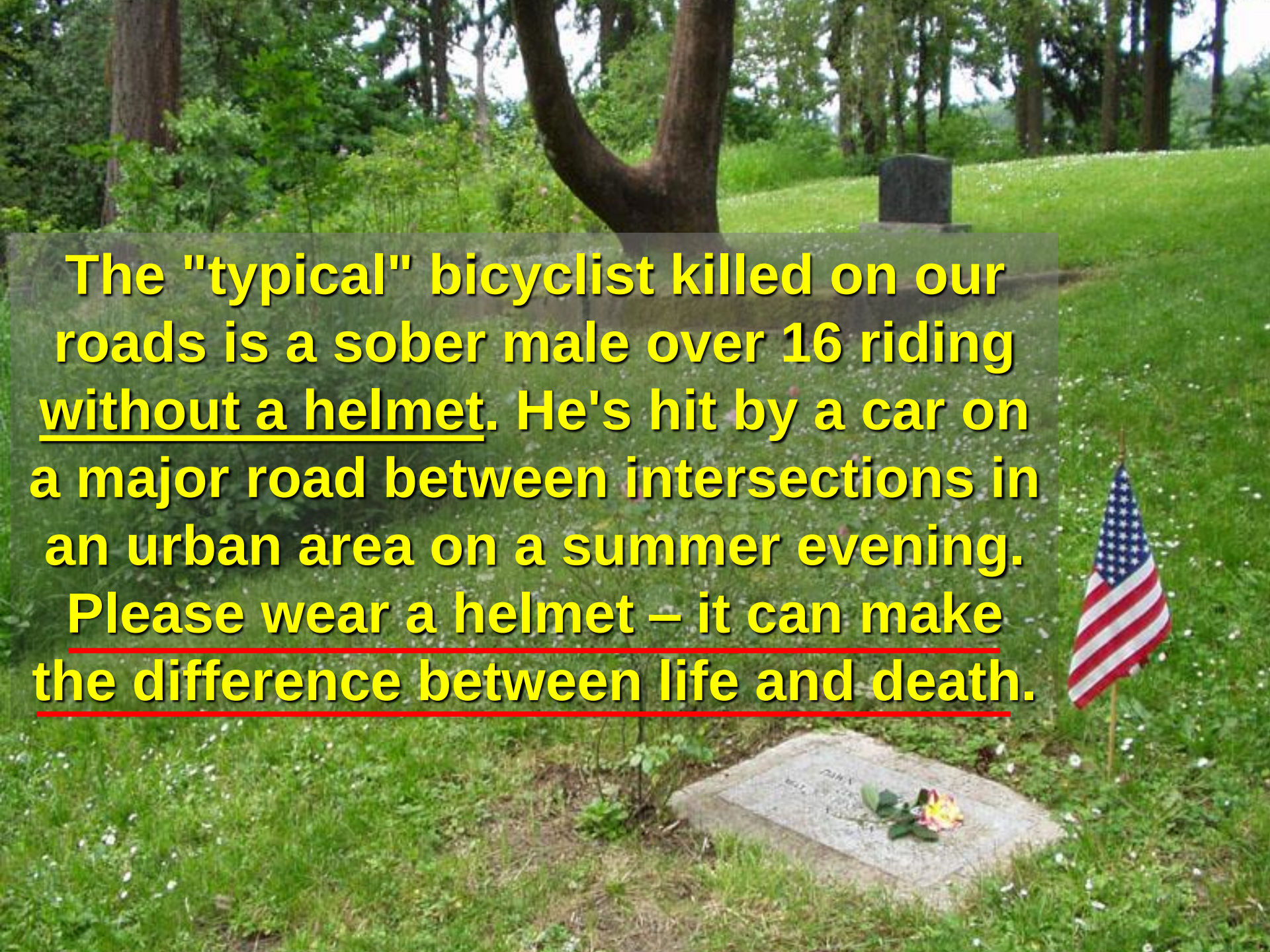
13% of deaths children ≤ 14 yr, 87% ♂

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!!

Stories, Discussion, Questions or Comments!