Bio 17 – Nervous & Endocrine Systems

Atoms and Ions

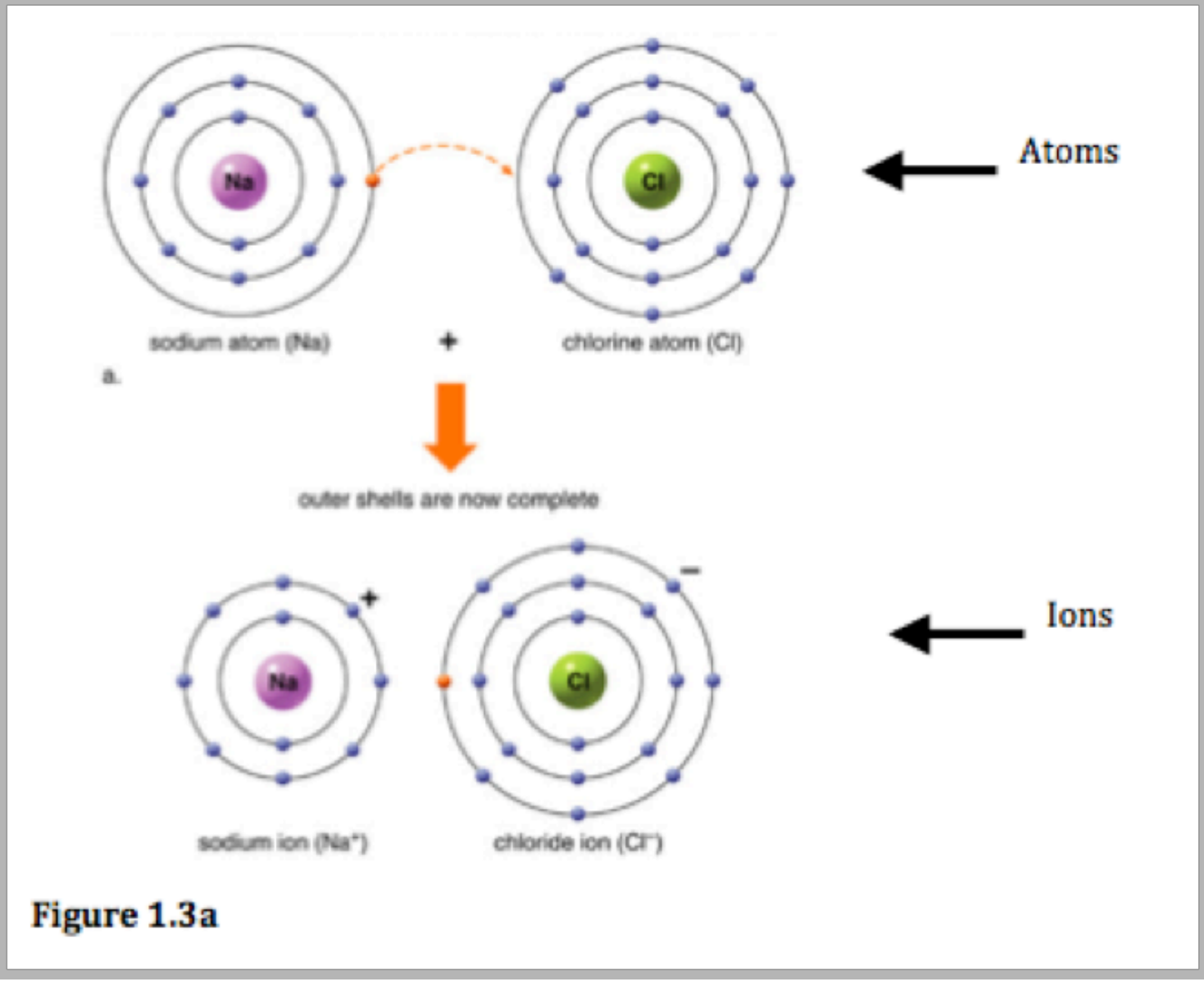
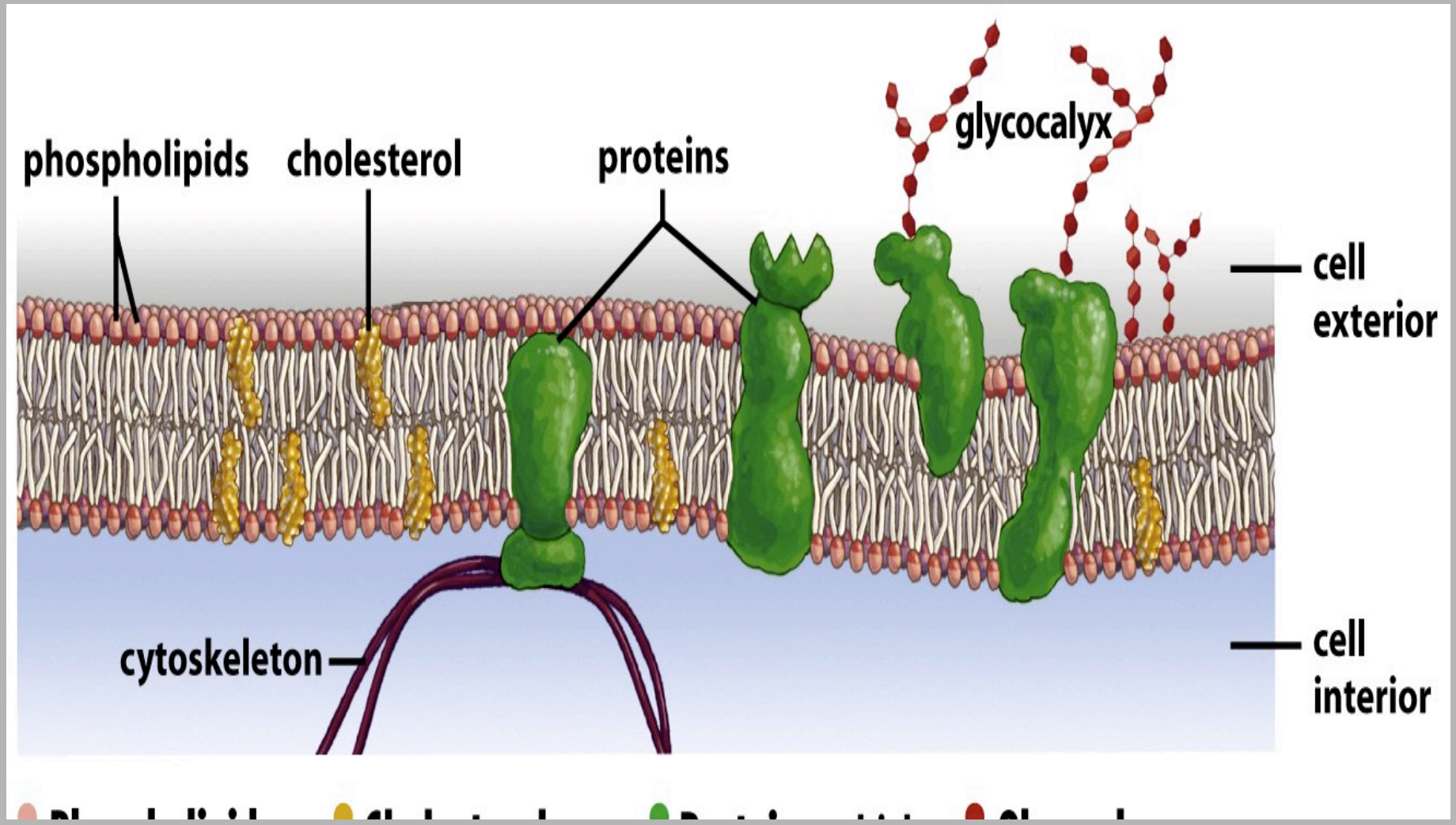
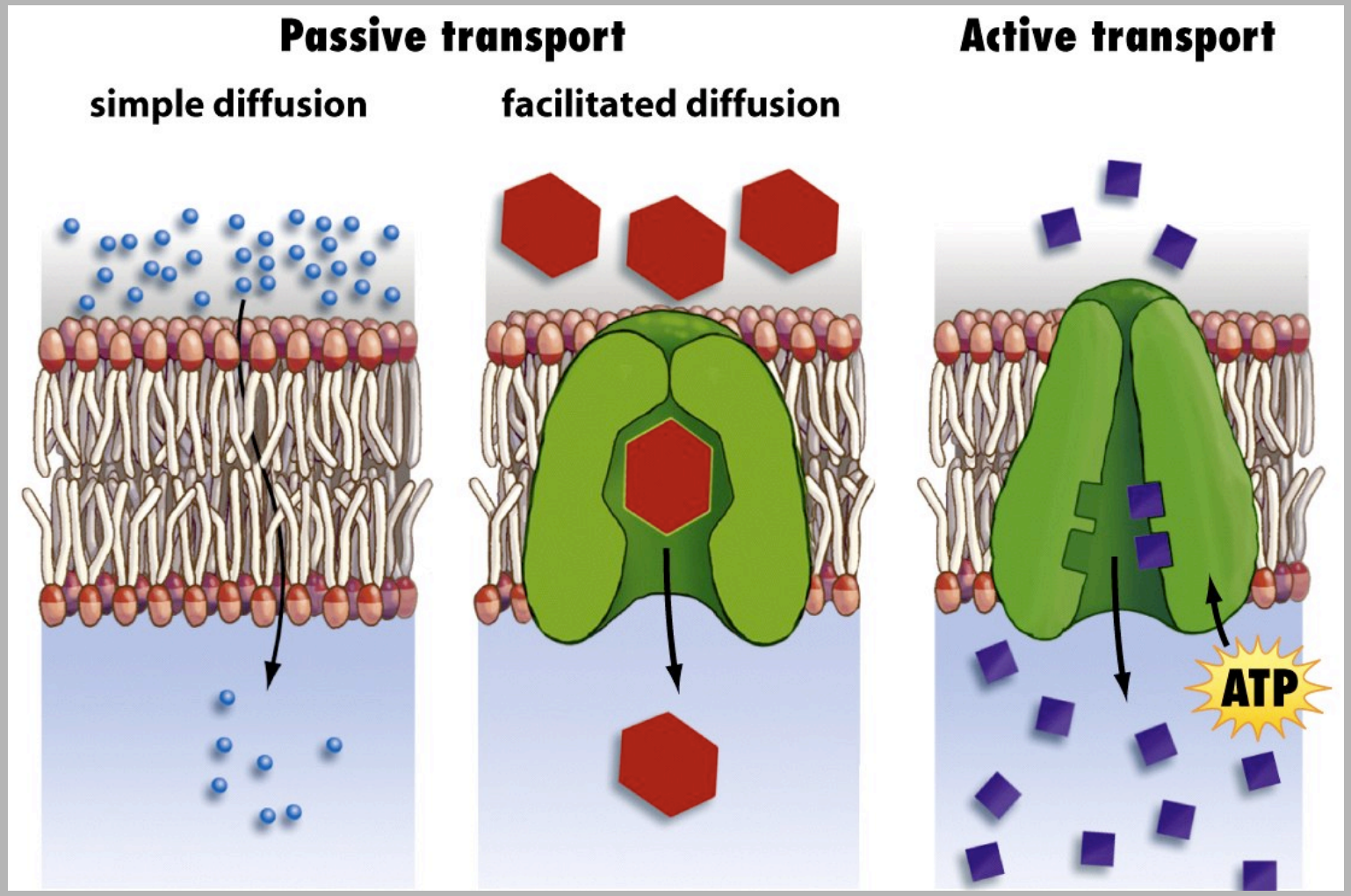


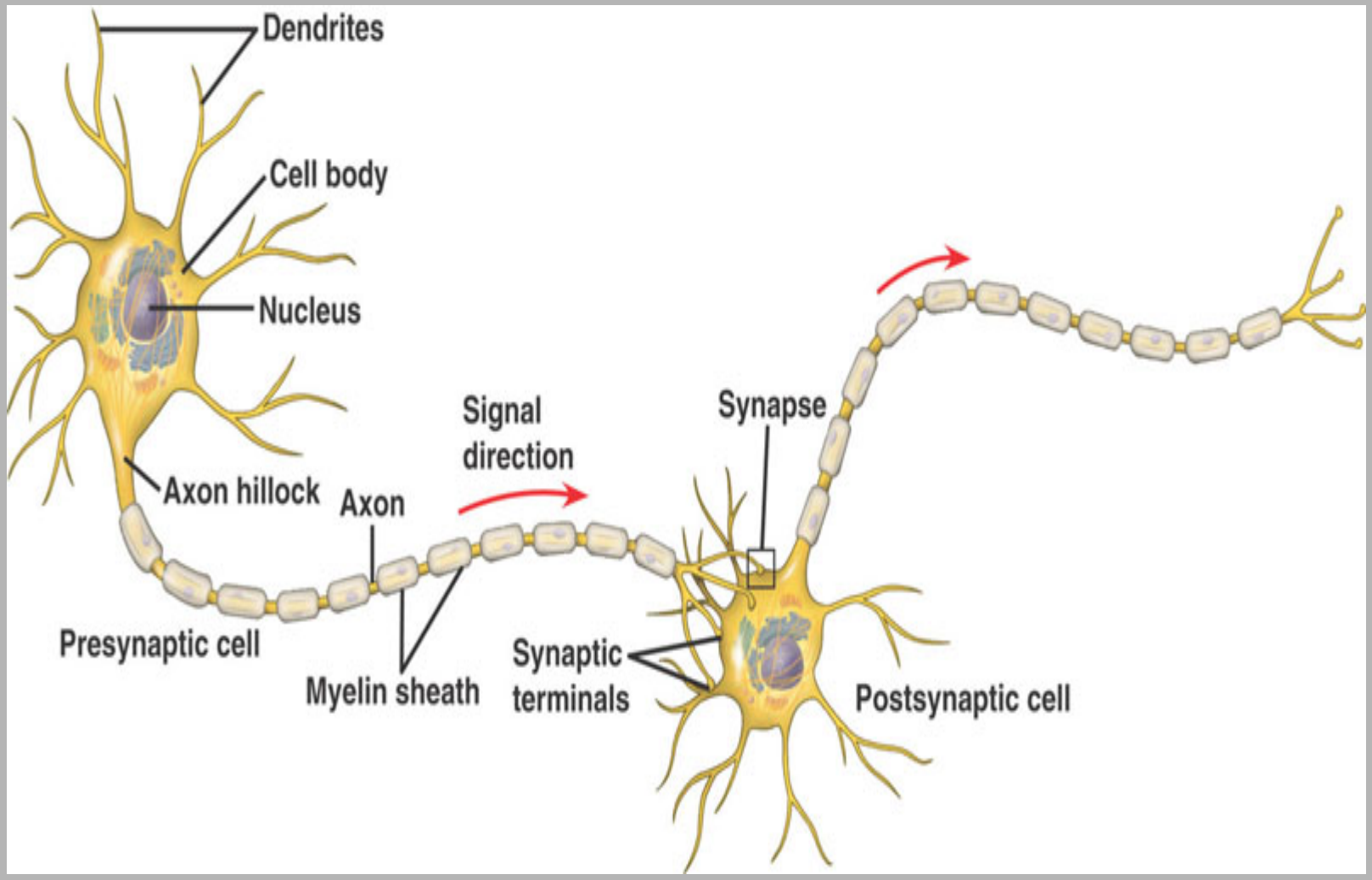
Figure 1.3a

Plasma Membranes

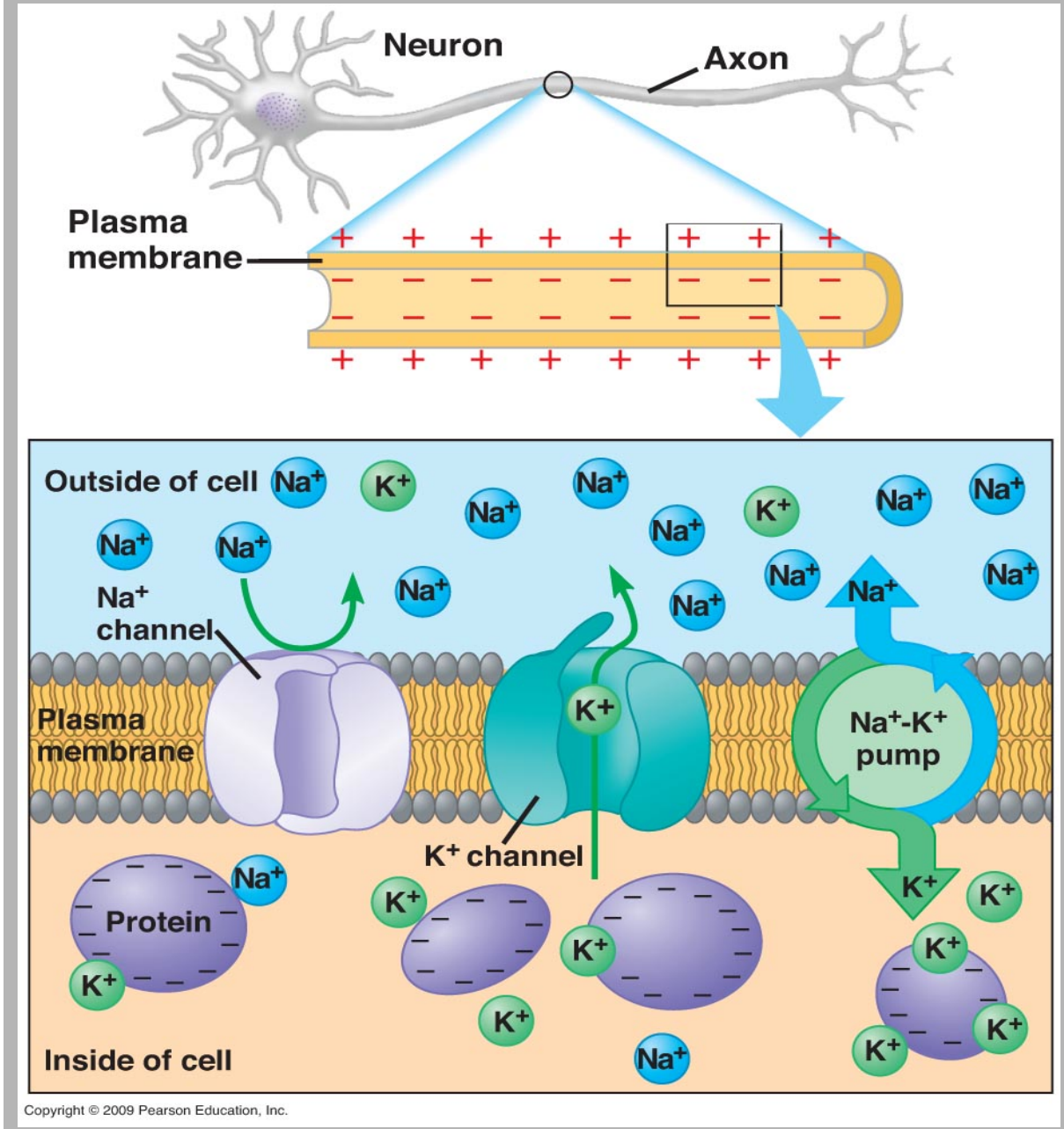


Transport


Passive transport
Active transport
simple diffusion
facilitated diffusion
ATP

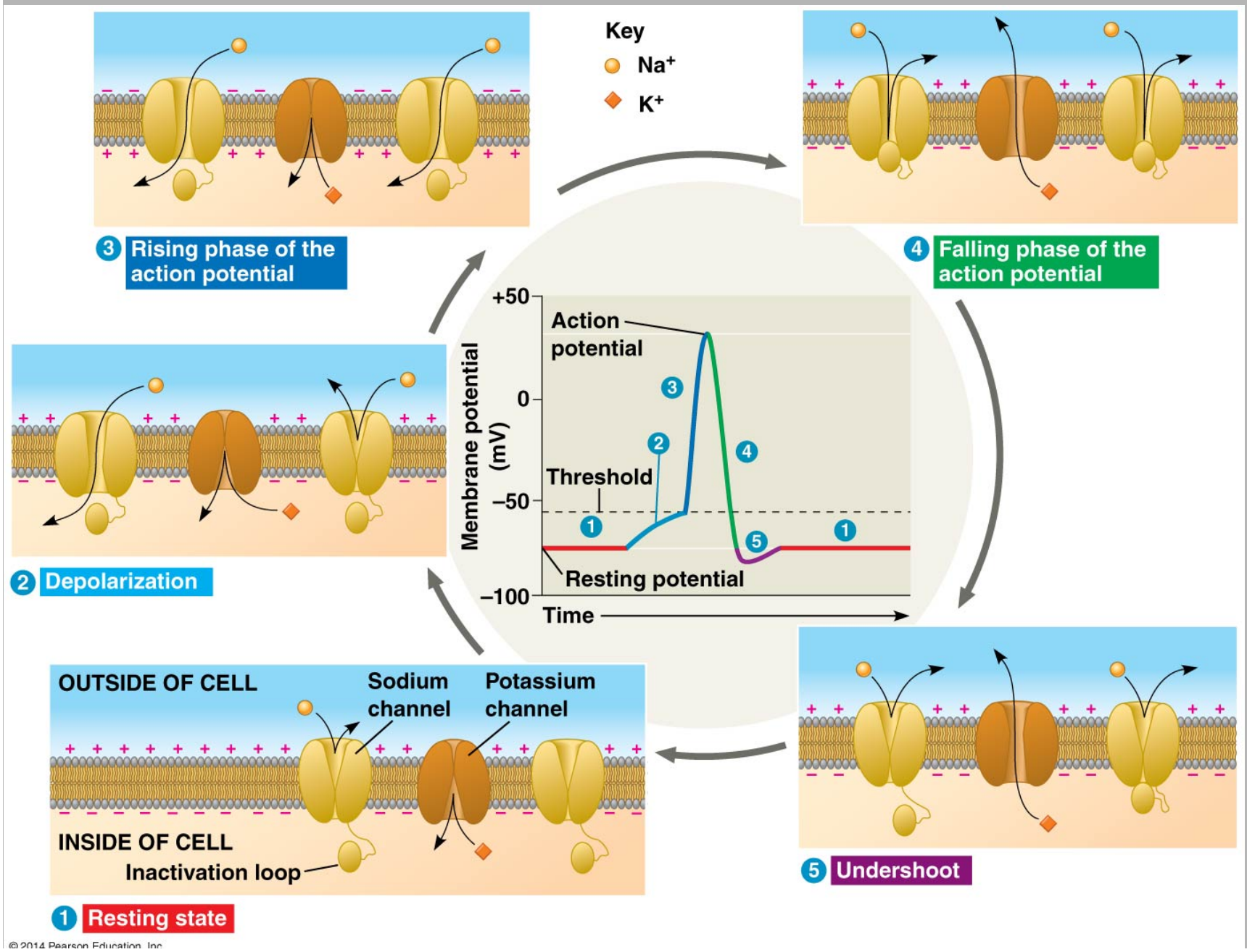

Dendrites
Cell body
Nucleus
Axon hillock
Axon
Signal direction
Synapse
Presynaptic cell
Myelin sheath
Synaptic terminals
Postsynaptic cell

The Resting Potential

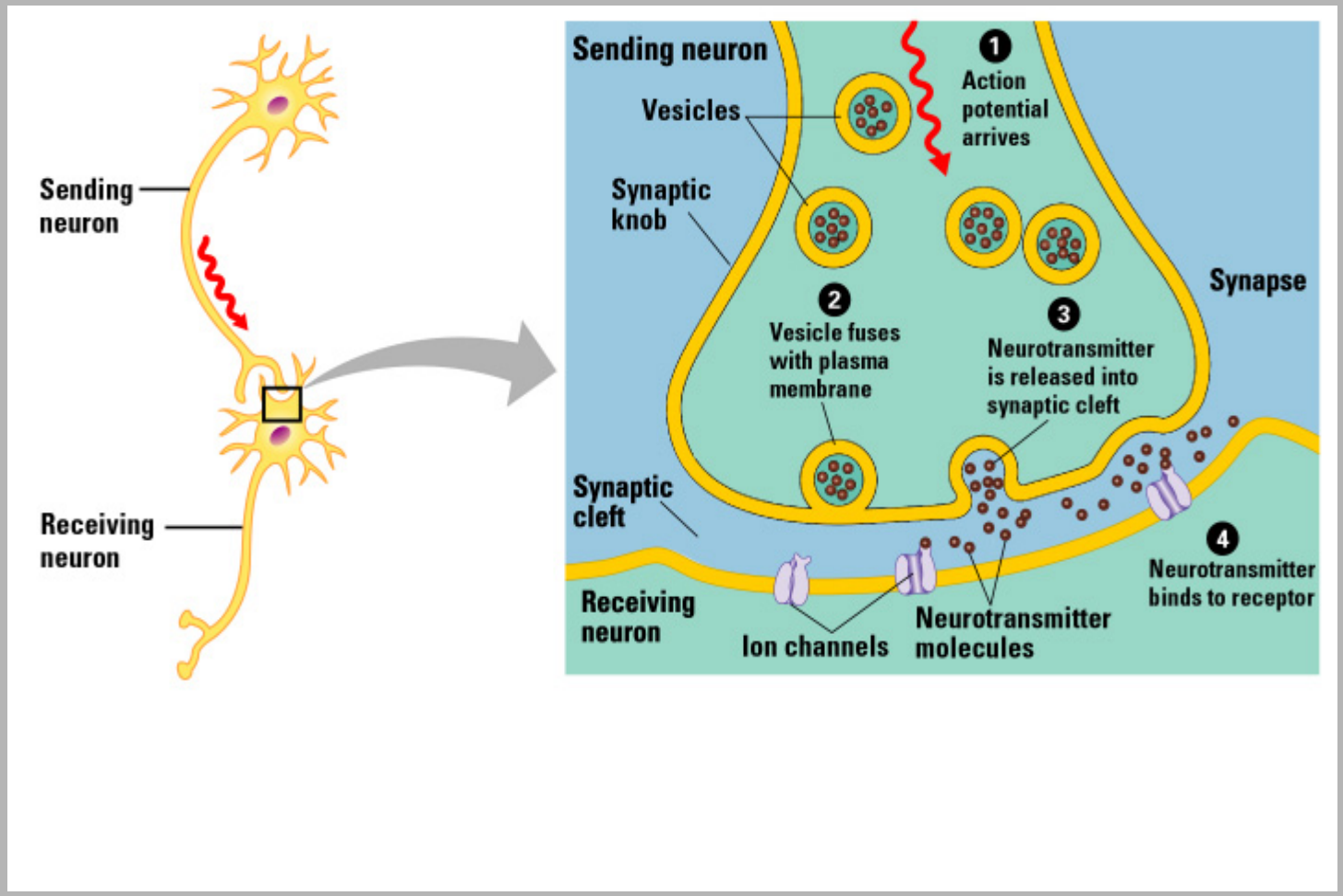


Sodium/ Potassium Pump Potassium (3 Na+ OUT, 2 K+ in)

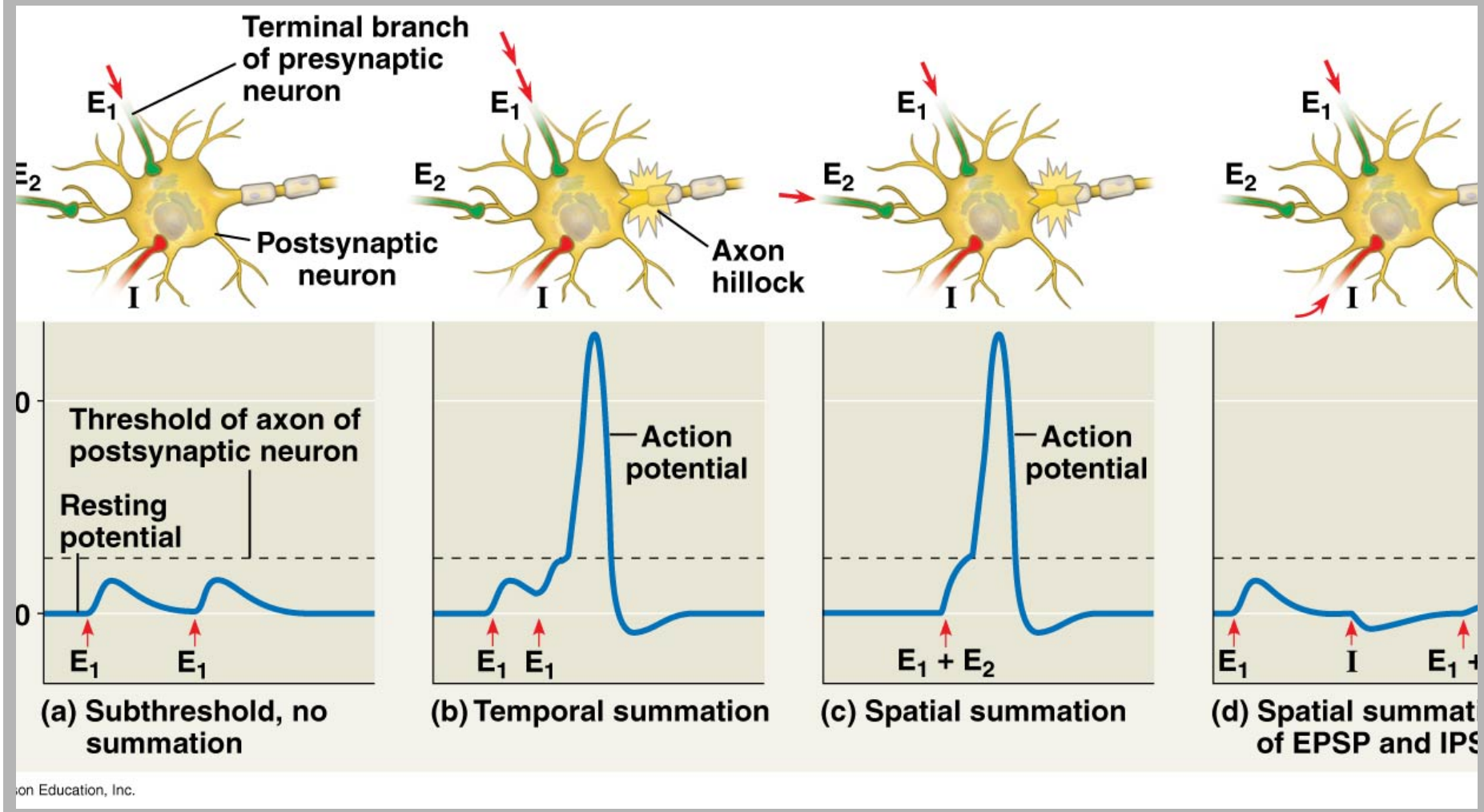
The Action Potential



How Neurons Communicate…

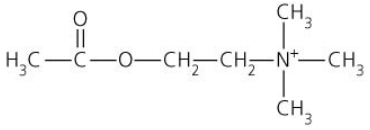
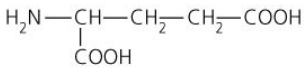
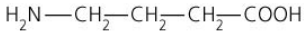
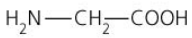
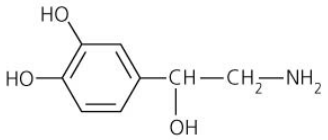
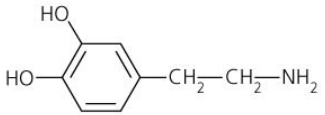
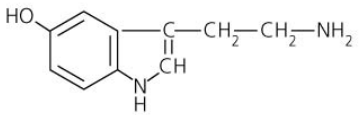


IPSP = Inhibitory Postsynaptic Potential
EPSP = Excitatory Postsynaptic Potential



Neurotransmitters

Table 48.2 Major Neurotransmitters

Neurotransmitter	Structure
Acetylcholine	
Amino Acids	
Glutamate	
GABA (gamma-aminobutyric acid)	
Glycine	
Biogenic Amines	
Norepinephrine	
Dopamine	
Serotonin	
Neuropeptides (a very diverse group, only two of which are shown)	
Substance P	Arg—Pro—Lys—Pro—Gln—Gln—Phe—Phe—Gly—Leu—Met
Met-enkephalin (an endorphin)	Tyr—Gly—Gly—Phe—Met
Gases	
Nitric oxide	N=O

Vital for Nerve Function. Binds to different types of receptors and has different results. Excitatory at neuromuscular junctions. Inhibitory in the heart (slows heart rate). Botulism toxin prevents presynaptic release

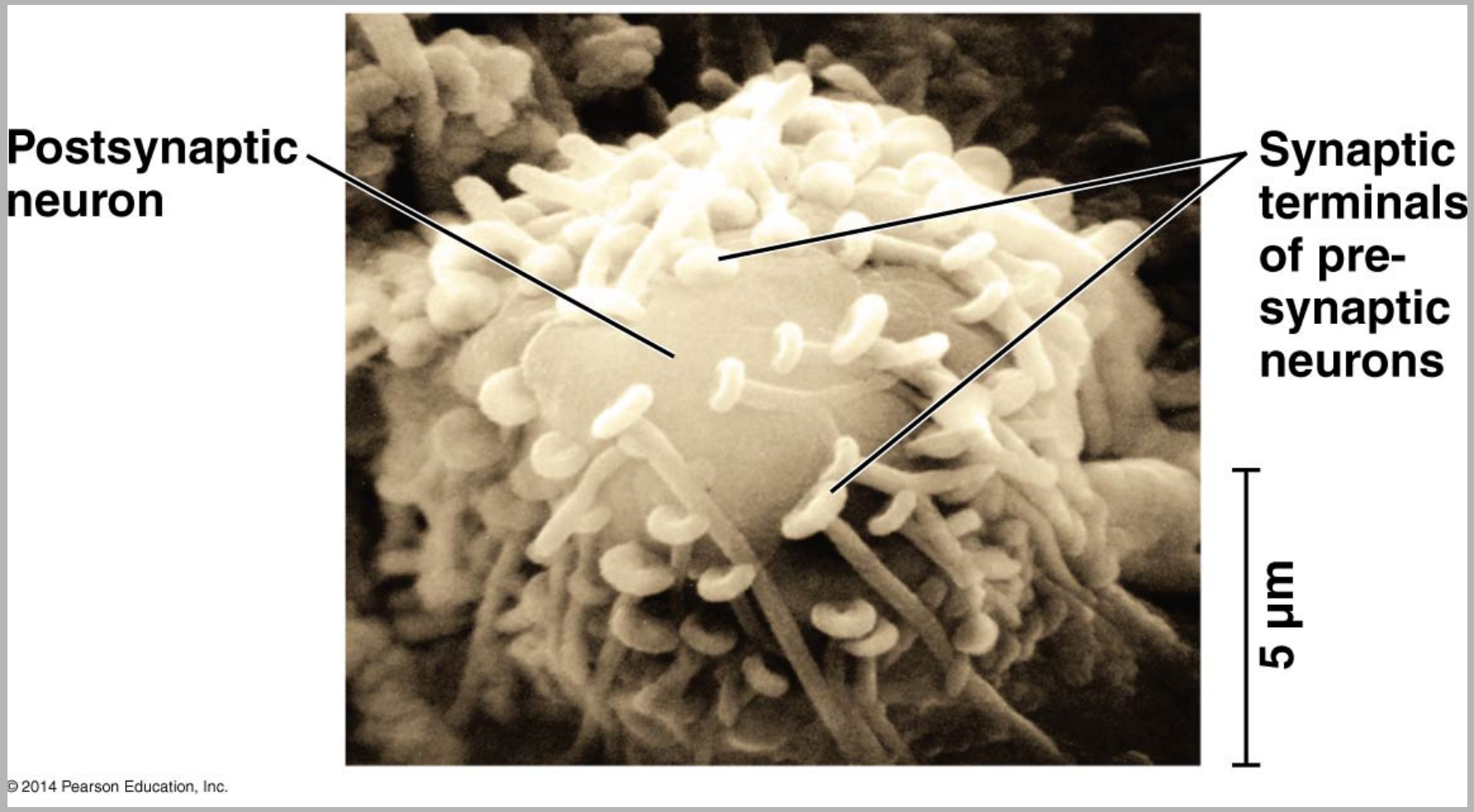
Glutamate – Most common neurotransmitter in the CNS; Important for long term memories

GABA – Common inhibitory neurotransmitter in the brain. Important for Sleep. The drug Valium binds to a GABA receptor

Norepinephrine = Excitatory in the autonomic nervous system (PNS)

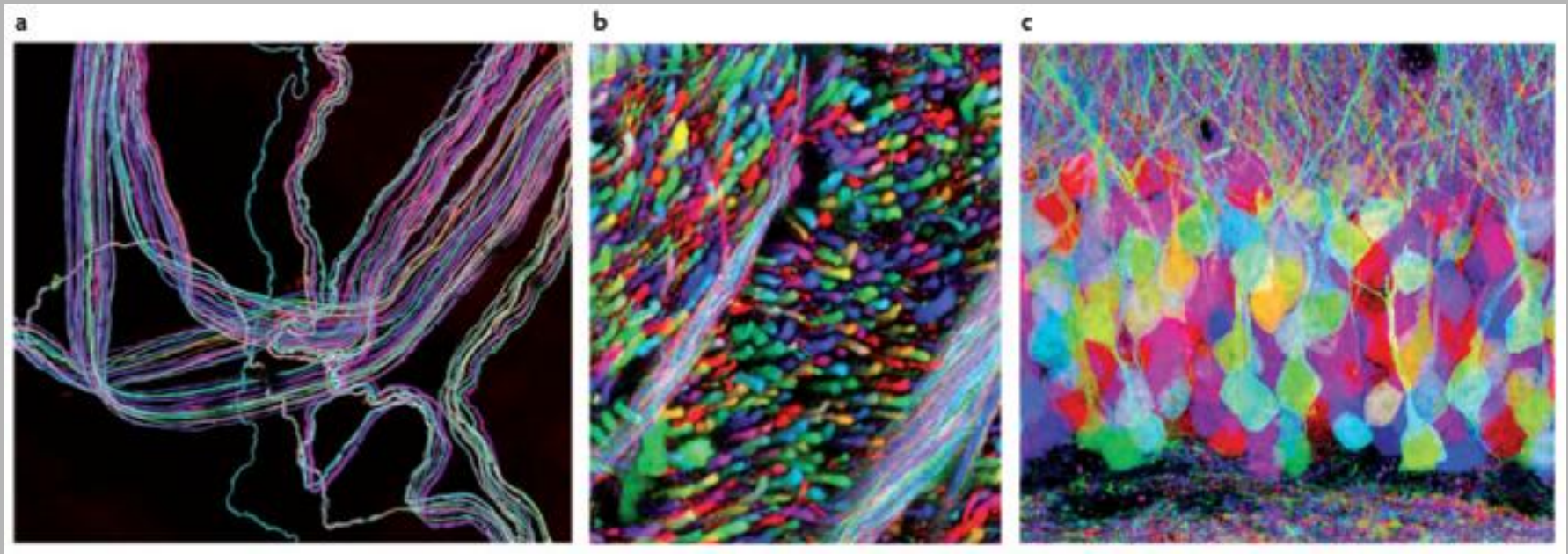
Dopamine = Sleep, Mood, Attention, Learning
Parkinson's = LOW levels of Dopamine in the brain
Schizophrenia = HIGH levels of Dopamine in the brain

Serotonin = Sleep, Mood, Attention, Learning
LOW level's associated with Depression (SSRI's)
LOW level's found in Serial Killers

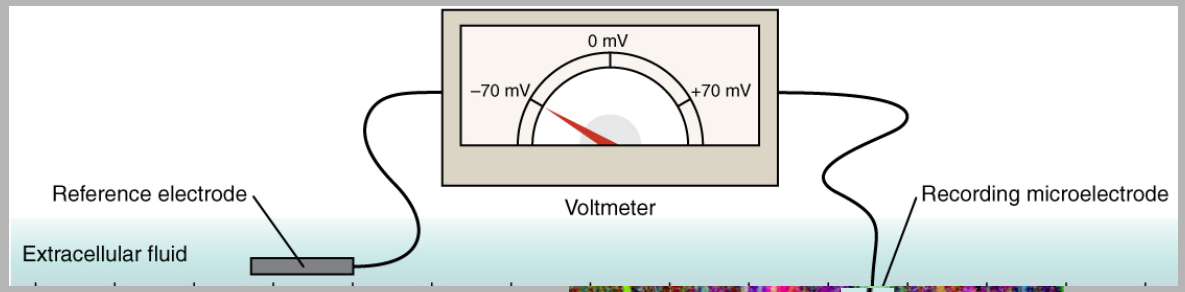


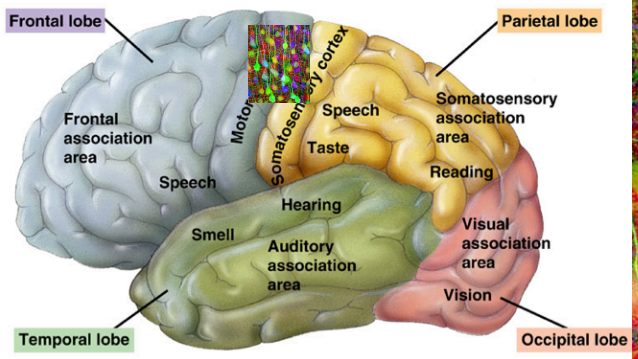
“Brainbow” Technology

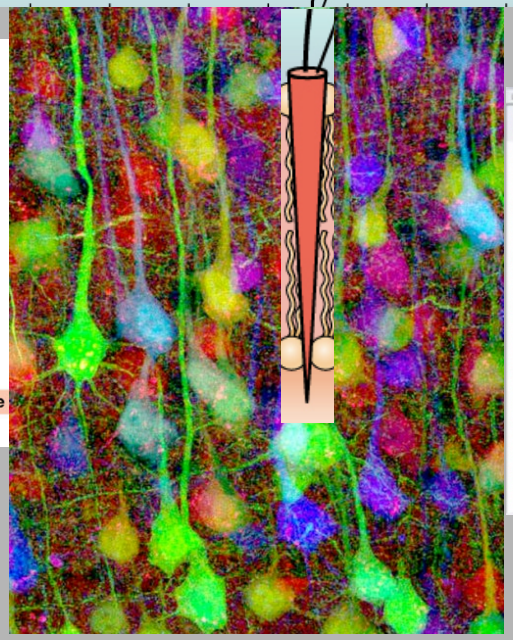
- Insert genes into DNA.
- When expressed, some cell types become colorful.
- Can see what is connected. Used to show learning.
- Can trace short-and-long range connections in brain circuits

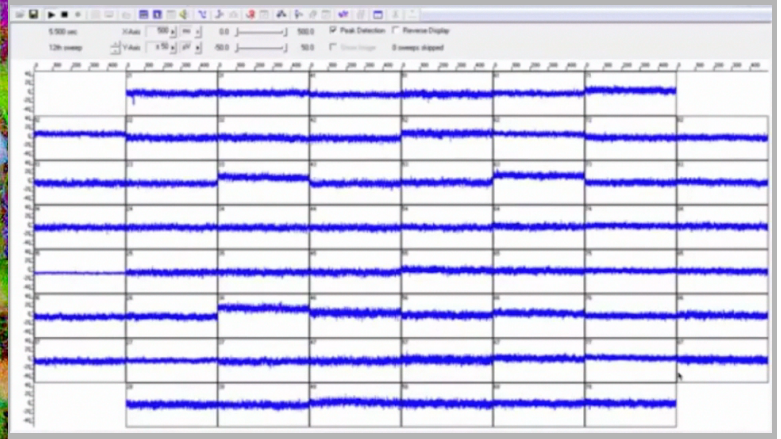


Can measure activity in a neuron



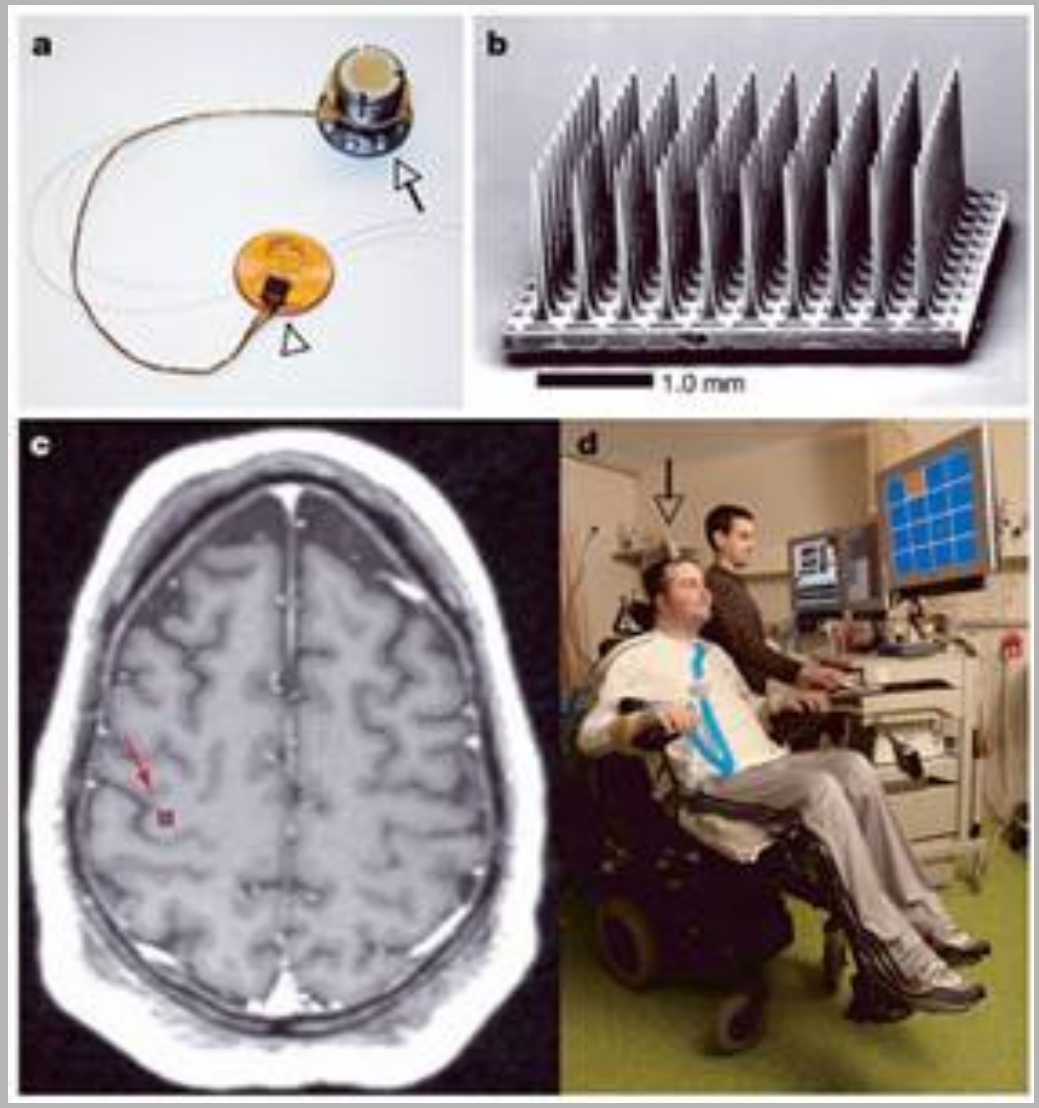






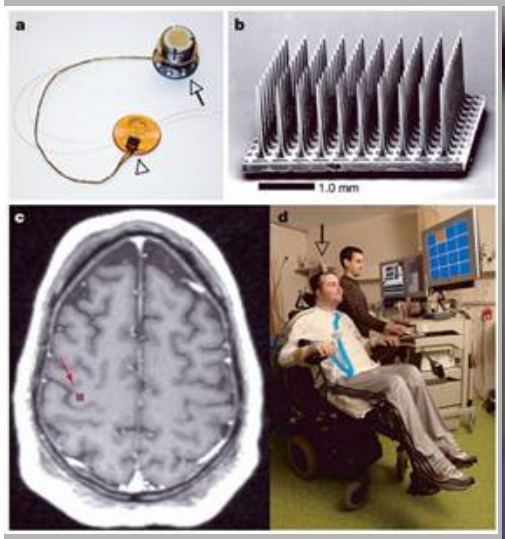
Brain-Machine Interface

Braingate Neural Interface System

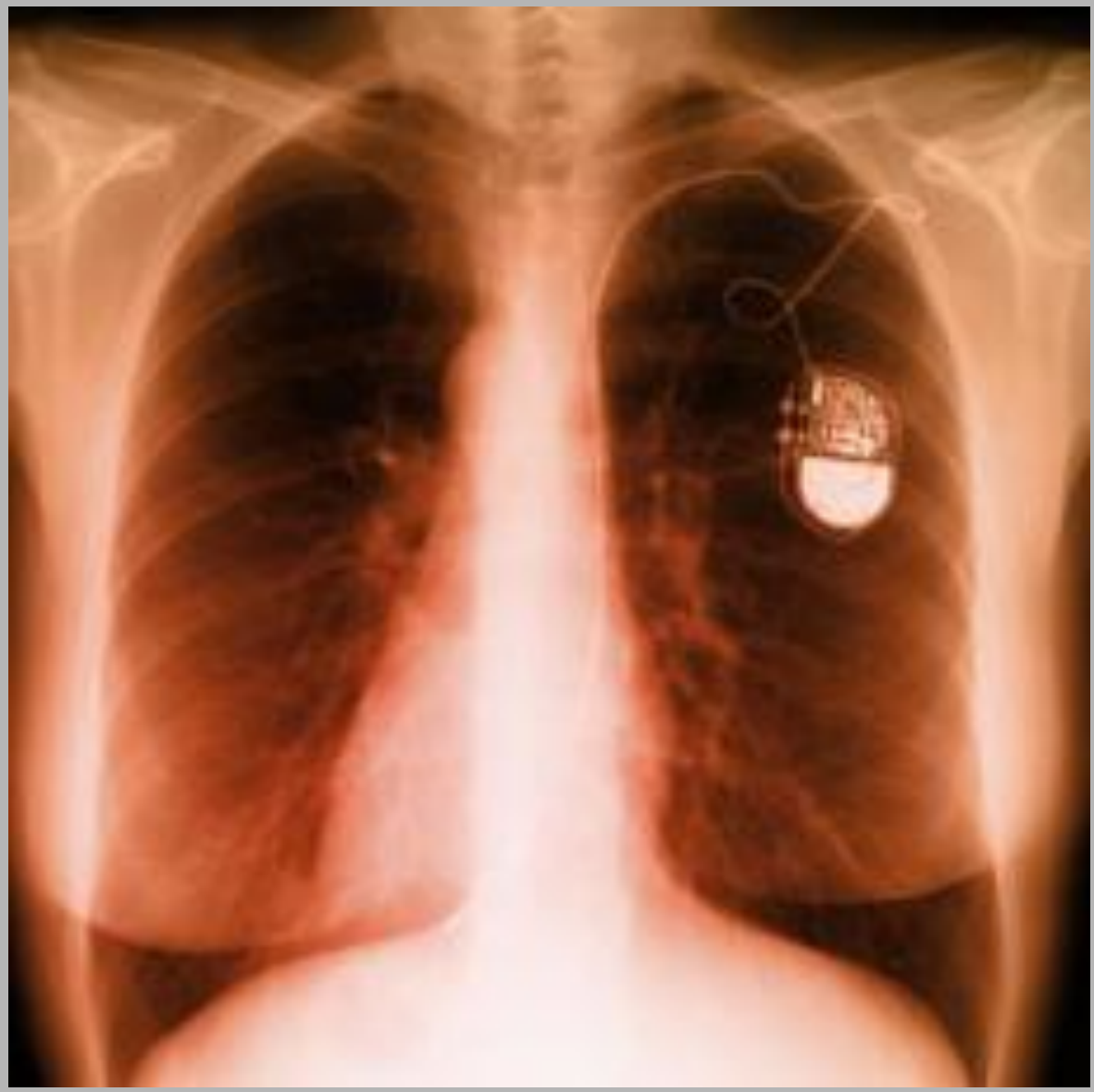


Monkey using brain to move robotic arm

University of Pittsburgh

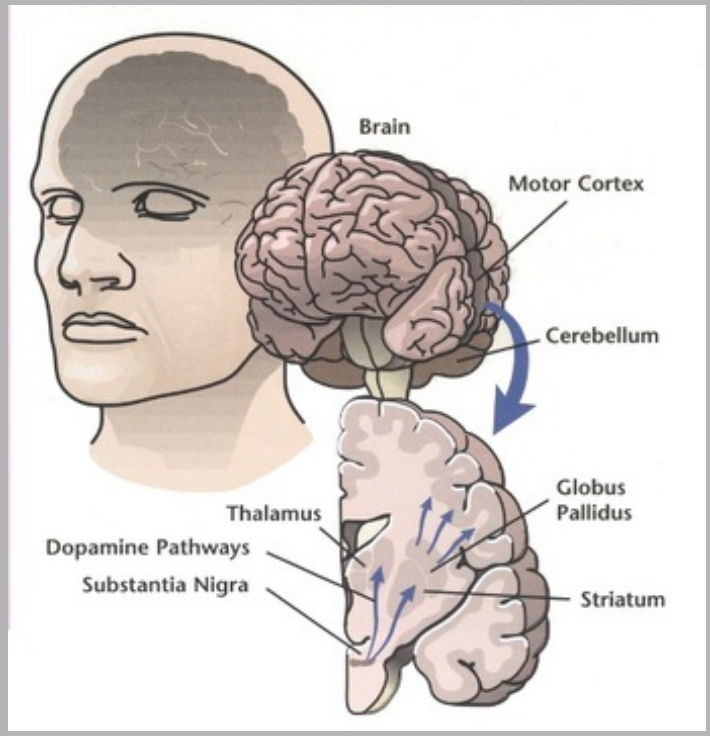


Brain Machine Interface = The other direction.

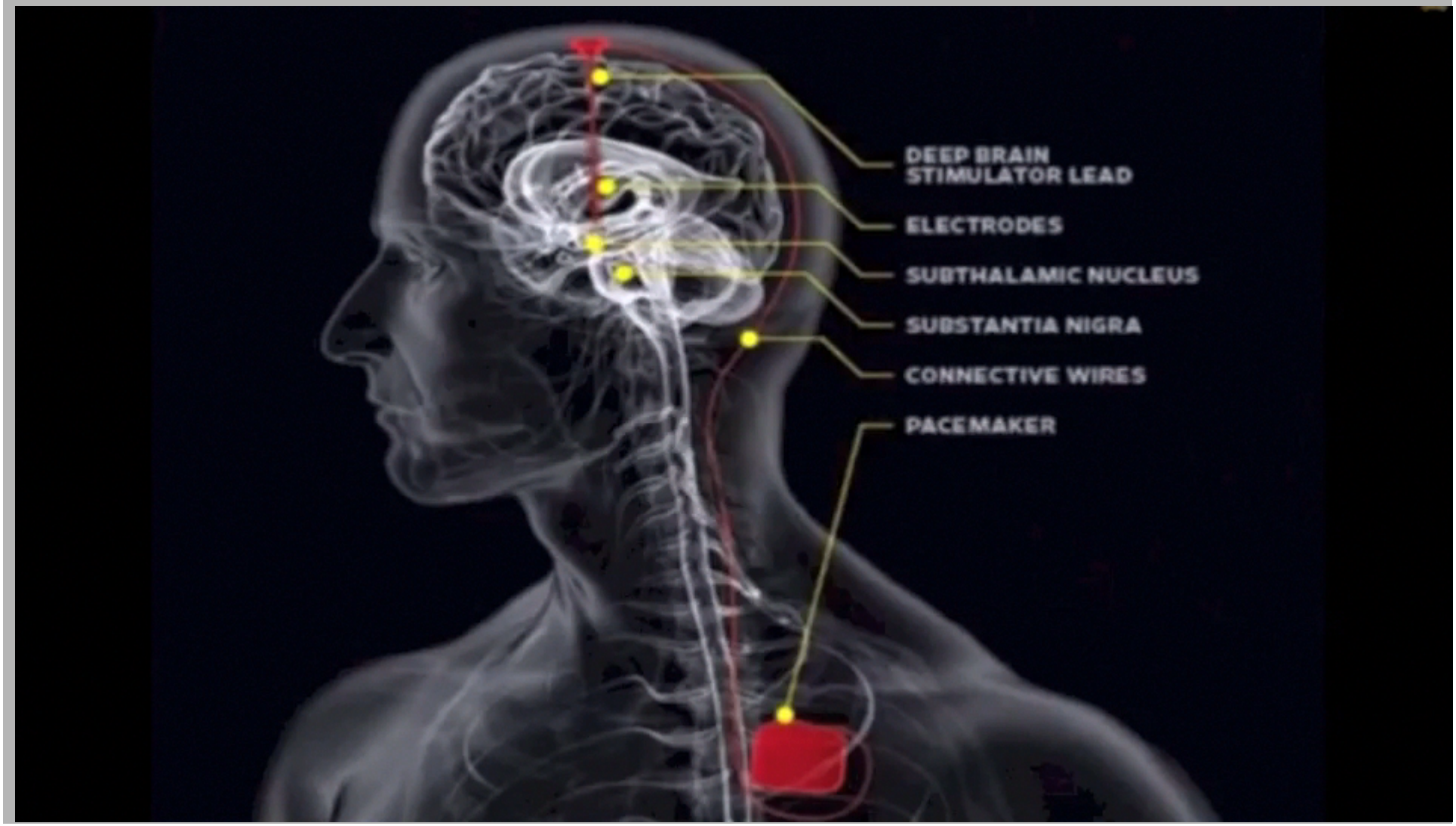


Parkinson's Disease

- Affects about 1% of the population.
- Uncontrolled body movements, tremors, shaking.
- Reduced levels of dopamine in the Substantia Nigra portion of the brain



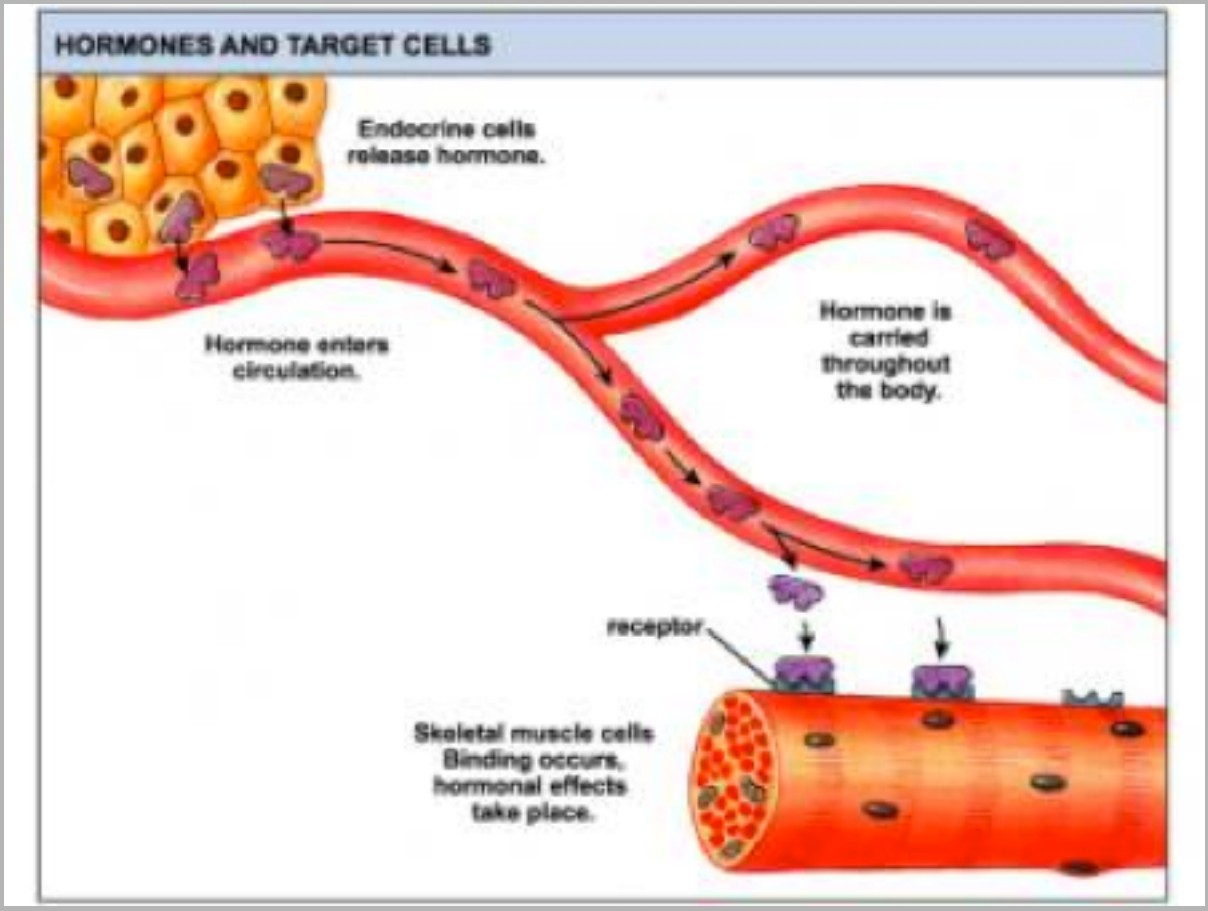
Deep Brain Stimulation



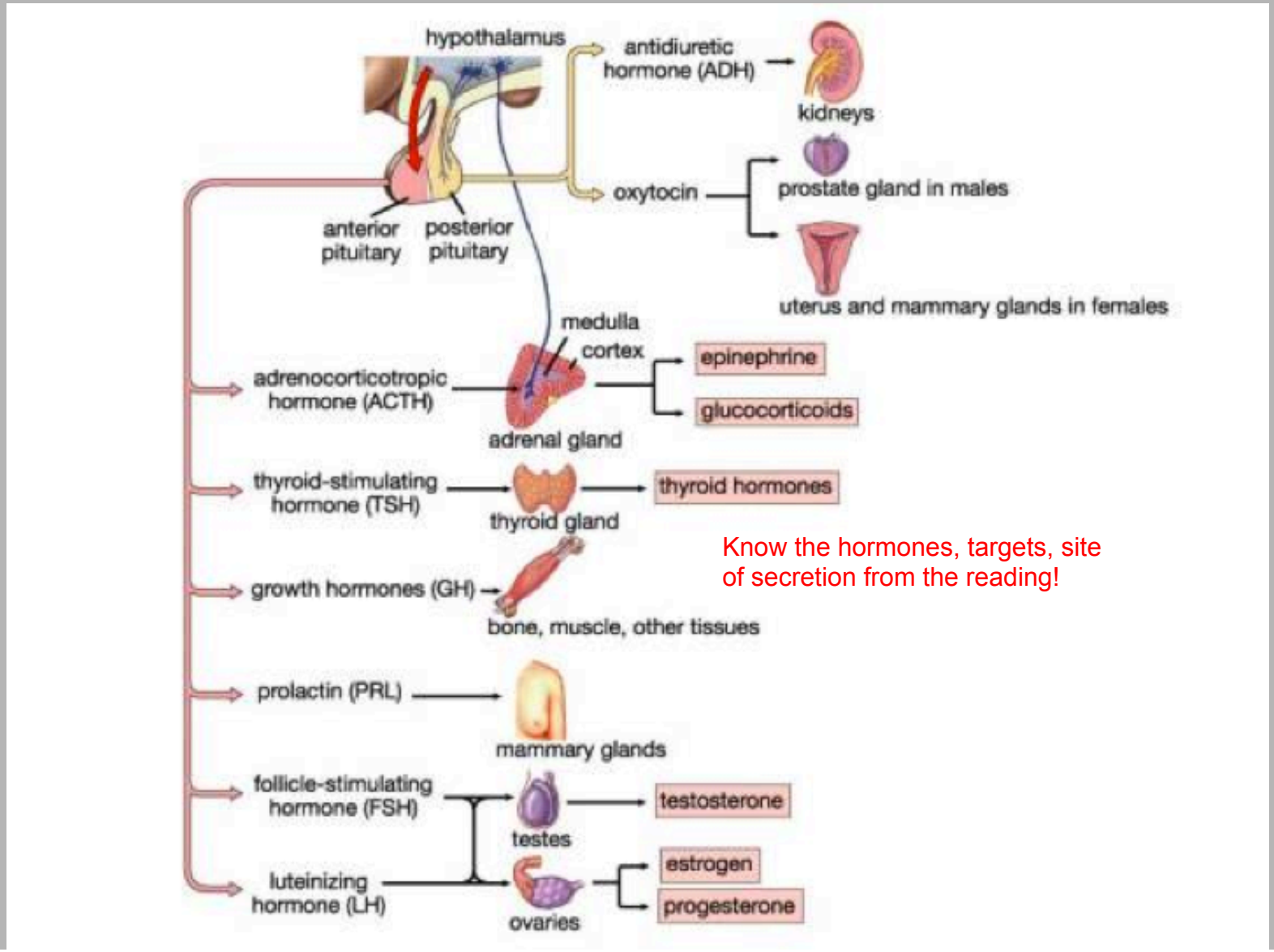
Brain Rules
by Mark Medina

- Sleep!
- Exercise
- Pictures!

Hormones

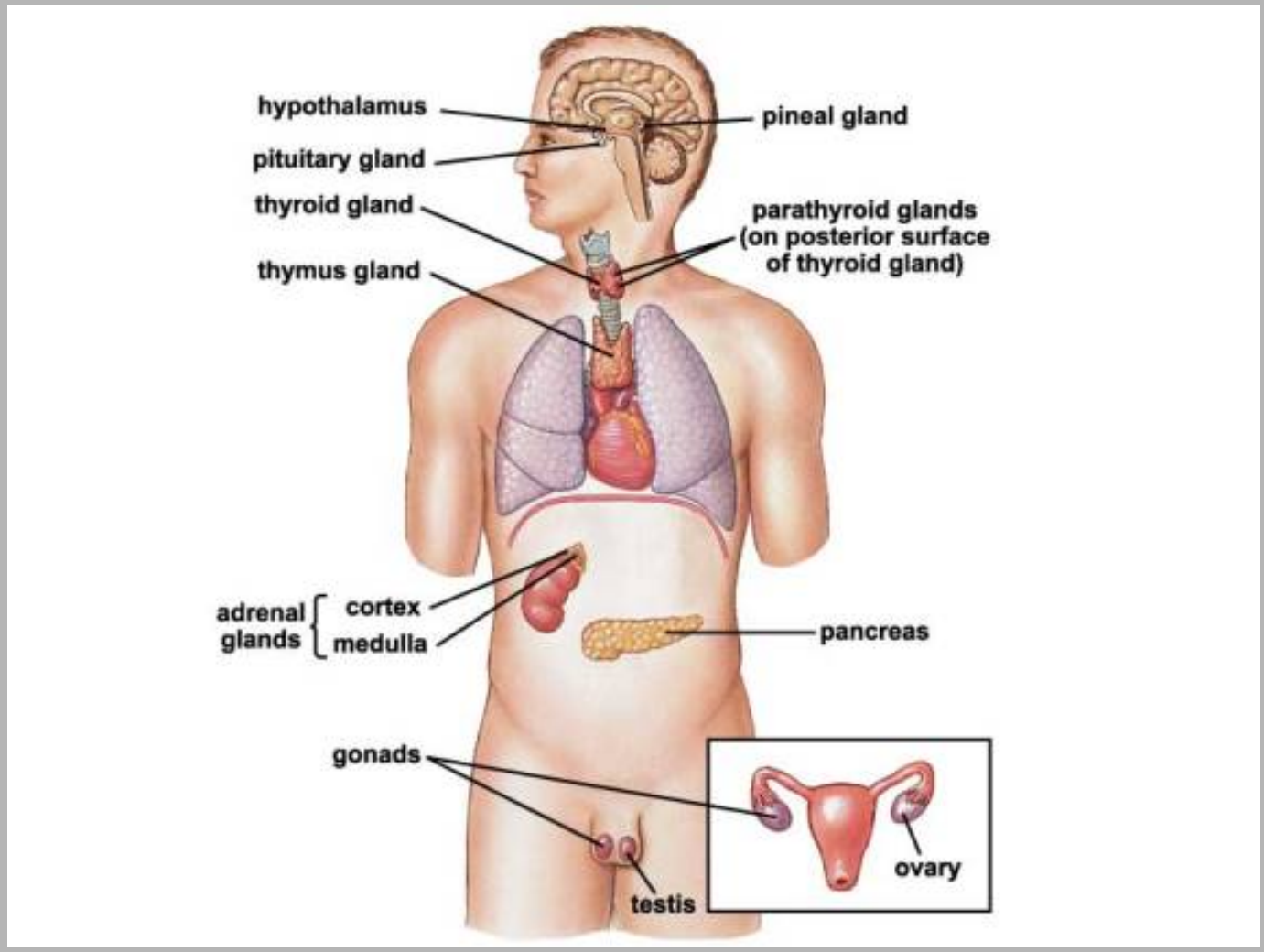

HORMONES AND TARGET CELLS
Endocrine cells release hormone.
Hormone enters circulation.
Hormone is carried throughout the body.
receptor
Skeletal muscle cells
Binding occurs, hormonal effects take place.

Hormones

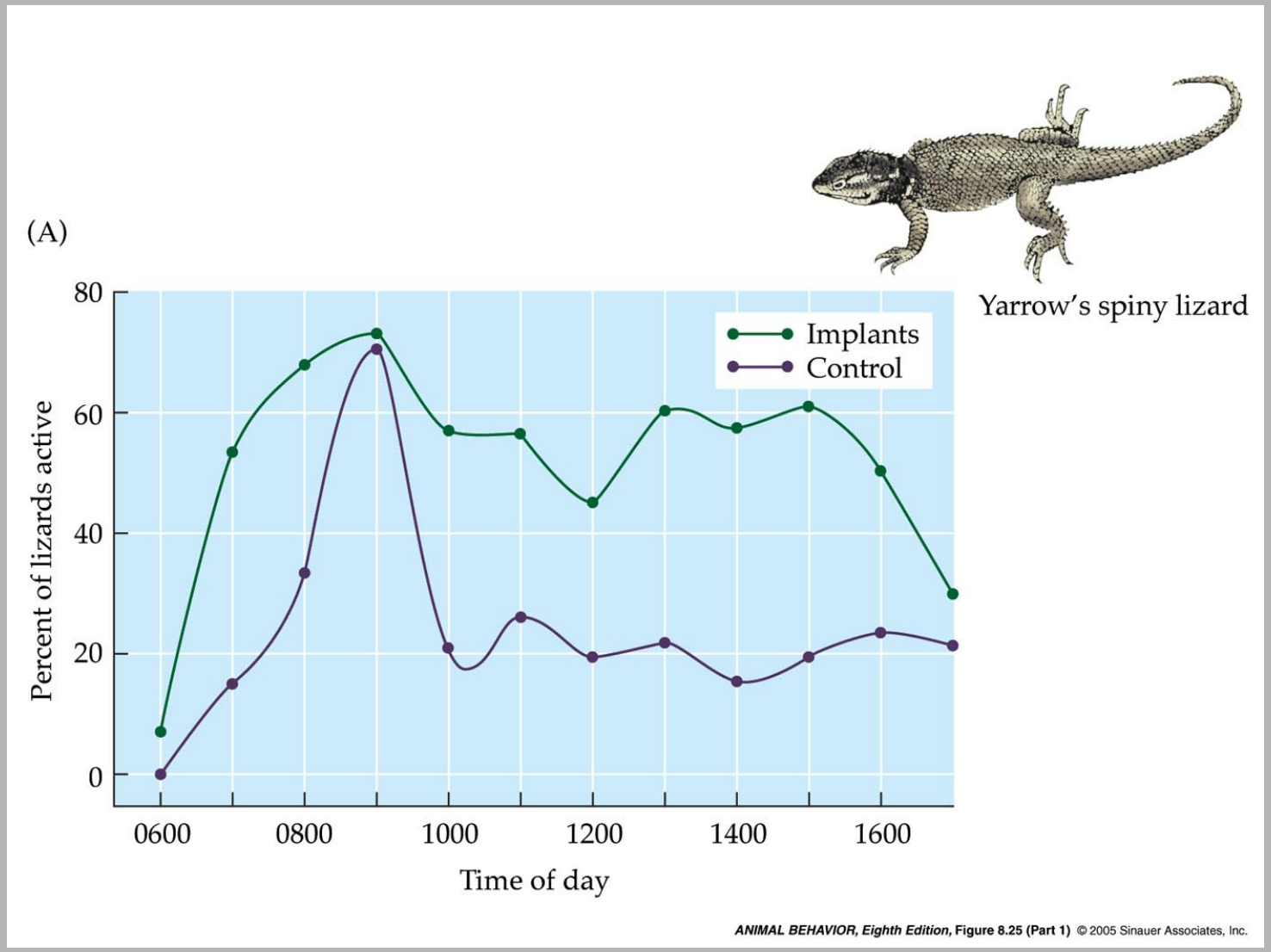


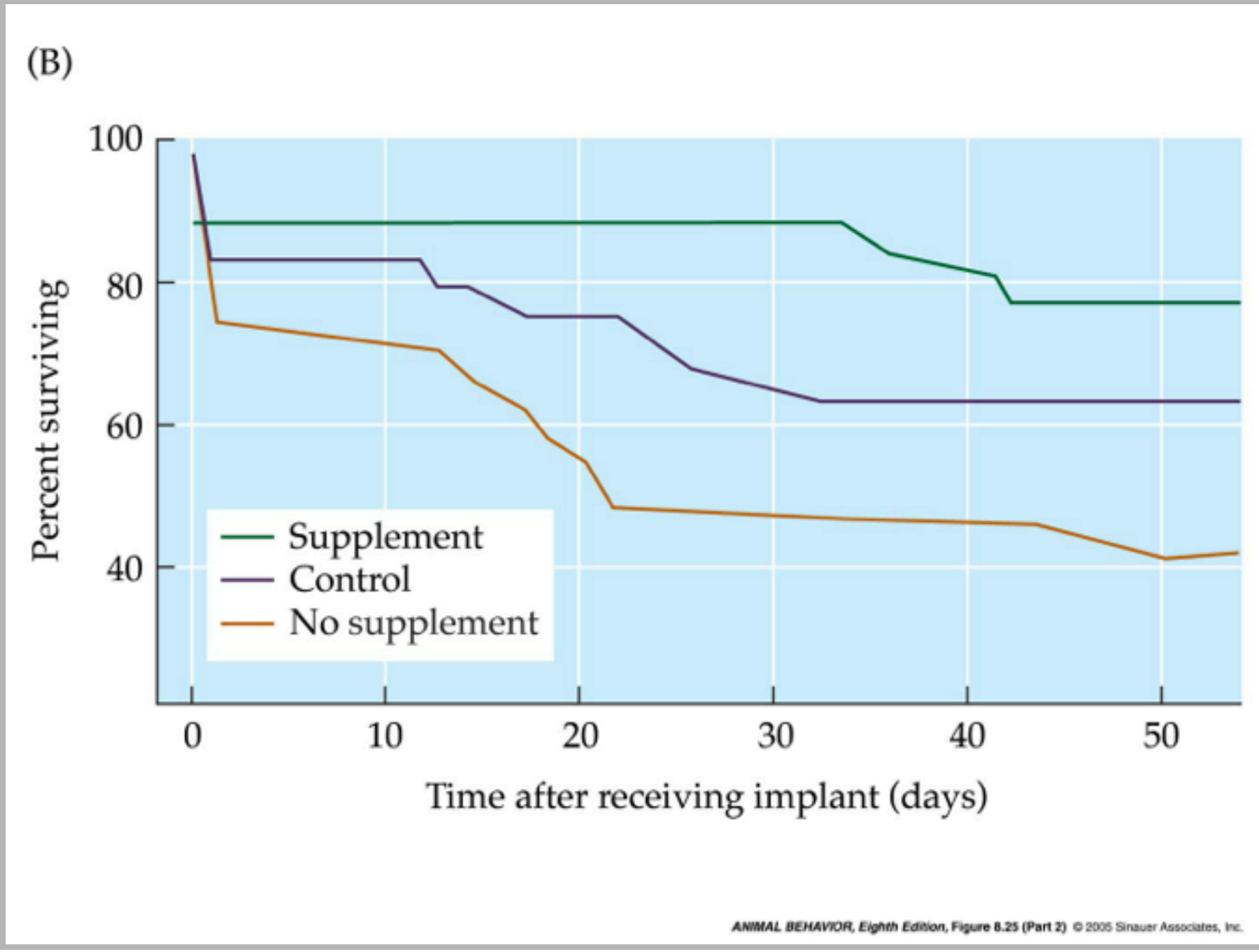
Know the hormones, targets, site of secretion from the reading!

Other Hormones



Hormone Example…





ANIMAL BEHAVIOR, Eighth Edition, Figure 8.25 (Part 2)