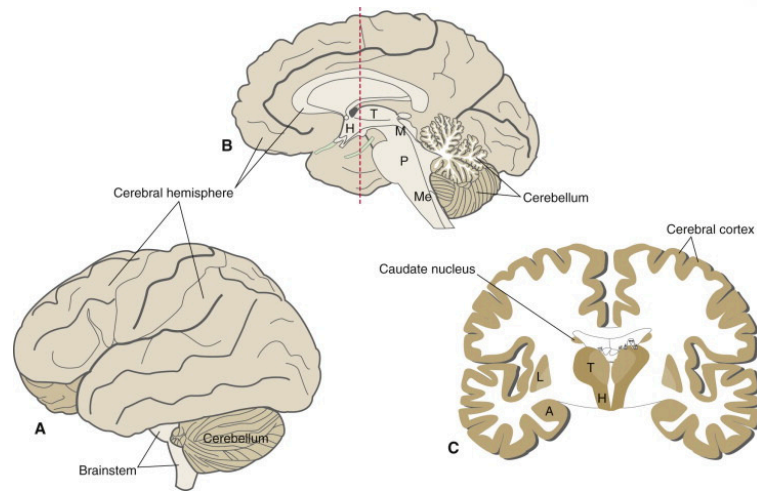


Neuroanatomy and Neurophysiology

GENERAL ORIENTATION

[2]

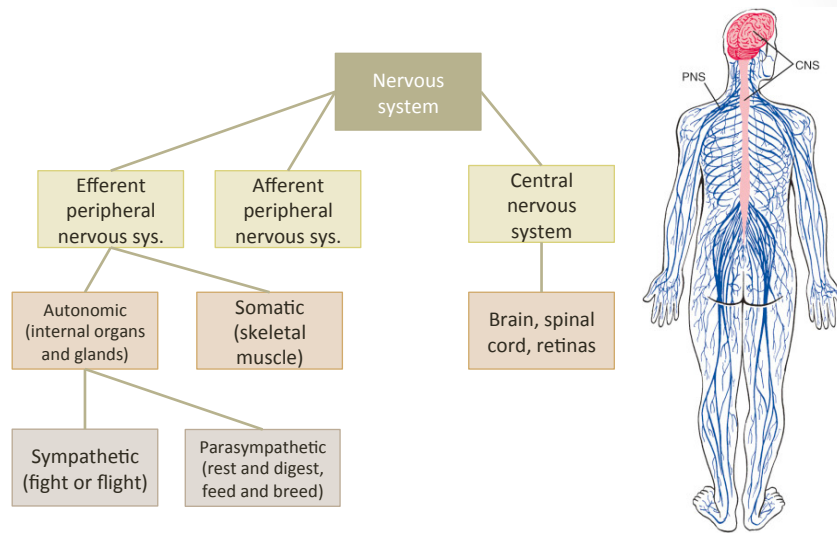
Nervous system



Nolte

[3]

Divisions of the nervous system



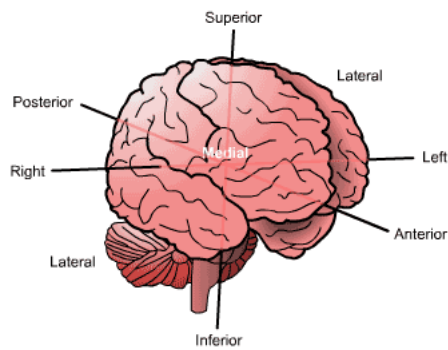
Vanderah

Where might neural engineers want to tap in?

[4]

Directions

Figure AB-5: Directions



- Dorsal – ventral
- Superior – inferior
- Anterior – posterior
- Rostral – caudal
- Lateral – medial
- Distal – axial
- Ascending – descending
- Afferent – efferent
- Contralateral – ipsilateral

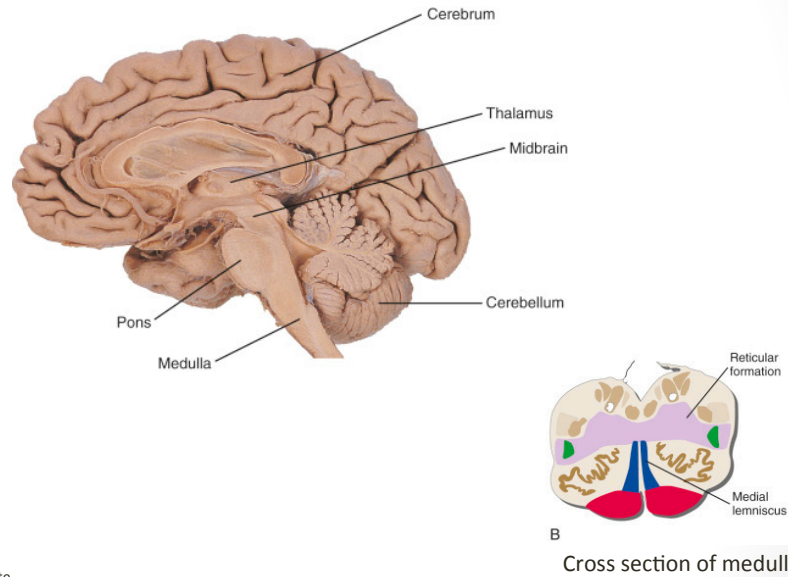
Stanford Huntington's Outreach Project

[5]

MAJOR DIVISIONS

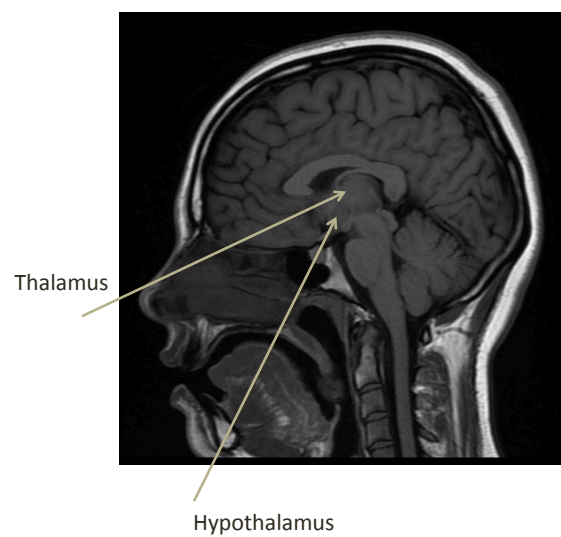
[6]

Brainstem and midbrain



[7]

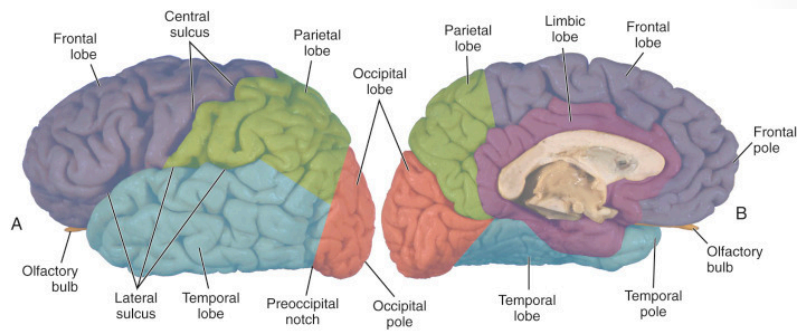
Thalamus and hypothalamus



[8]

Gaillard

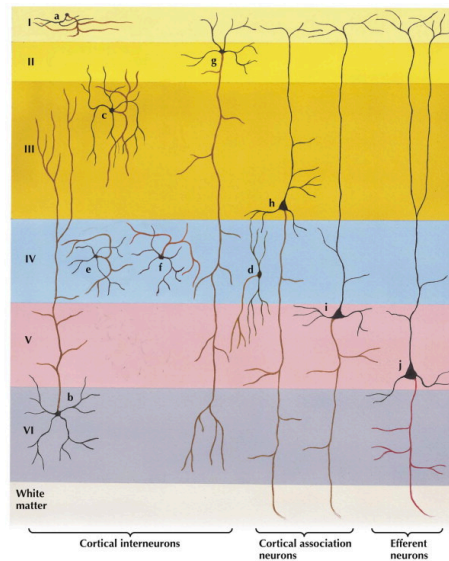
Neuranatomy – cortex



[9]

Vanderah

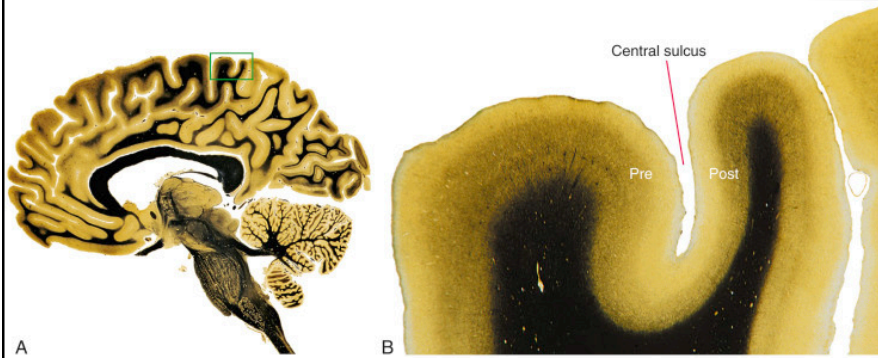
Layers



[10]

Jones

Sulci and gyri

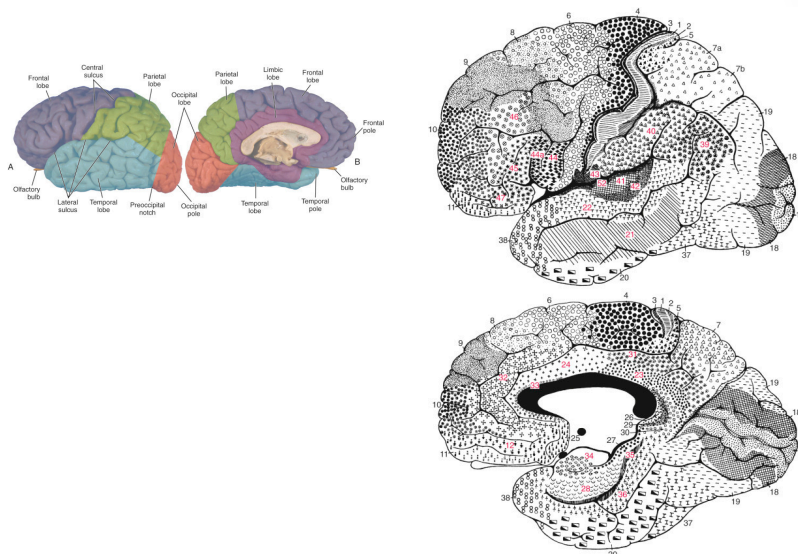


- Gyri and sulci are same positions in all typically-developing individuals
- Wrinkles add surface area

(11)

Vanderah

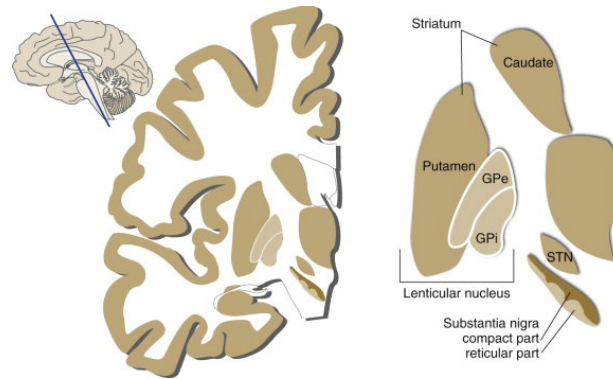
Smaller divisions



(12)

Vanderah, Brodmann

Neuroanatomy – basal ganglia



Major components

- Caudate
- Putamen
- Globus pallidus
- Substantia nigra

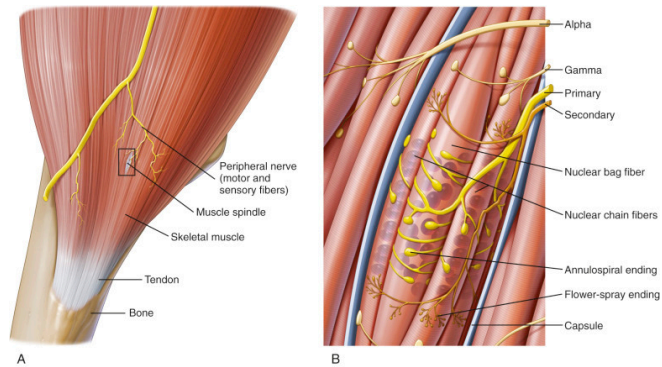
Nolte

[13]

TARGETS FOR NEURAL ENGINEERING

[14]

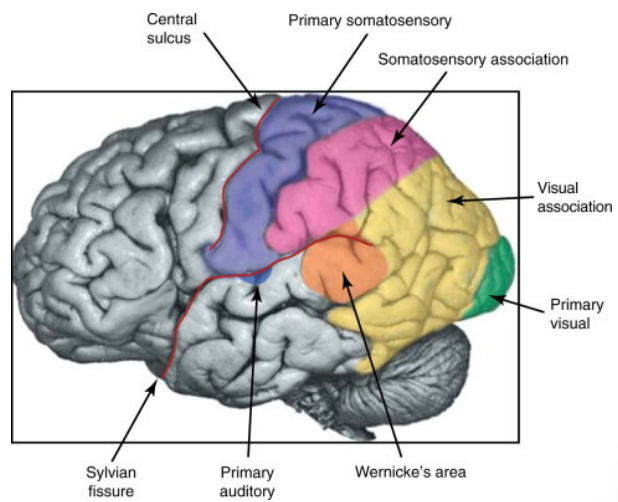
Motor systems



[15]

Vanderah

Sensory systems



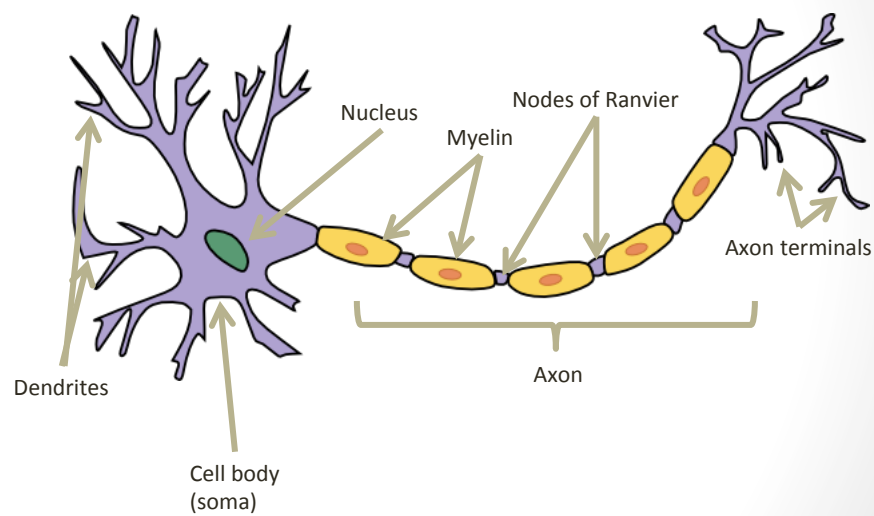
[16]

Squire

NEUROPHYSIOLOGY AND NEURONS

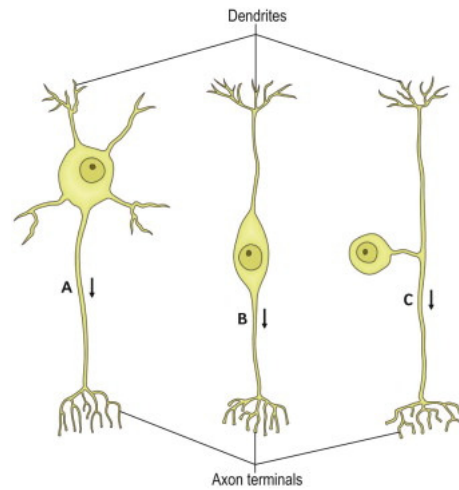
[17]

Neurons



[18]

Types of neuron

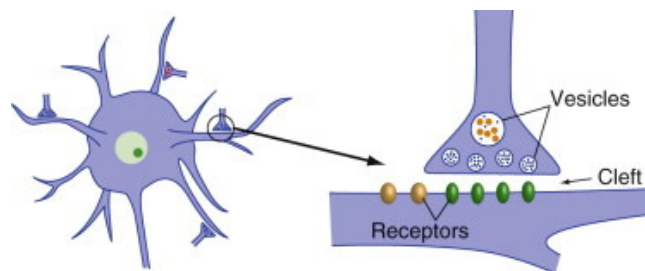


- A Multipolar
- B Bipolar
- C Unipolar

Crossman

[19]

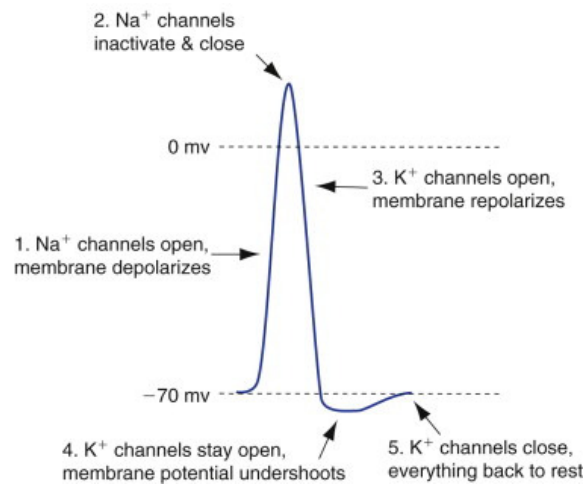
Synapses



[20]

Nolte

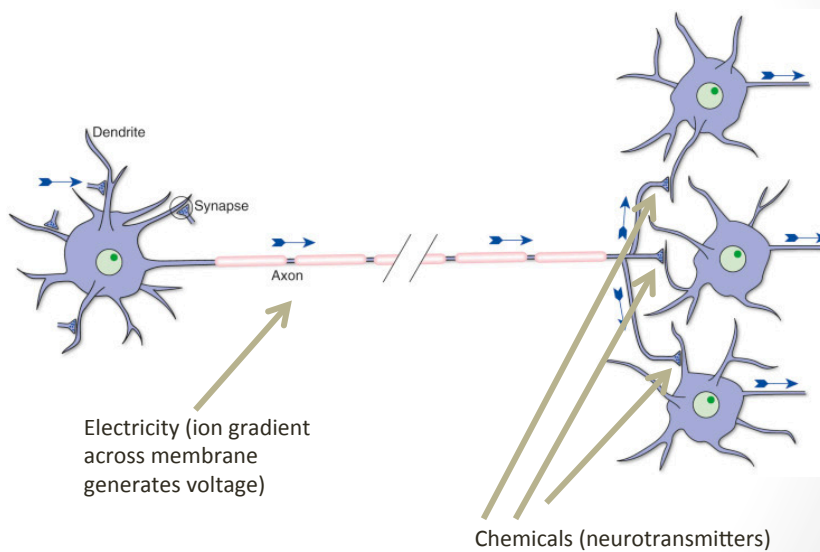
Action potential



Nolte

[21]

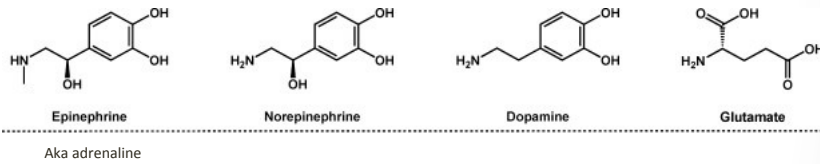
Chemicals and electricity



Vanderah

[22]

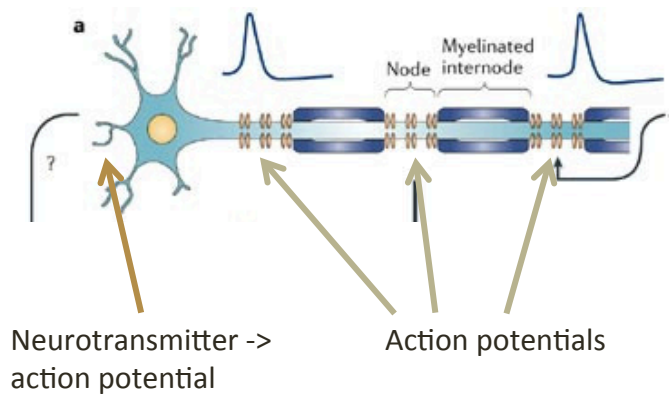
Neurotransmitters



(23)

Hettie 2014

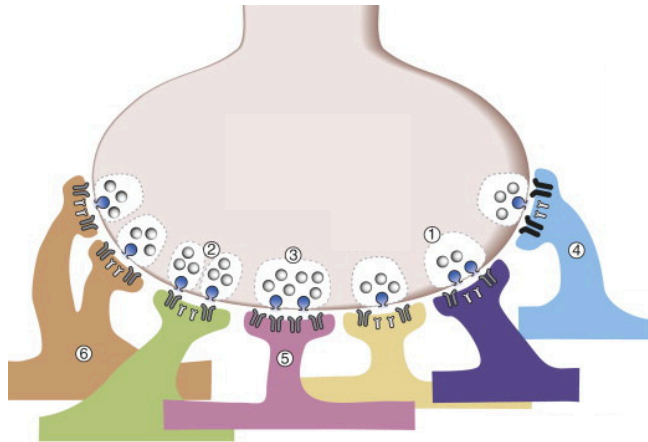
Myelin



(24)

Waxman 2006

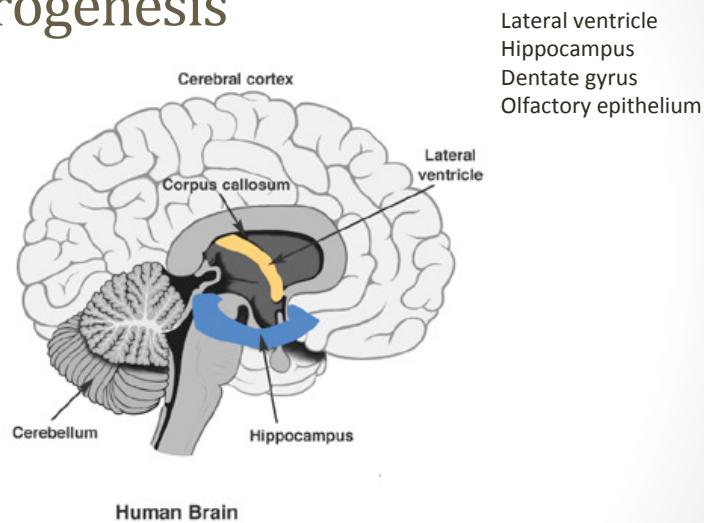
Synaptic plasticity



Squire

[25]

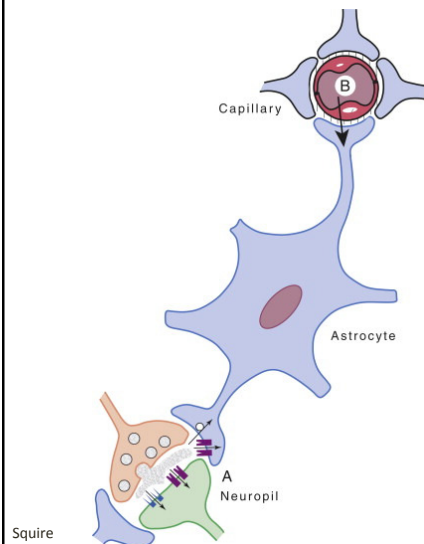
Growing a neuron – adult neurogenesis



NIAAA

[26]

Glia – support and defend



- Pros:
 - Defends brain from infection
 - Feeds neurons
 - Clears out waste
 - Protects brain from foreign bodies
 - Blood-brain barrier
- Cons:
 - Blocks helpful drugs
 - Still requires constant blood supply (stroke)
 - Forms scars and tissue blockade
- Neural engineering consequences?

(27)