
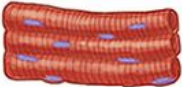
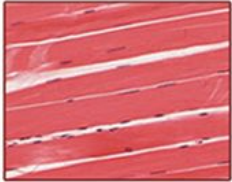





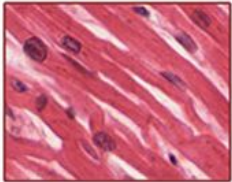


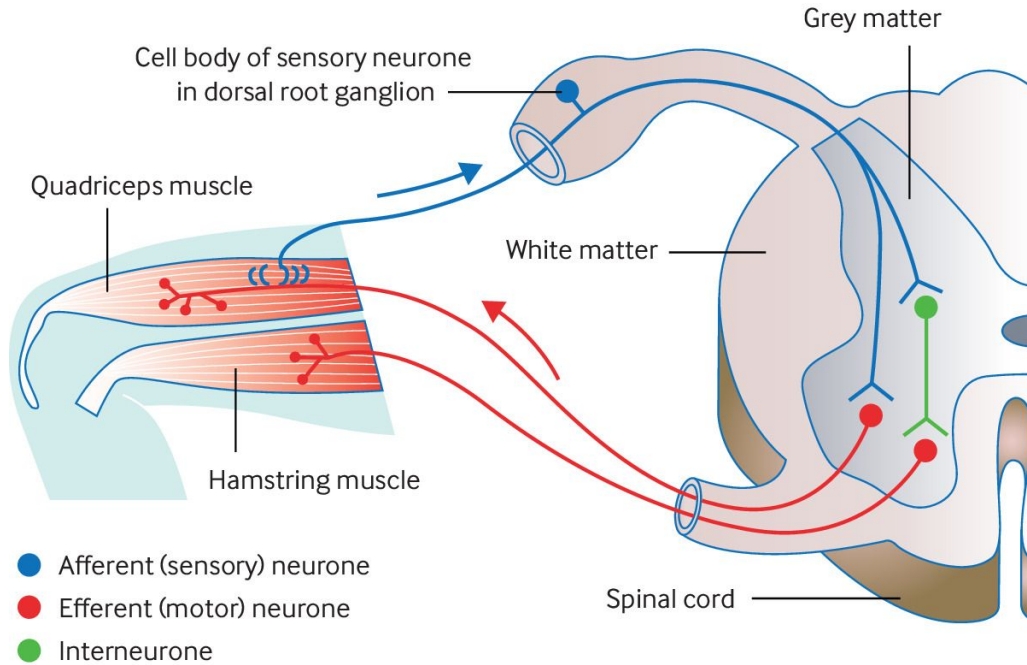
COGS 17 WEEK 7

WINTER 2024, A04

3 TYPES OF MUSCLES

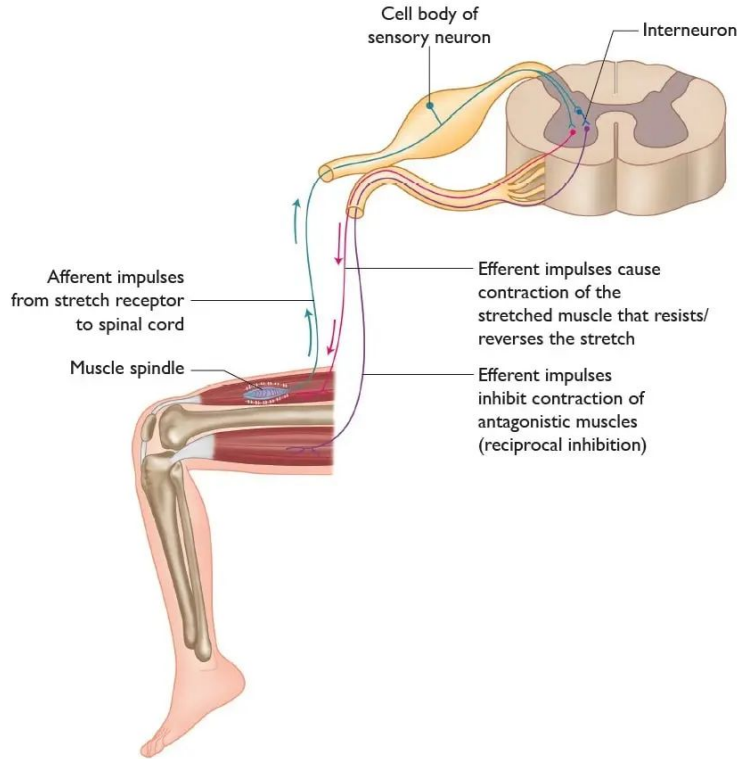
	Main features	Location	Type of cells	Histology
Skeletal muscle	<ul style="list-style-type: none">- Fibers : striated, tubular and multi nucleated- Voluntary- Usually attached to skeleton			
Smooth muscle	<ul style="list-style-type: none">- Fibers : non-striated, spindle-shaped, and uninucleated.- Involuntary- Usually covering wall of internal organs.			
Cardiac muscle	<ul style="list-style-type: none">- Fibers : striated, branched and uninucleated.- Involuntary- Only covering walls of the heart.			

REFLEXES



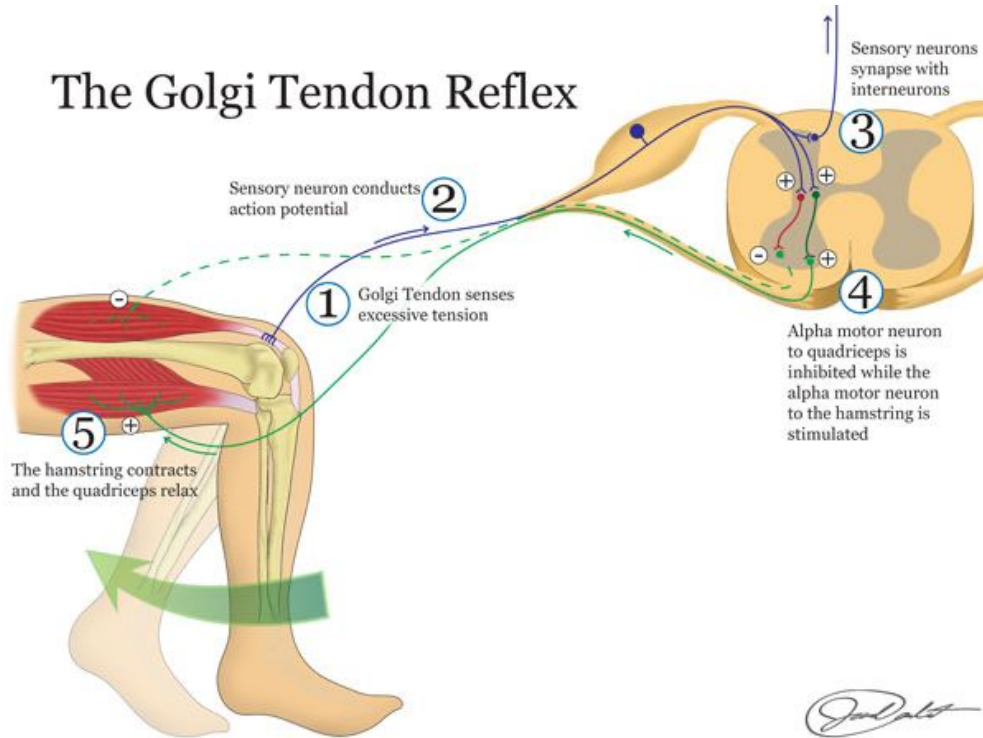
- Most involve Spinal Cord circuits (i.e. without brain participation)

STRETCH REFLEX



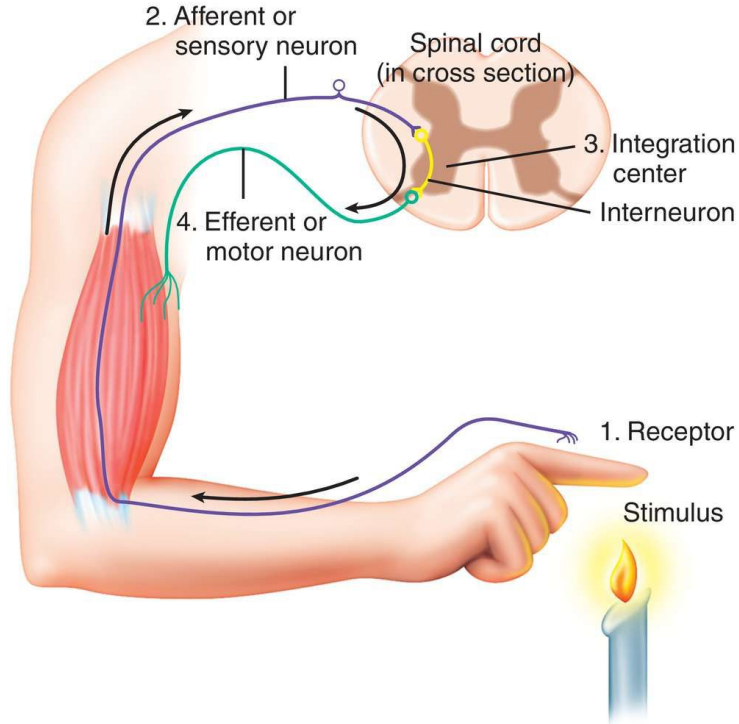
- Proprioceptors called Spindles in muscle detect passive stretch of muscle
- Axon of Spindle to Spinal Cord, excites Motor Neuron back to same muscle, contracts to counter stretch

GOLGI TENDON REFLEX



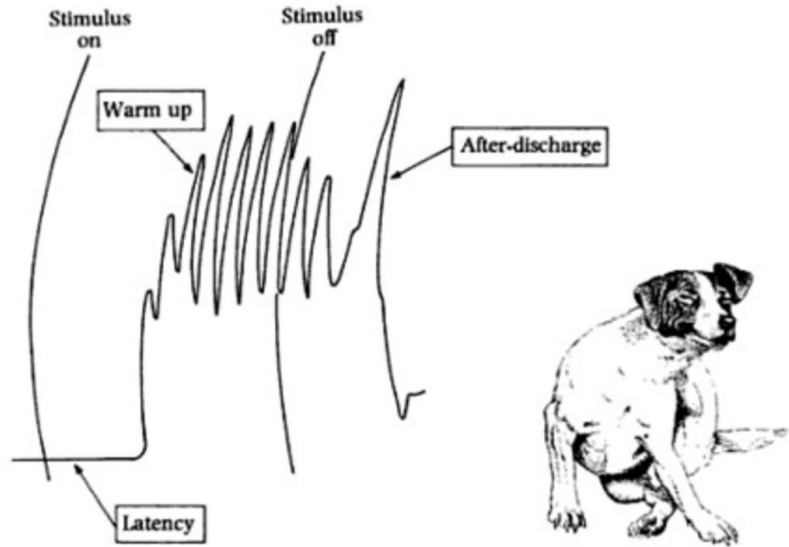
- Proprioceptors called Golgi Tendon Organs in tendons detect intensity of muscle contraction
- If contraction is too strong (threatens to tear muscle apart) sends signal to Interneurons in Spinal Cord that inhibit the Motor Neurons causing that contraction, lessening their rate of firing

PAIN WITHDRAWAL REFLEX



- Stimulated Nociceptors signal Interneurons in Spinal Cord to excite Motor Neurons that synapse back onto relevant Flexor muscles to move body part away from noxious stimulus
- Signals sent along myelinated Motor Neurons reach muscle **before** Pain signal even reaches brain

SCRATCH REFLEX



- An Oscillator Circuit
- Rate is relatively fixed, mediated by Spinal Cord
- Such Oscillator circuits, produced by Central Pattern Generators, in Cord, Cerebellum, & elsewhere, in humans probably involved many learned “motor programs” including dance, speech, writing, etc.

INFANT REFLEXES

Tonic
neck
reflex



Grasp
reflex



Step
reflex

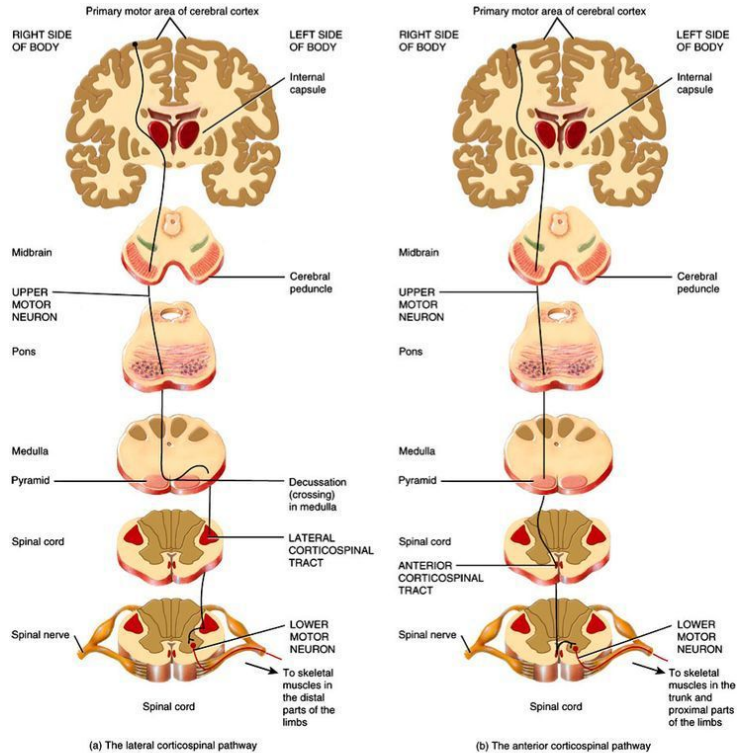
Crawl reflex



 ADAM.

- These can reappear in drunken (or brain damaged) adults in part mediated by Cerebellum

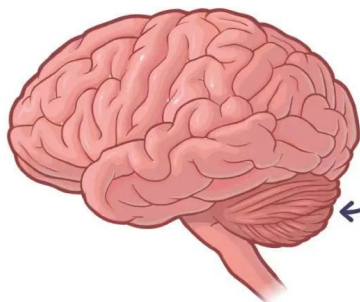
MOTOR PATHWAYS



- Corticospinal (“Pyramidal”) Tracts -- mainly to contralateral periphery, crossover at Pyramids of Medulla
- Ventro-Medial Tracts -- Mainly for bilateral midline control (both sides of central body & coord'd limbs)

CEREBELLUM

CEREBELLUM = "LITTLE BRAIN"

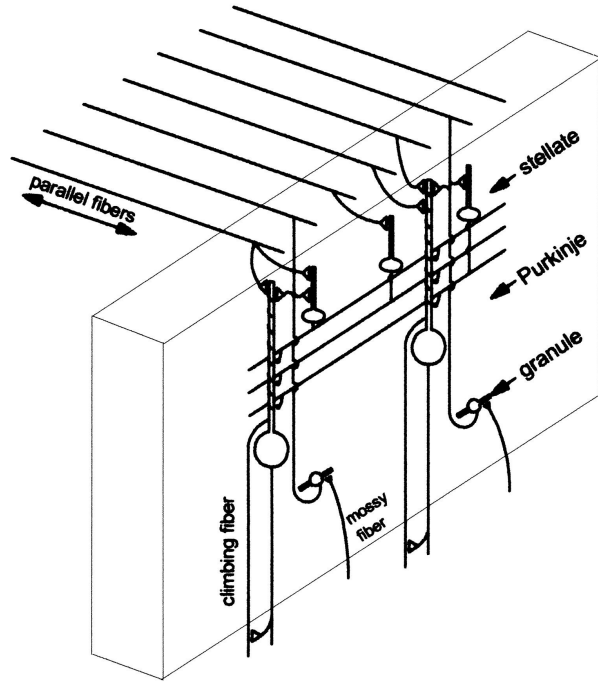


CEREBELLUM

- * COORDINATES MOVEMENTS
- * CONTROLS POSTURE, BALANCE & FINE MOTOR MOVEMENT
- * INVOLVED IN MOTOR LEARNING

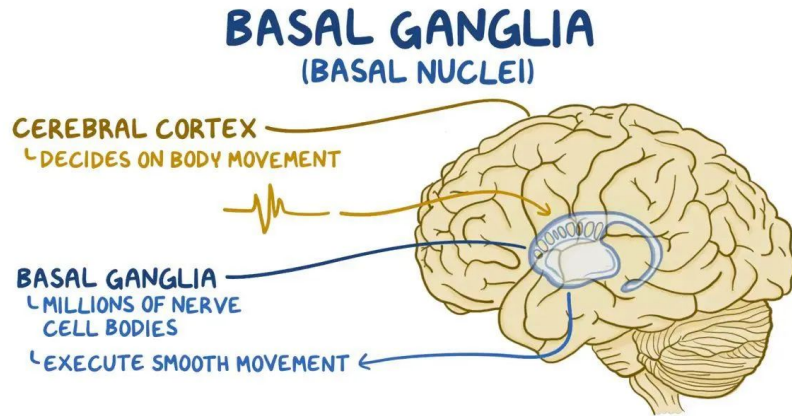
- 13% of brain mass, contains more neurons (~50 billion) than rest of brain combined
- For rapid, coordinated and/or ballistic movements requiring precise aiming and timing
- Receives proprioception from Spinal Cord & sensory info(esp Visual and Vestibular) via Cranial Nerves
- Projects to all major motor structures in brain; Including Ventrolateral Thalamus (VLN) to Cortex

CEREBELLUM



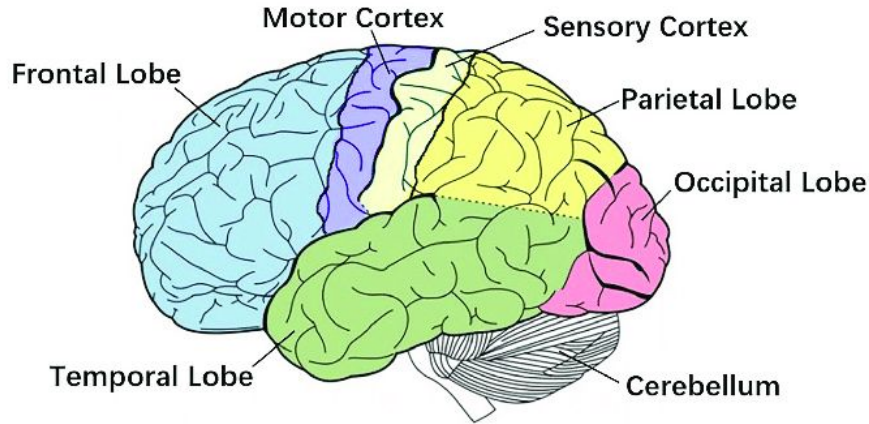
- In Cerebellar Cortex, Parallel Fibers like wires along long rows of “telephone poles” called Purkinje Cells
- Action potentials in Parallels travel along, exciting Purkinjes, who send Inhibition down to Deep Nuclei
- Deep Nuclei, when released from Inhibition, spontaneously command motor nuclei in brain
- Timing of such outputs is coded per distance the signals travel along the Purkinjes

BASAL GANGLIA



- Organizes Behavior, esp (tho not only) learned, task-based sequences
- Involved in direction and amplitude of slow, smooth-changing, voluntary movements (e.g. posture, walking)
- May also be implicated in “automating” complex sequential processes (e.g. driving) & in “selecting” use
- Pathology includes Parkinson’s Disease

MOTOR CORTEX



- Primary Motor Cortex in Frontal Lobe on Precentral Gyrus just anterior to Central Sulcus
 - Includes topological “Map” of body;
 - No direct connection to muscles, but send commands to Motor Neurons in Brain Stem and Spinal Cord
- Secondary Motor Cortex involved in Planning movement, which includes:
 - Premotor Cortex in Frontal Lobe anterior to Primary Motor Cortex
 - Supplementary Motor Cortex in Frontal Lobe anterior to Primary Motor & dorsal to Premotor Cortex

QUESTIONS?

Office Hours: Mon 5-6 pm

To get the section slides:

https://github.com/JasonC1217/COGS17_A04_Wi24

OR:

