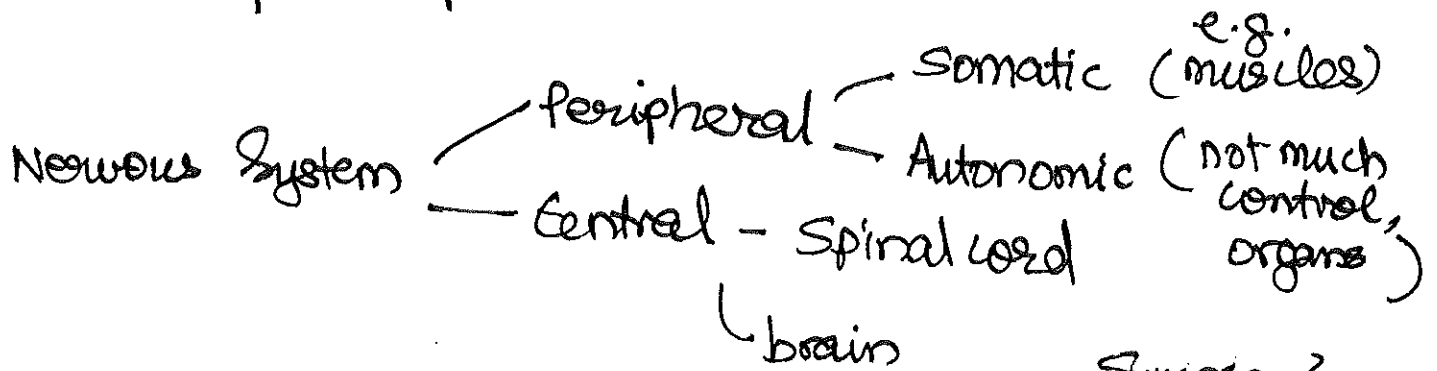


Lecture 2

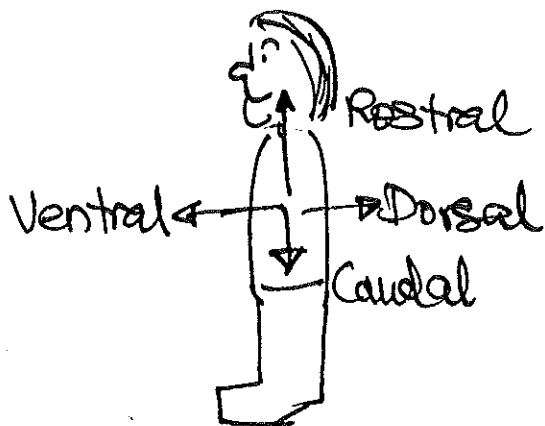
Anatomy of brain, spinal cord, ~~muscle~~ (direction, insertion, myofibrils) P1

muscle sensors, skin sensors.

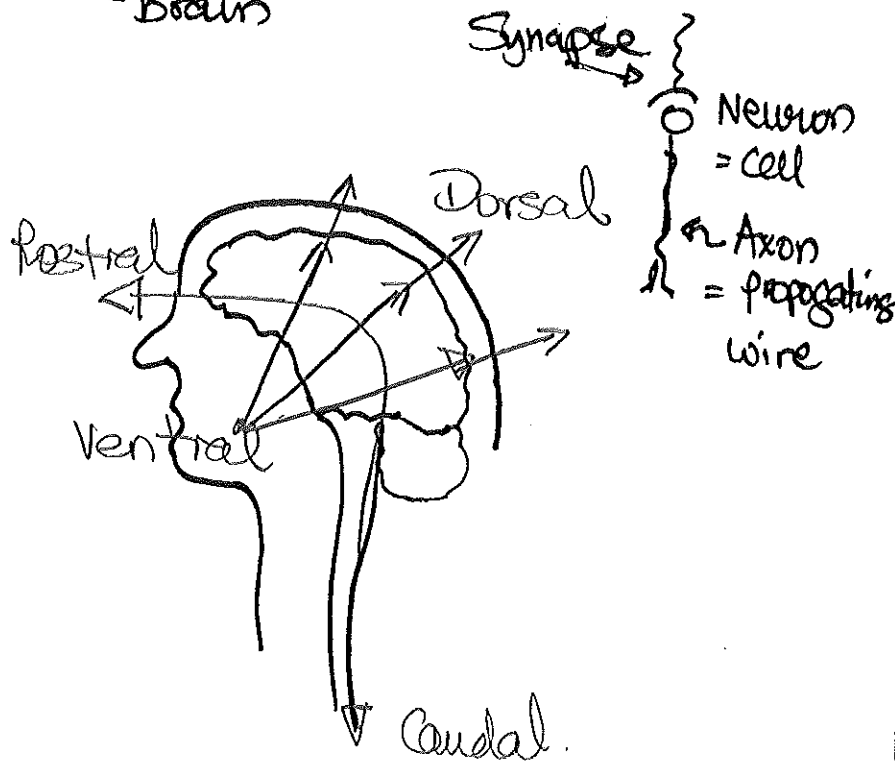
Somatotopic representation



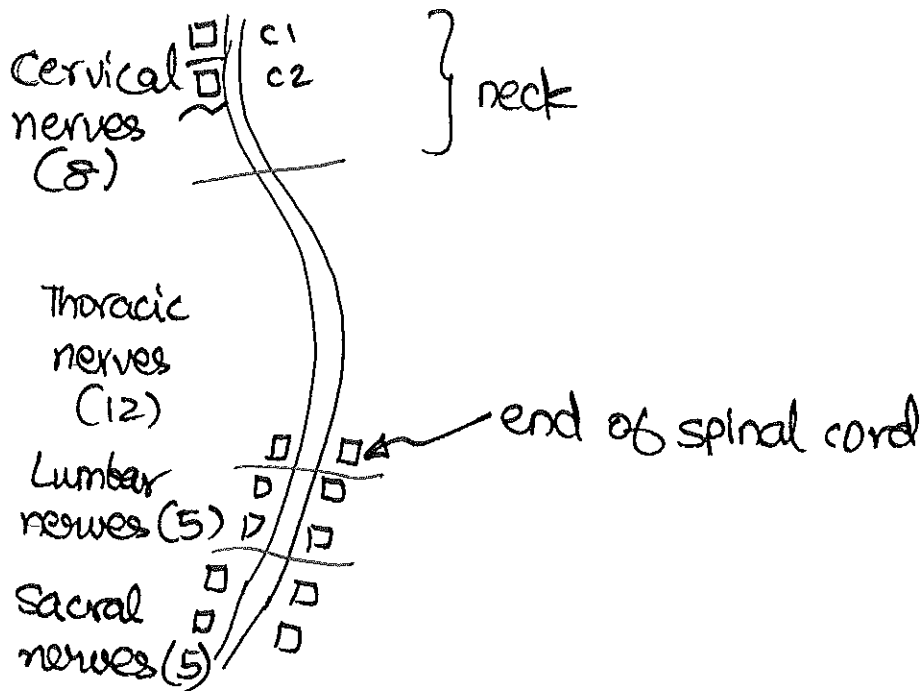
Orientation



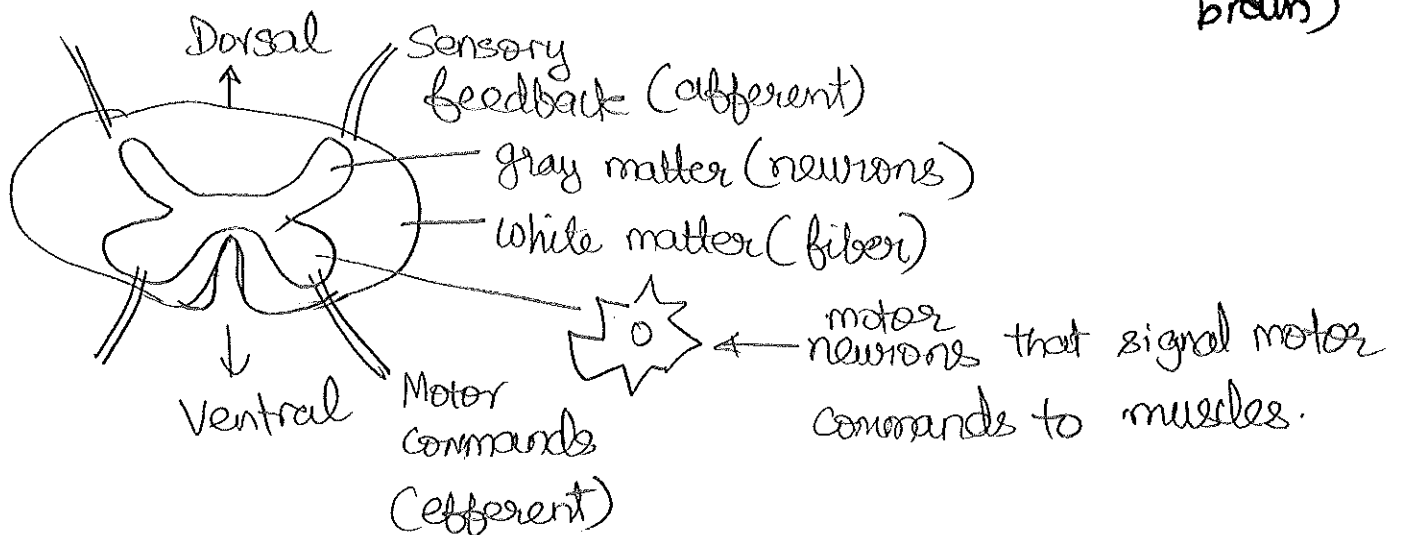
Spinal cord.



Spinal cord

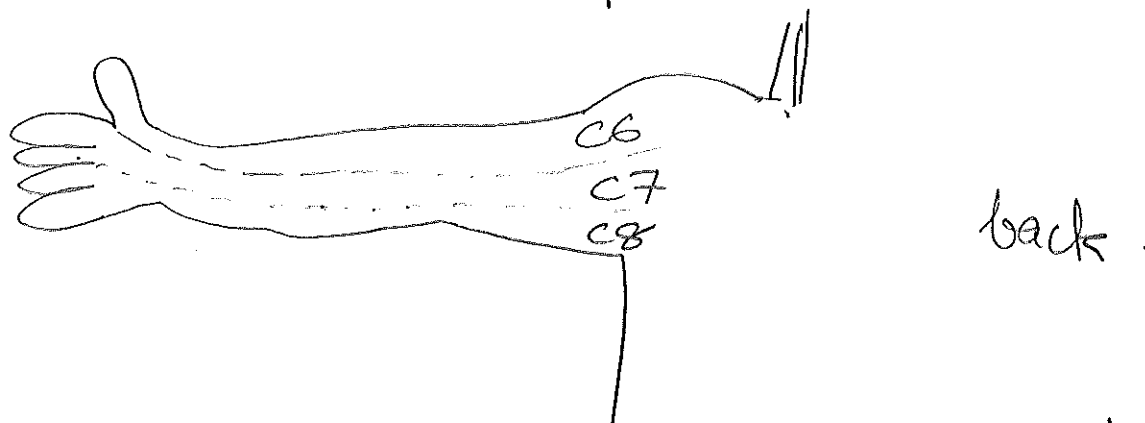
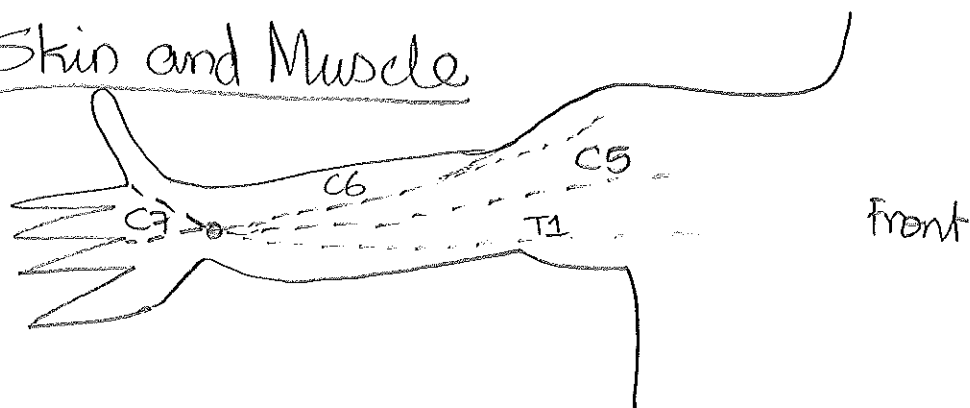


- Ascending / Descending signals
- Afferent / Efferent pathways (nerve fibers)
 - De-afferented (can move but no feedback reaches brain)



Interneurons — neurons that are in between connections

Skin and Muscle

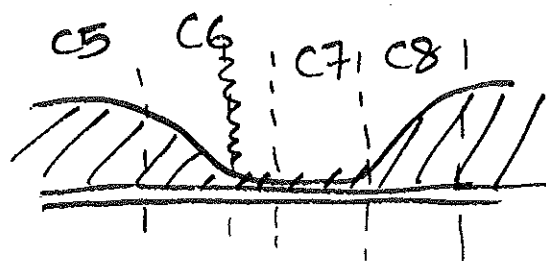


Quadriplegic - injuries higher than C4 paralyzed on both arms & legs.

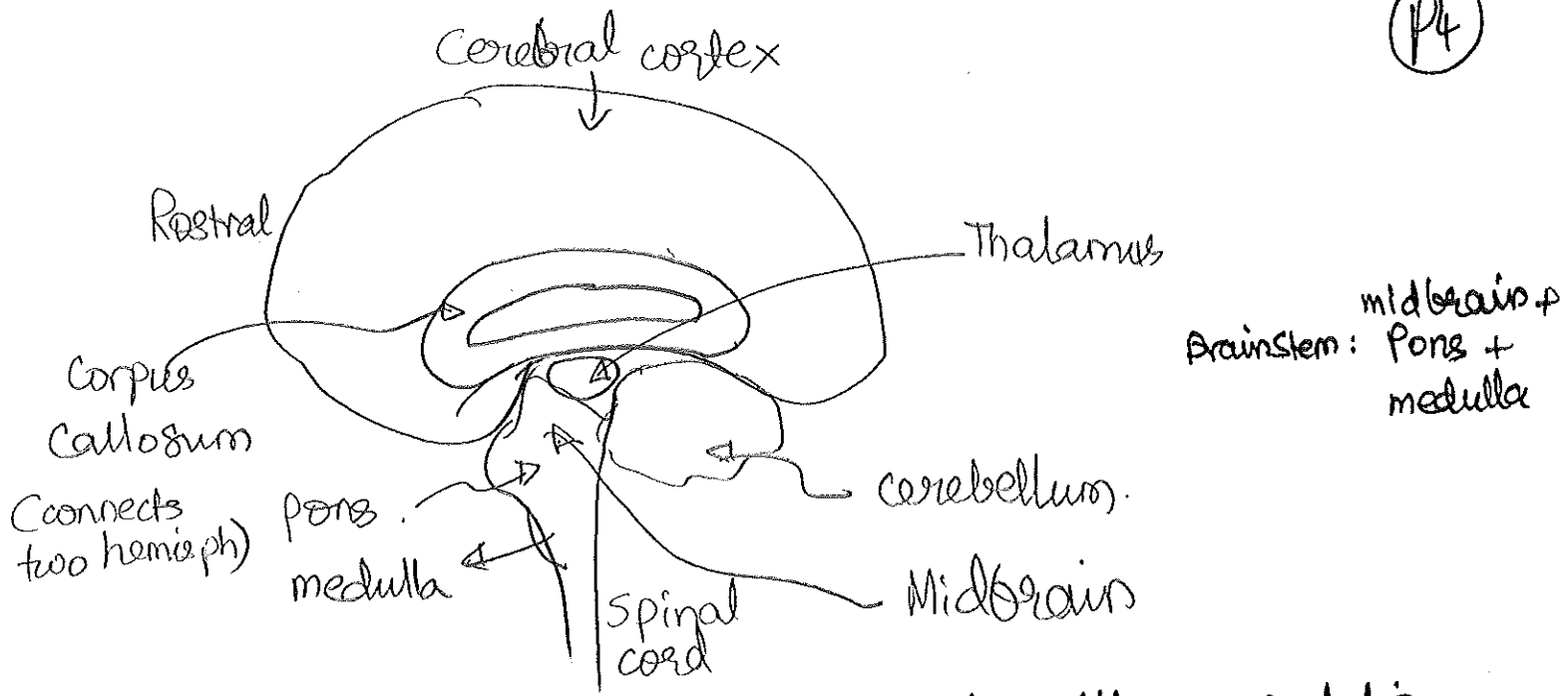
Paraplegic - Injuries lower than T2
Paralyzed legs & maybe torso.

In between - a variety of deficits in the upper limbs.

Usually injuries are not clearly defined in one area



Large individual difference



Medulla & pons: Lots of ascending/descending fibres + regulation of blood pressure & respiration.

Midbrain - contains basal ganglia which is ~~sent~~ ^{input} for reinforcement learning.

Lesions of BG: Slows voluntary movements
uncontrolled involuntary movements
Hard to initiate movements

Cerebellum: Heavily involved in motor coordination

Inputs { sensory input from SC
Motor signal from M1
Balance info from inner ears.

- coordinates the planning, timing, & patterning of muscle contractions

Lesions in cerebellum: Uncoordinated movements
Loose posture control

Thalamus - processes & distributes all (almost)

(P5)

sensory & motor info. going to the cerebral cortex

Cerebral cortex

wrinkled (evolved faster than cranium)



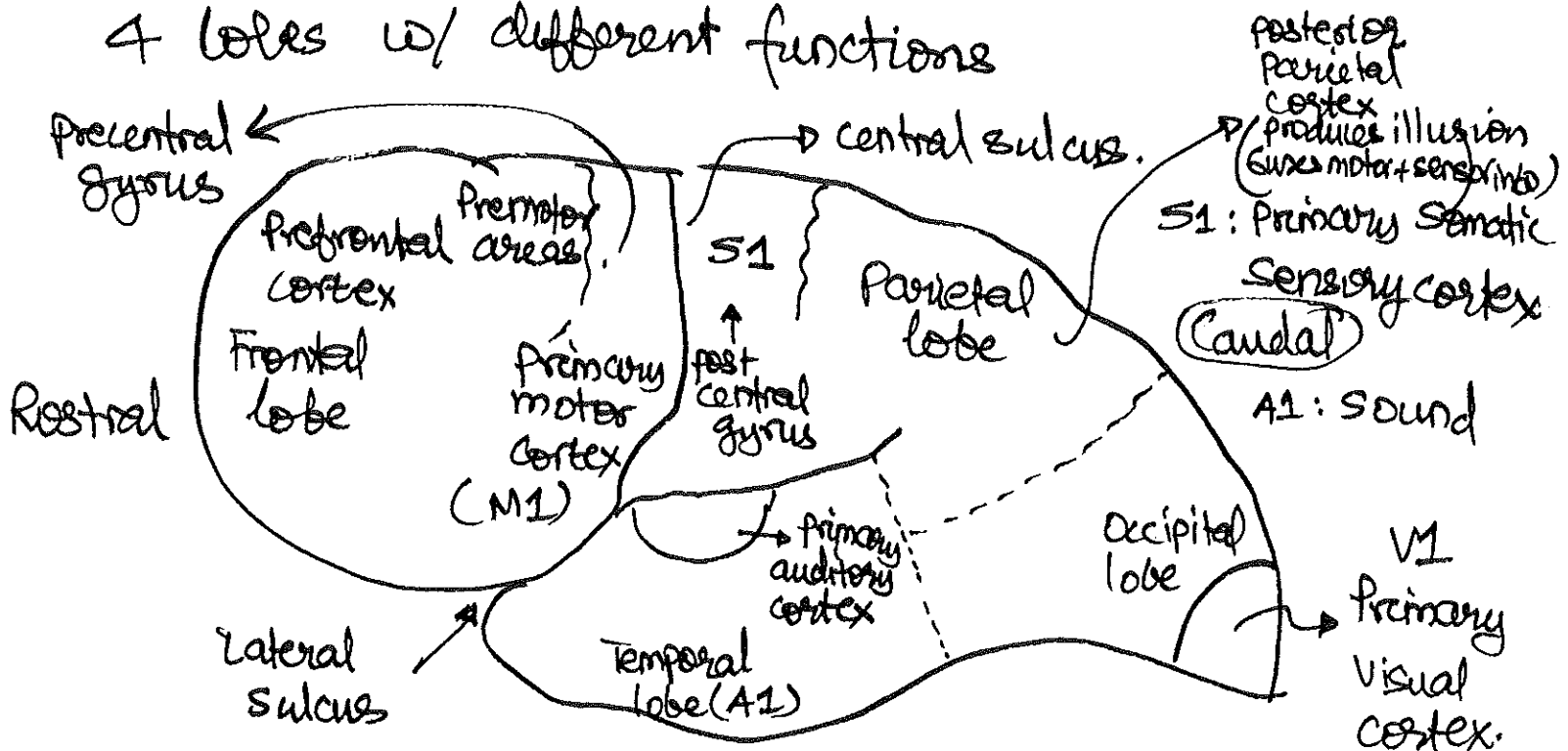
(one to note:

pyramidal cell has long axons)



- Most neurons on surface
- Grooves \Rightarrow Sulcus (sulci)
- Elevated region - gyrus (gyri)

4 lobes w/ different functions



Primary motor cortex (M1)

(p6)

- Some neurons project directly to the SC. → muscle control
- Others to brain stem first (coordination)

Primary somatic sensory cortex (S1)

- receive info from peripheral receptors w/ a few connections
- so as V1, A1

Pre Motor Areas - motor sequence planning

- projects to M1

relates to mvt. motivation?

Prefrontal Cortex - projects to PMA.

- planning voluntary mov.
- receives info from limbic sys.

Medial temporal lobe → Hippocampus, amygdala, basal ganglia

Posterior parietal cortex - projects to prefrontal, PMA

- receives info from S1, V1

* coordinate sensory info, perception for movt creation/production

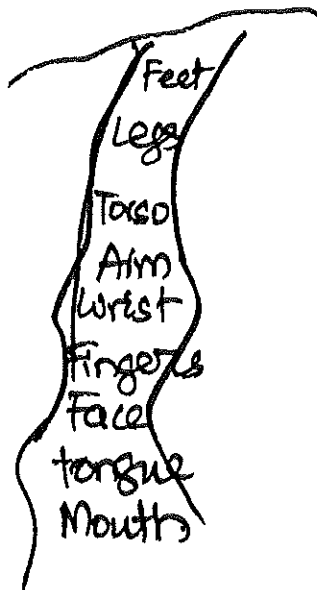
Neural pathways that connect thru CNS are never (p7)
tangled (topographically organized)

Example, In M1, index finger is next to middle next
to ring

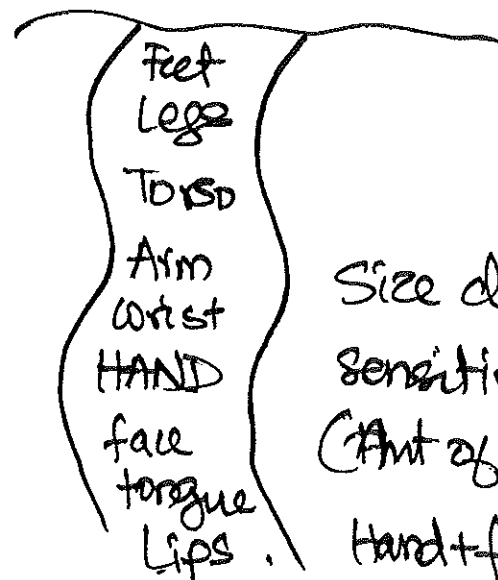
In V1, monkey w/ spiral visual feedback +
firing very similar.

Penfield (1960)

Motor map.



Somatotopic Map.



Size depends on
sensitivity
(Amt of innervation)
Hand + face = Large

Specific lesions \Rightarrow specific motor or sensory deficit.

Behavior deficit \Rightarrow location identification

One except to tangleness: Bilateral symmetrical cross-over

Left brain controls right body parts.

Right " " left " "

↳

contralateral side

Same side → ipsilateral

Where do they cross?

A few selected places: i.e. corpus callosum
connects 2 hemispheres

eg: motor pathways cross in brain stem

pain " " in SC.