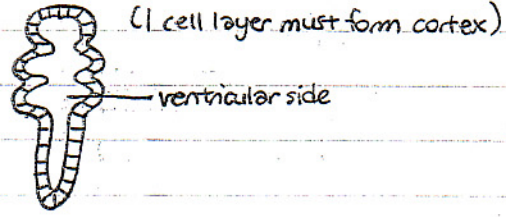


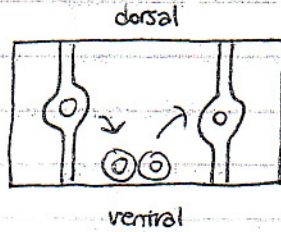
1. Cell migration: neural tube  $\rightarrow$  vesicles (single layer of epithelial columnar cells); have to migrate
  - in cortex
  - in PNS (neural crest cells  $\rightarrow$  entire PNS)



2. proneural genes & neurogenic genes (notch/delta pathway)

3. cell death (SD). neurons die from apoptosis

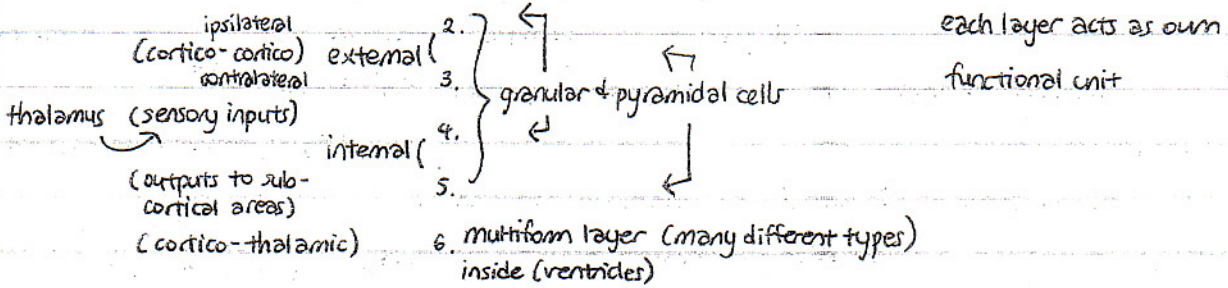
cortex cell migration:



cells attached to dorsal & ventral surfaces (8.5 day in mice)

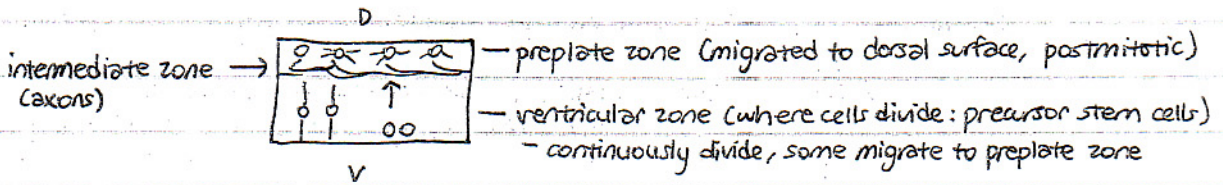
- cells detach from surfaces down to ventral, divide, migrate back up, form D/V connections again

- must make 6 different layers:
  1. molecular layer: many tracts

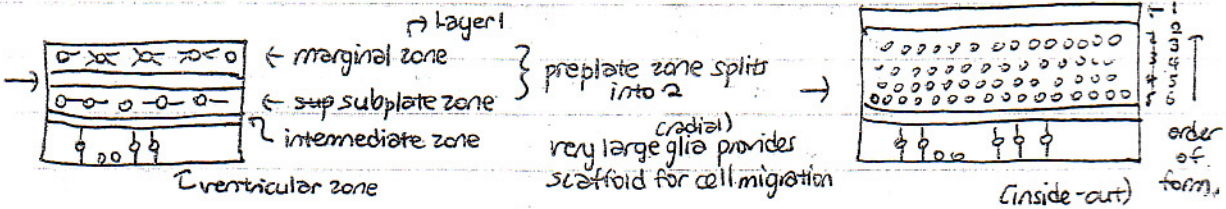


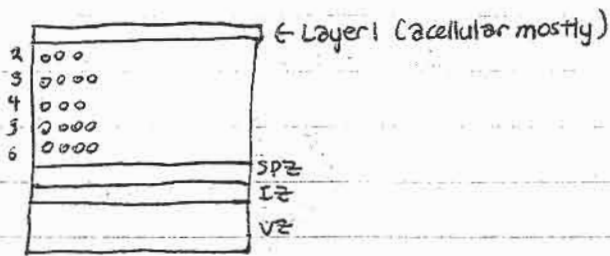
- in layer 4, visual & parietal areas have thick layer 4
- layer 5 in motor cortex very prominent (but little layer 4)

- day 10 in mice: formation of preplate zone (up to this point, dividing, pluripotent)



- day 12: cortical plate (where cortex will form)





- if label layer cells w/ GFP, put back in VZ:

- layer 6 cell from young animal w/ only 6, → migrates up to layer 2
- w/ older animal, layer 2 ~~animal~~ put in young animal, cell migrates up to layer 2 (no longer able to form younger layer 6 neuron): lost competence
- take 6, 5, 4 animal, put in very old animal, can go up to layer 2 (layer 4 cell)?  
(~~cell can't~~ young cell can in old animal can redifferentiate  
old cell in young animal can't redifferentiate)

younger cells can assume older cell fates, but not vice-versa

- happens w/ cell migration throughout entire brain

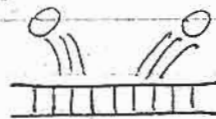
1. radial migration - cells born, migrate straight out ↑  
- cortex, hippocampus, cerebellum  
↳ 6 layers      2 layers (but same principles: divide & migrate outward)
2. mixed migration (radial & tangential) - retina, spinal cord ↔  
↳ eg w/ SHH in ventral spinal cord?

3. non-layered - in ganglia, eg, non-layered structure

- diencephalon, brainstem



ganglion structure



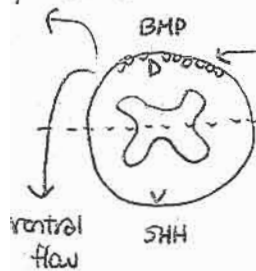
start as layer, migrate into different nuclei

PNS cell migration:

- somatic & autonomic nervous systems

↳ spinal cord

↳ sympathetic, parasympathetic, enteric nervous systems



early formation of sensory neurons: neural crest cells

(immediately migrate out: 2 paths, 1. ventral flow → PNS neurons, glia, 2. dorsal flow → melanocytes)

aorta secretes BMP7, turns into ? symp.



also neural crest cells here to form cranial neurons for sensory function

first: ventral stream  
then: dorsal flow

(if take dorsal cell & put back in ventral stream animal ... later)







proneural genes - drive neural competence

neurogenic genes - eg. notch + delta, E(Cadherin) (inhibitory)  
└─ turns off proneural genes

- if knock out, form way too many neurons
- refine expression of proneural genes to subset