

BRAIN EVOLUTION

segmentation as a means of evolving the nervous system

Replication

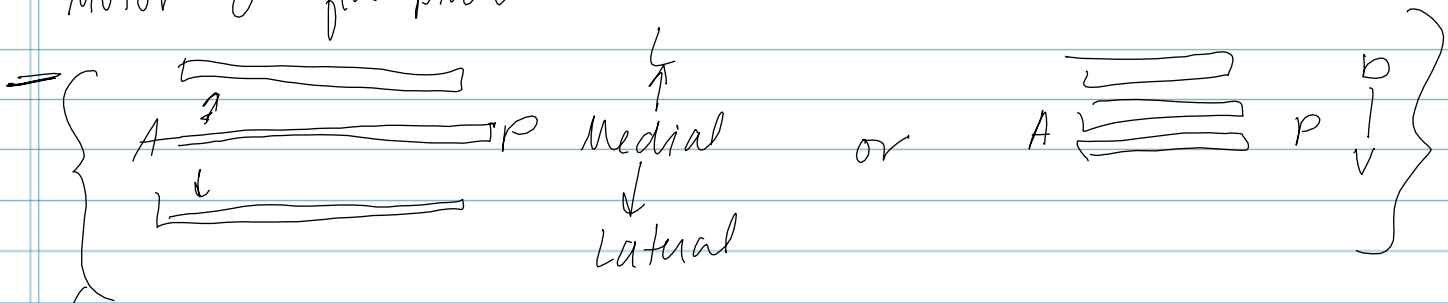
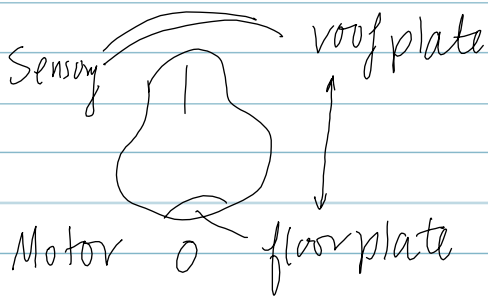
- how you get complexity out of simple structures

Bauplan

"Blue print"

patterning of neural tube

sonic hedgehog - notochord → floor plate



↳ "columnar" models - dominant hypothesis

- But: Segmentation along A → P

- Hox genes : homeobox gene
↳ contains a sequence



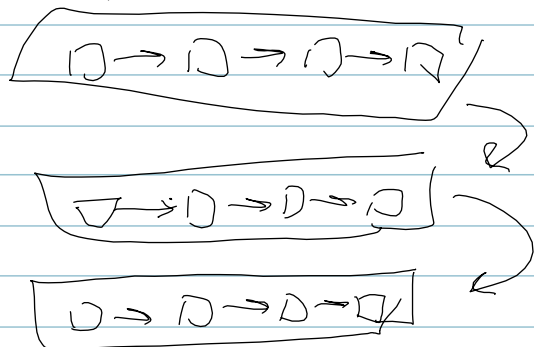
hox is a subclass of homeobox genes

- these are program initiators that are limited to a segment
- loss of function \Rightarrow legs as default
- gain of function \Rightarrow e.g. extra set of wings

SOMITES

dif. #s of replicant units

- whole chunk of chromosome replicated, 4x, from fly



- duplication vs split of chromosome

Justin \rightarrow 1, 2, 4 copies
 \downarrow
insects

kleosts \rightarrow 4 copies
redundancy

Neurometric Model \rightarrow replication is AP

not $D \rightarrow L$ or $M \rightarrow L$

- * segment of nervous system for every somite

BRAIN EVOLUTION

Rhombomeres

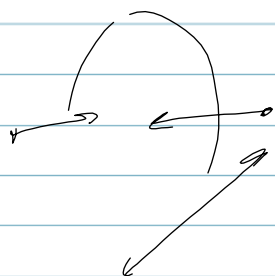
- restricted compartments
- 7 in the hindbrain
- gap junctions between each compartment
- becomes more segmented over development

2 processes

- hox genes ⇒ pattern a segment ↗ give identity to each compartment
- different set involved in replication ^{compartment} _{meri}
e.g. organizing structures.

cranial nerves

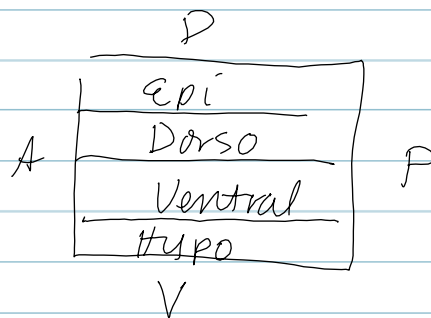
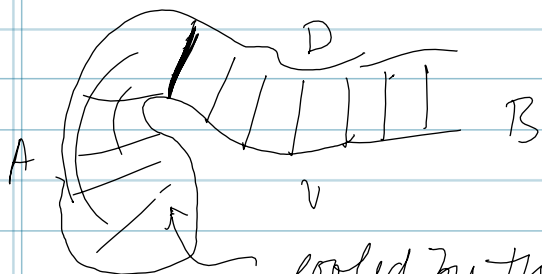
- linked to 1-2 rhombomeres



habenulum → not symmetrical

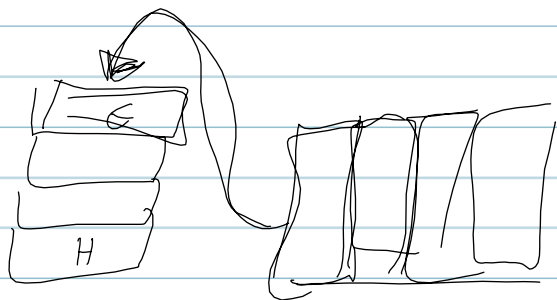
knockout hox in mouse, chick

comparing the models

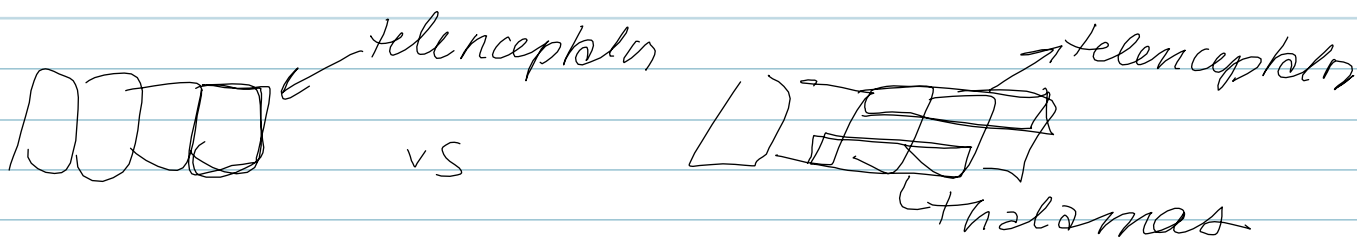


fooled by this link

BRAIN EVO



alternatives



Segmental scaffold - Figdor & Stern 1993
similar to prosomere model

- make a rhombomere have a tectum
"ectopic expression"

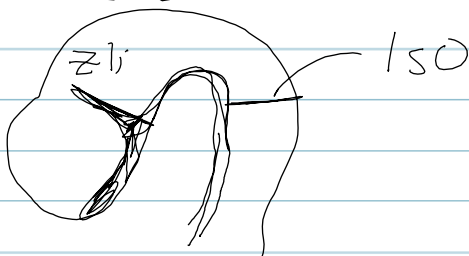
1, 2, 3 criterion

conservative Prosomere model

ganglionic emanences → all
inhibitory neurons come from
here, not very "compartmentalized"

neuromeres are not added thru out
vertebrate evolution

organizers



cortical
hem

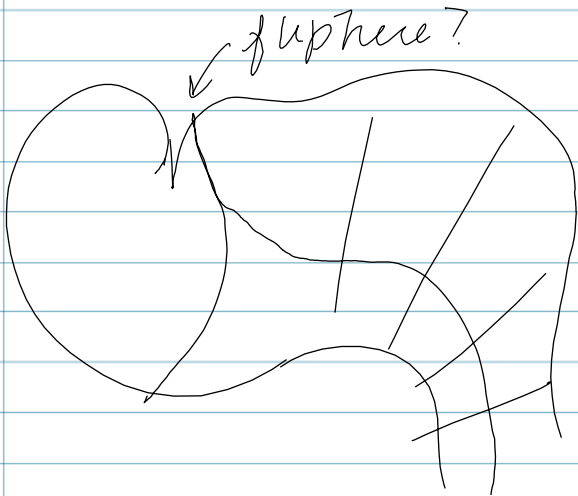
and anti-hem

Kiecker & Lumsden 03, 12

- Arash
 - how can this help w/ cortical plan?
 - sensory/motor exist in cortex?

Question

→ do inhibitory neurons
in thalamus migrate from
emmenca or w/in their own
compartment



when
does contral
ipsi flip happen

Puelles - visit