Cours du 17-10-2011

Nat Rev Neurosci
2008 vol. 9 (9) pp. 678-85

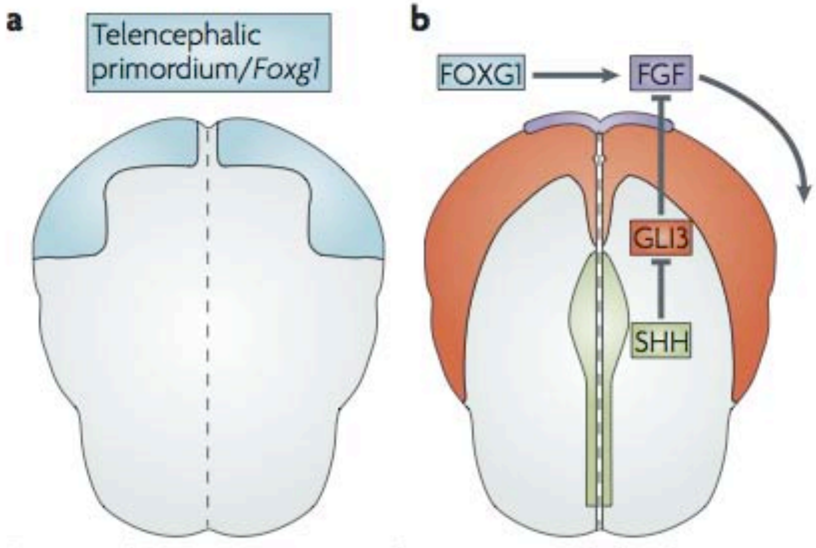
The genetics of early telencephalon patterning: some assembly required

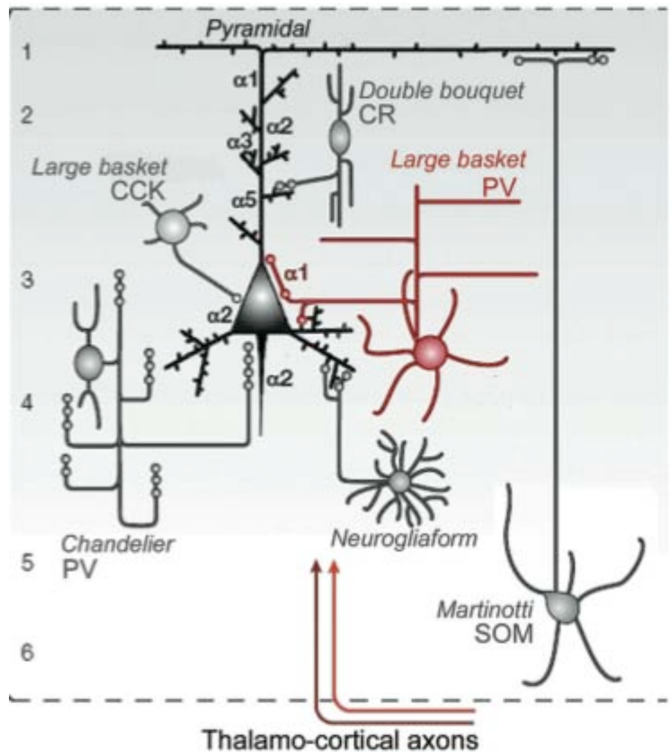
Hébert J, Fishell G

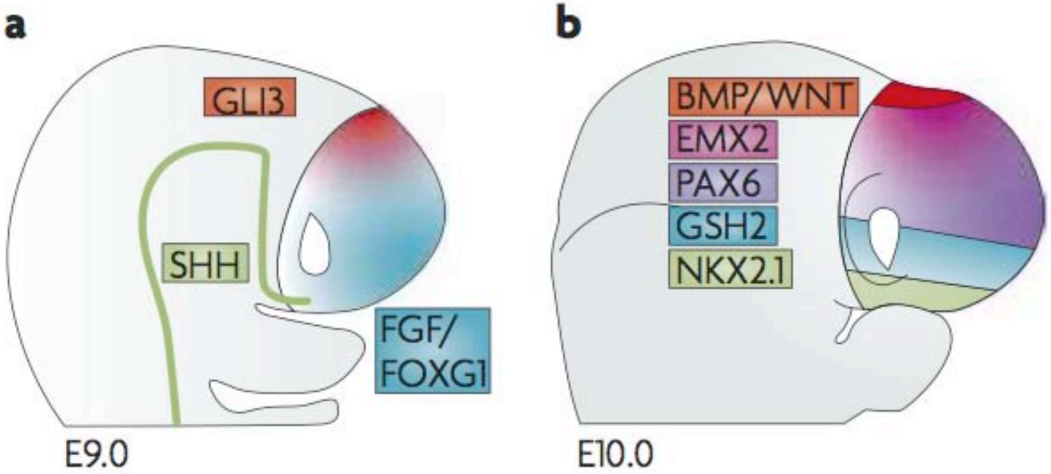
From brain formation to plasticity: insights on Otx2 homeoprotein

Sugiyama S, Prochiantz A, Hensch T

Development, Growth & Differentiation
2009 vol. 51 (3) pp. 369-77



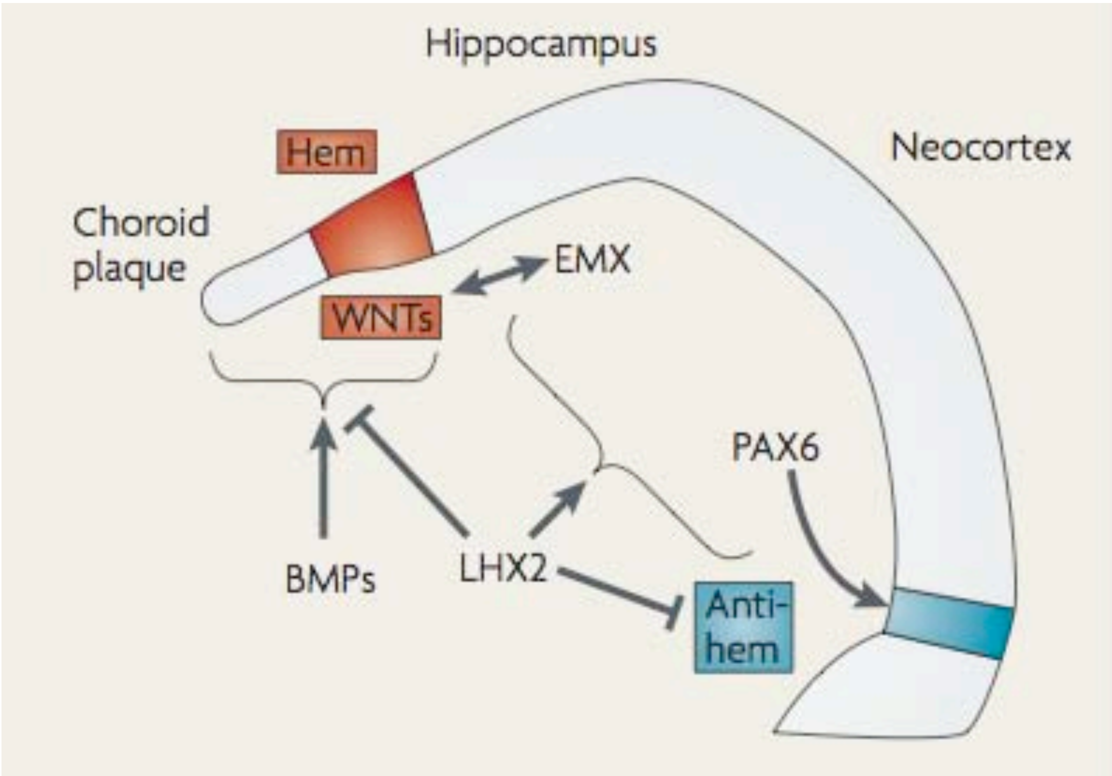


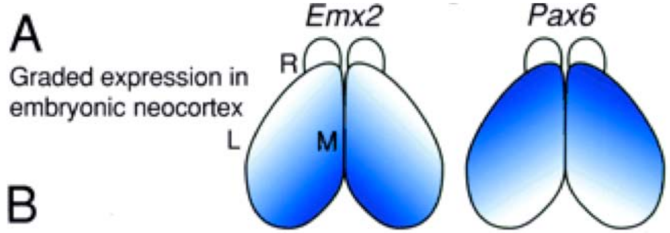


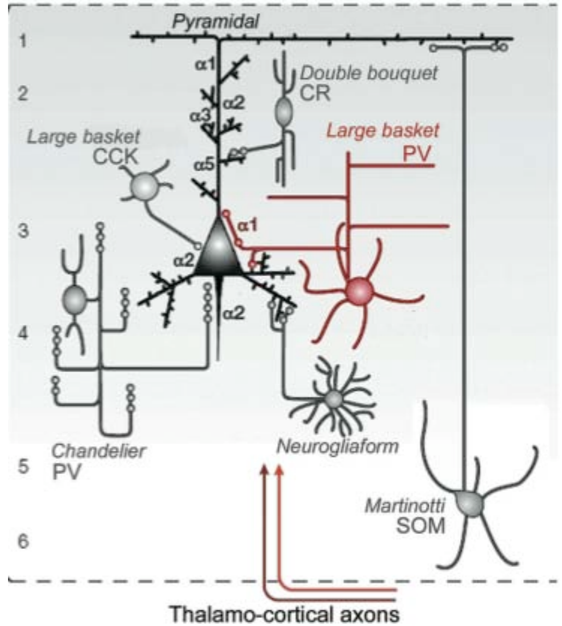
The genetics of early telencephalon patterning: some assembly required

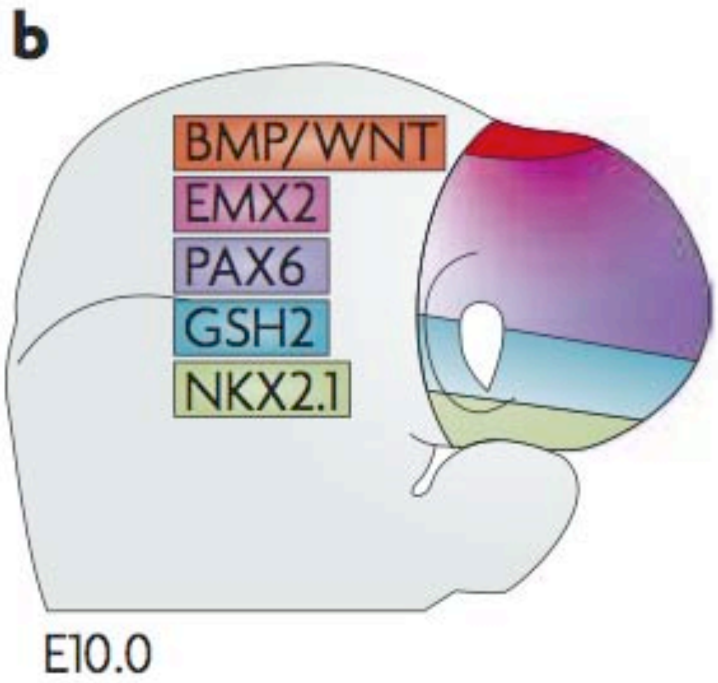
Hébert J, Fishell G

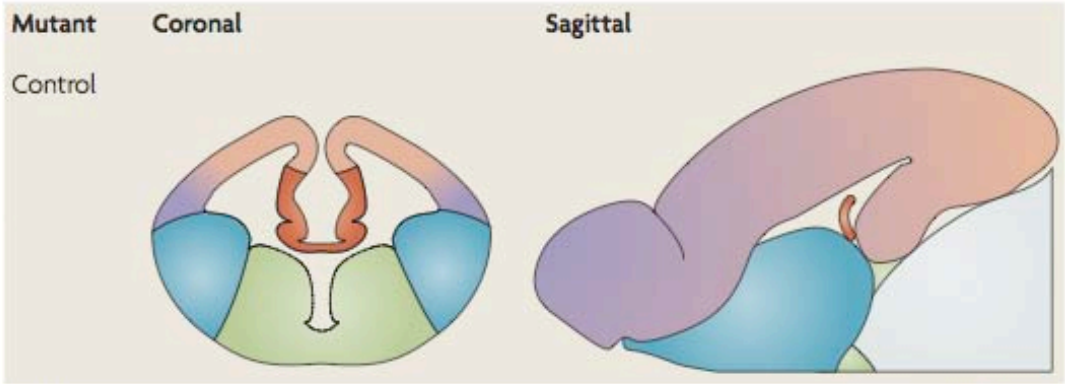
Nat Rev Neurosci
2008 vol. 9 (9) pp. 678-85

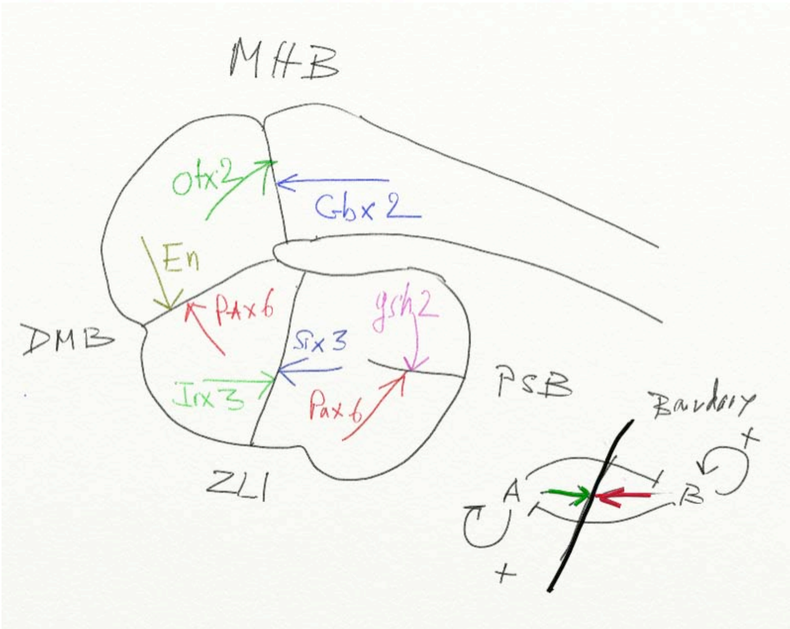


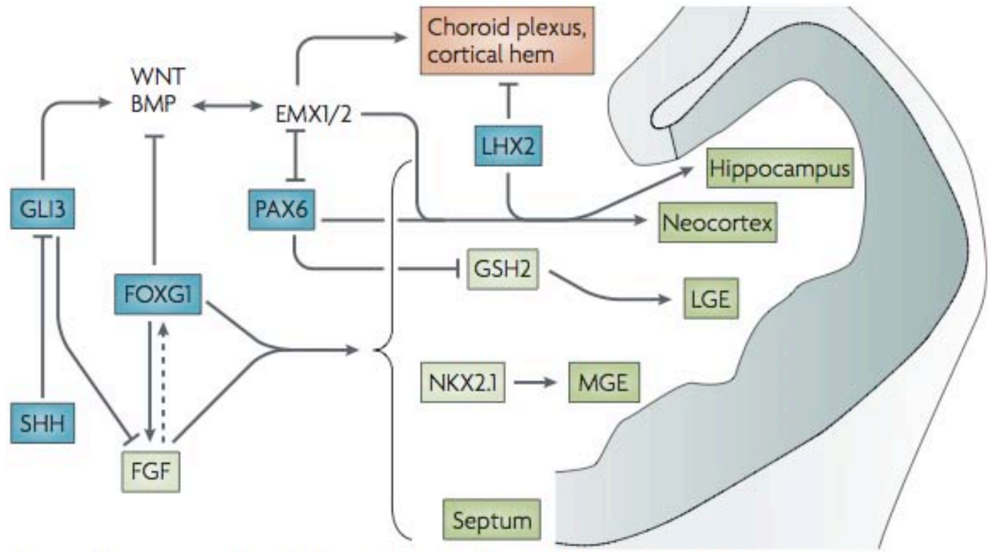


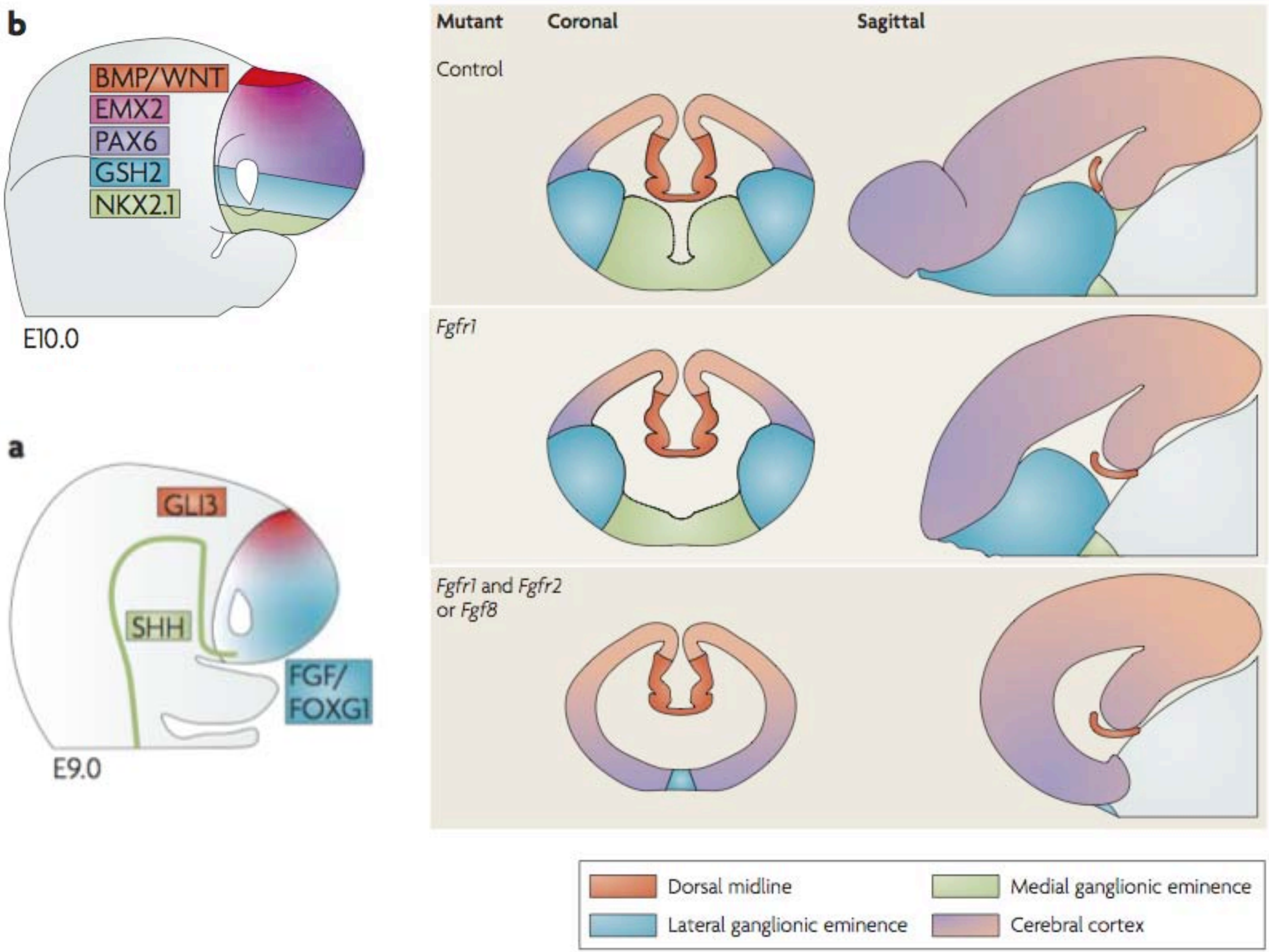



b
BMP/WNT
EMX2
PAX6
GSH2
NKX2.1
E10.0


Mutant
Coronal
Sagittal
Control


MHB
Otx2
Gbx2
En
DMB
Pax6
Six3
gsh2
Irx3
Pax6
PSB
ZLI
A
B

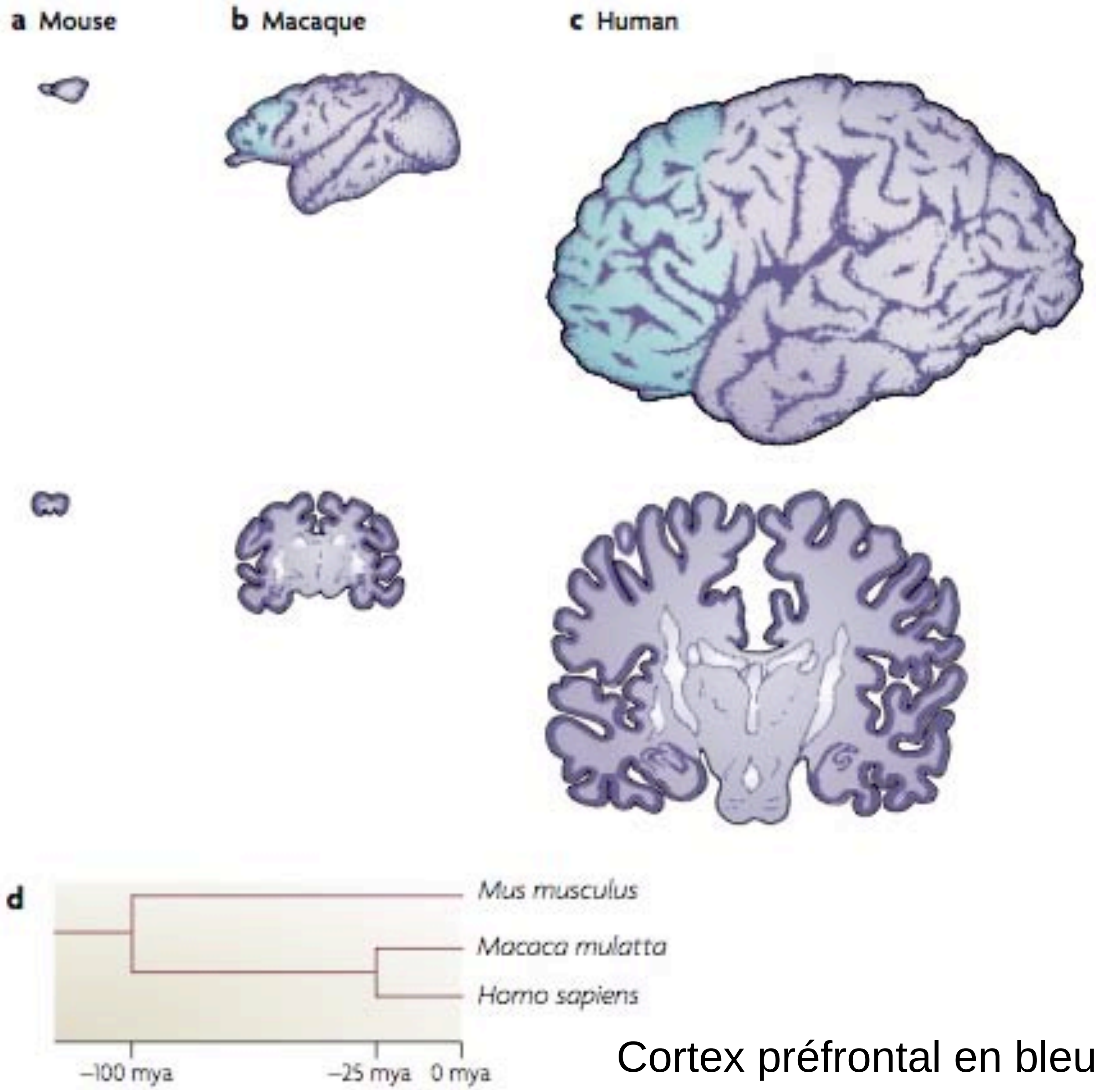

Choroid plexus, cortical hem
WNT
BMP
EMX1/2
LHX2
Hippocampus
GLI3
PAX6
Neocortex
GSH2
FOXG1
LGE
NKX2.1
MGE
SHH
FGF
Septum


b
BMP/WNT
EMX2
PAX6
GSH2
NKX2.1
E10.0
a
GLI3
SHH
FGF/
FOXG1
E9.0
Mutant
Coronal
Sagittal
Control
Fgfr1
Fgfr1 and Fgfr2
or Fgf8
Dorsal midline
Medial ganglionic eminence
Lateral ganglionic eminence
Cerebral cortex

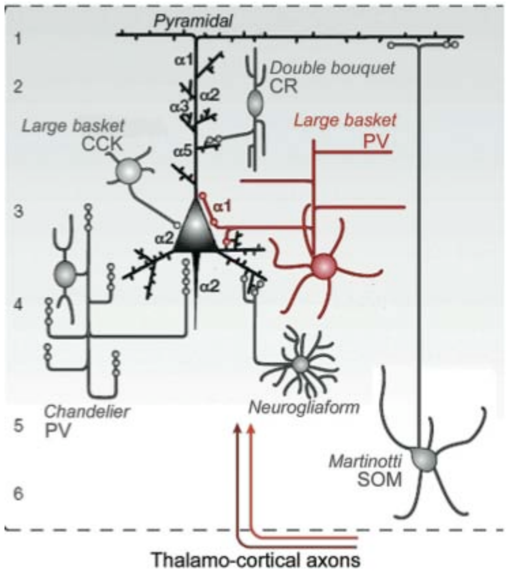
Evolution of the neocortex: a perspective from developmental biology

Rakic P

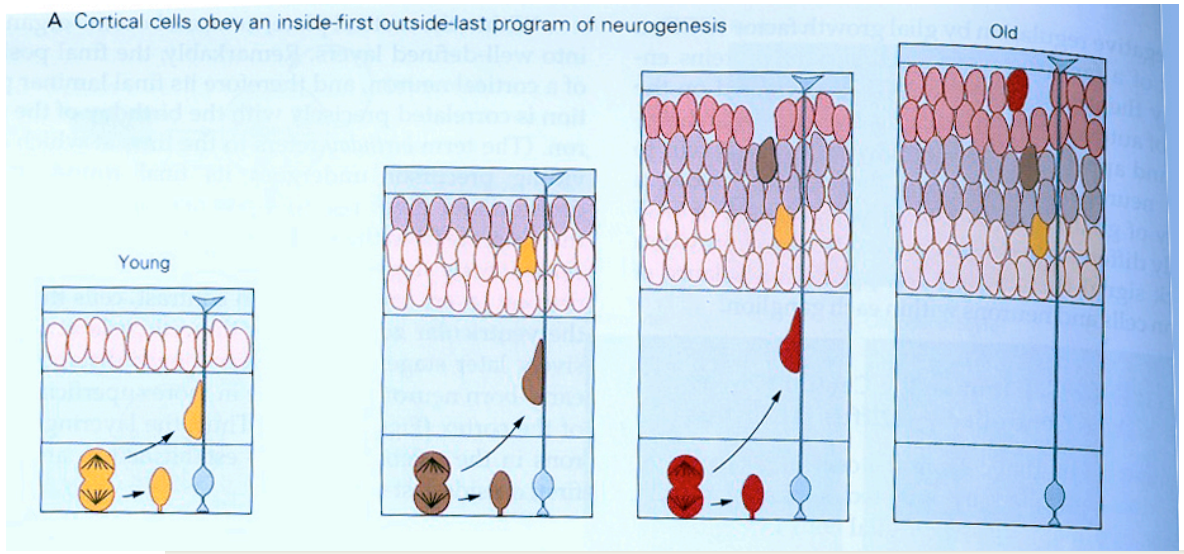
Nat Rev Neurosci
2009 vol. 10 (10) pp. 724-35



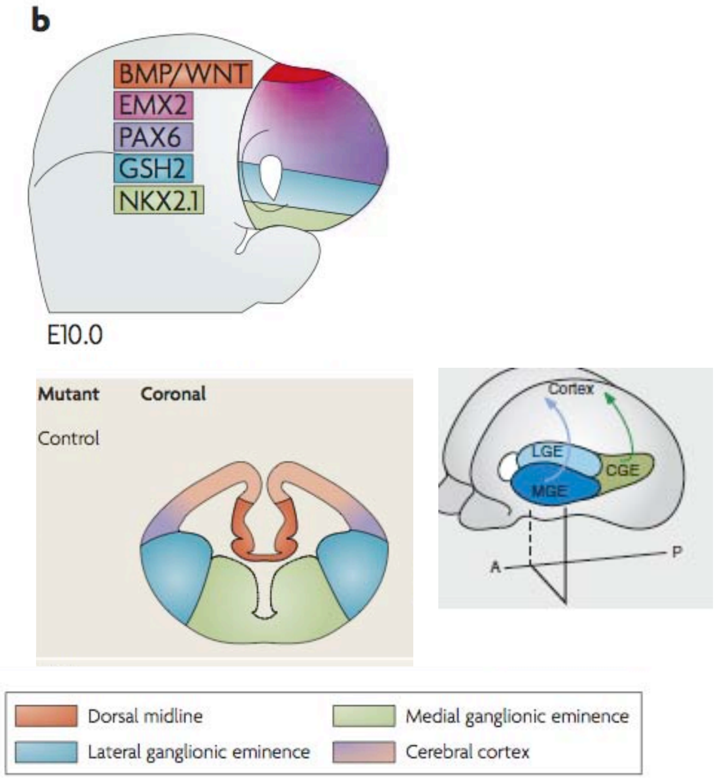
Cortex préfrontal en bleu, absent chez la souris



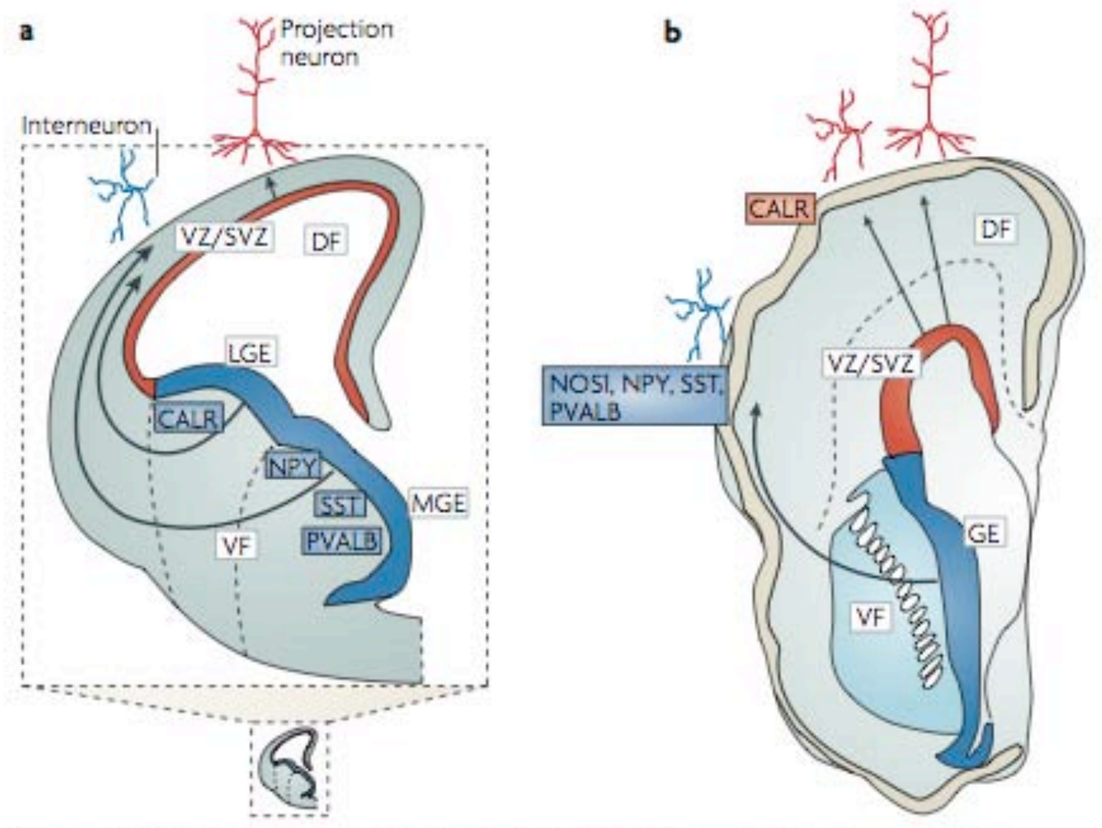
Pyramidal
1
2
3
4
5
6
α1
α2
α3
α5
α2
α1
α2
Double bouquet
CR
Large basket
CCK
Large basket
PV
Chandelier
PV
Neurogliaform
Martinotti
SOM
Thalamo-cortical axons



A Cortical cells obey an inside-first outside-last program of neurogenesis
Young
Old



b
BMP/WNT
EMX2
PAX6
GSH2
NKX2.1
E10.0
Mutant
Coronal
Control
Cortex
LGE
CGE
MGE
A
P
Dorsal midline
Lateral ganglionic eminence
Medial ganglionic eminence
Cerebral cortex

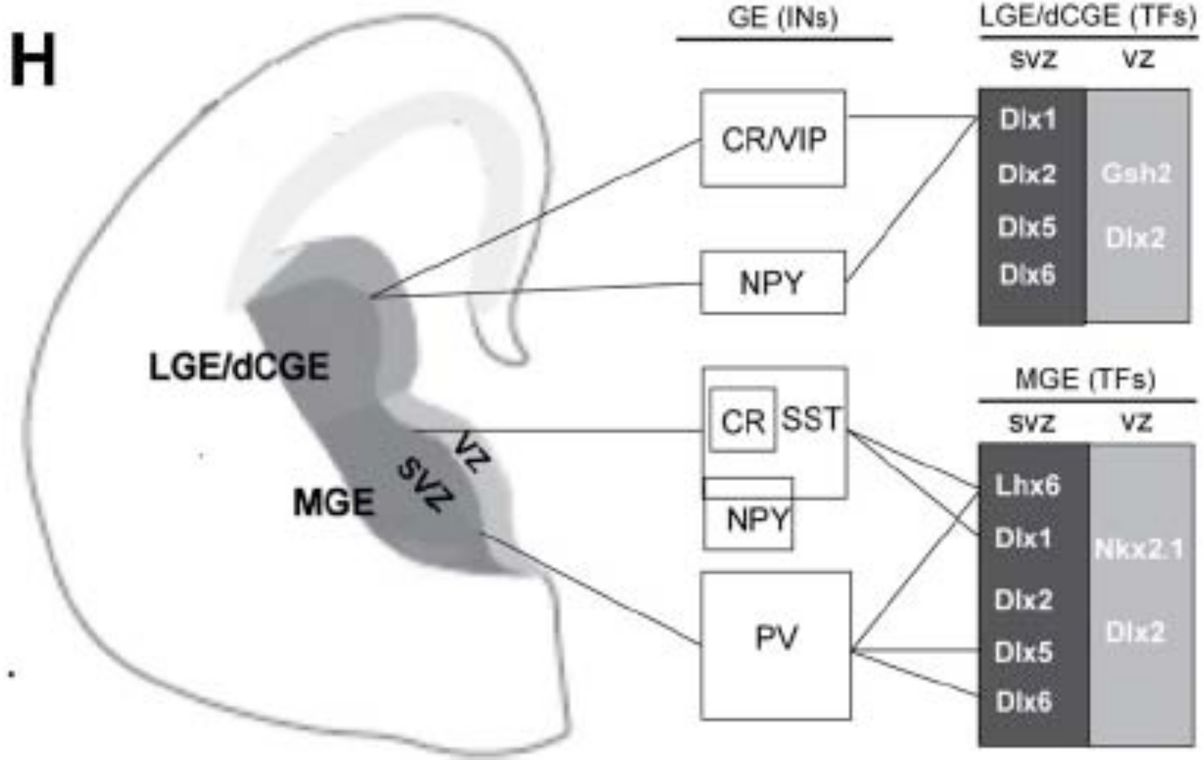


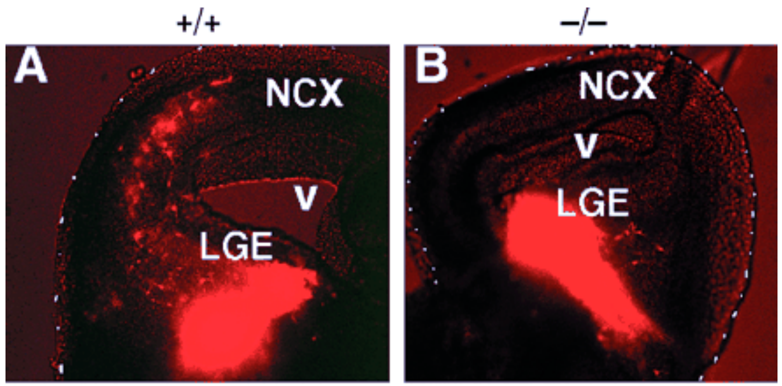
a
Projection neuron
Interneuron
VZ/SVZ
DF
LGE
CALR
NPY
SST
PVALB
MGE
VF
b
CALR
DF
NOS1, NPY, SST, PVALB
VZ/SVZ
GE
VF

Dlx5 and *Dlx6* Regulate the Development of Parvalbumin-Expressing Cortical Interneurons

5334 • The Journal of Neuroscience, April 14, 2010 • 30(15):5334–5345

Yanling Wang,[1*] Catherine A. Dye,[1,2*] Vikaas Sohal,[7] Jason E. Long,[1,3] Rosanne C. Estrada,[4] Tomas Roztocil,[5] Thomas Lufkin,[6] Karl Deisseroth,[7] Scott C. Baraban,[4] and John L. R. Rubenstein[1]

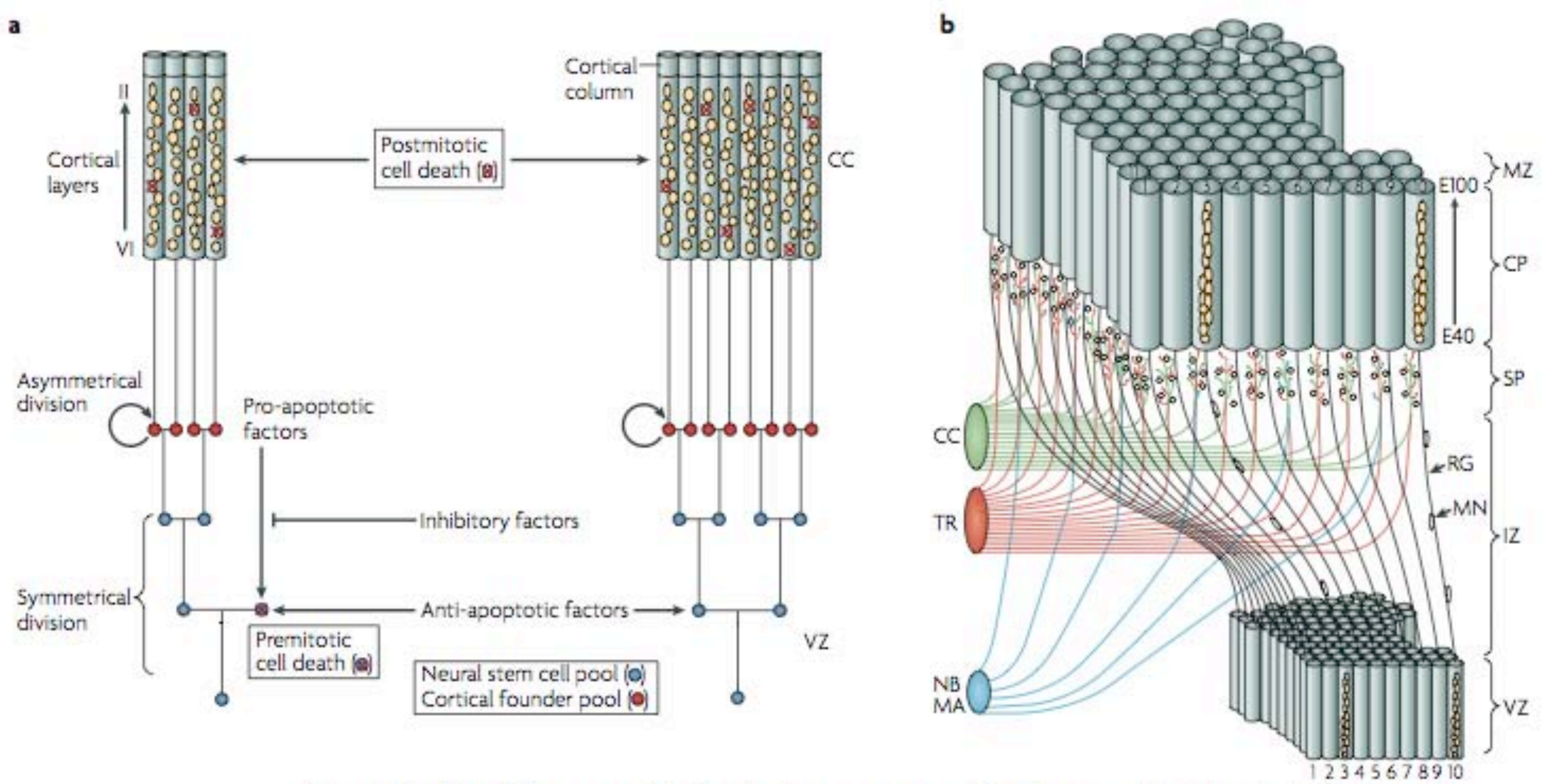


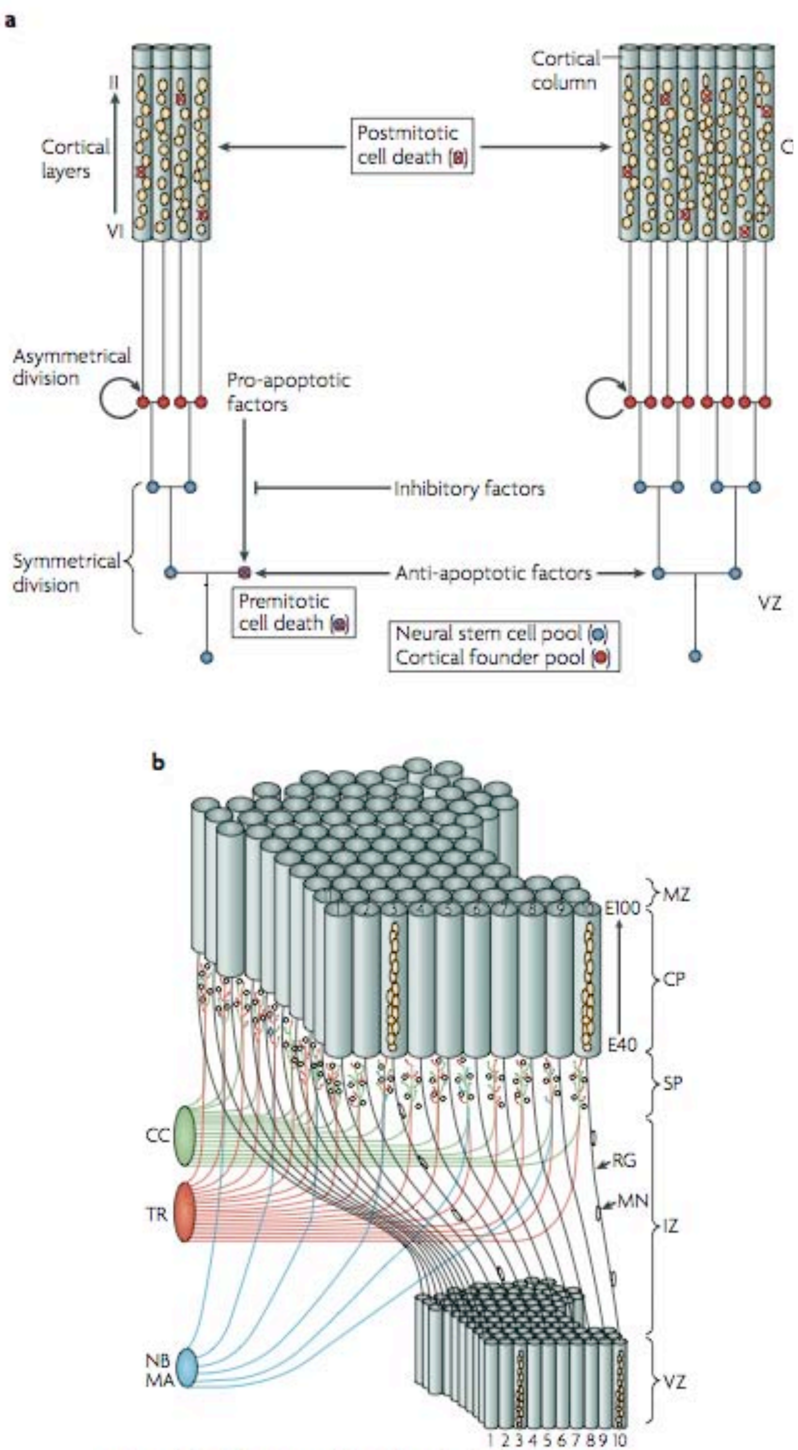


Evolution of the neocortex: a perspective from developmental biology

Rakic P

Nat Rev Neurosci
2009 vol. 10 (10) pp. 724-35

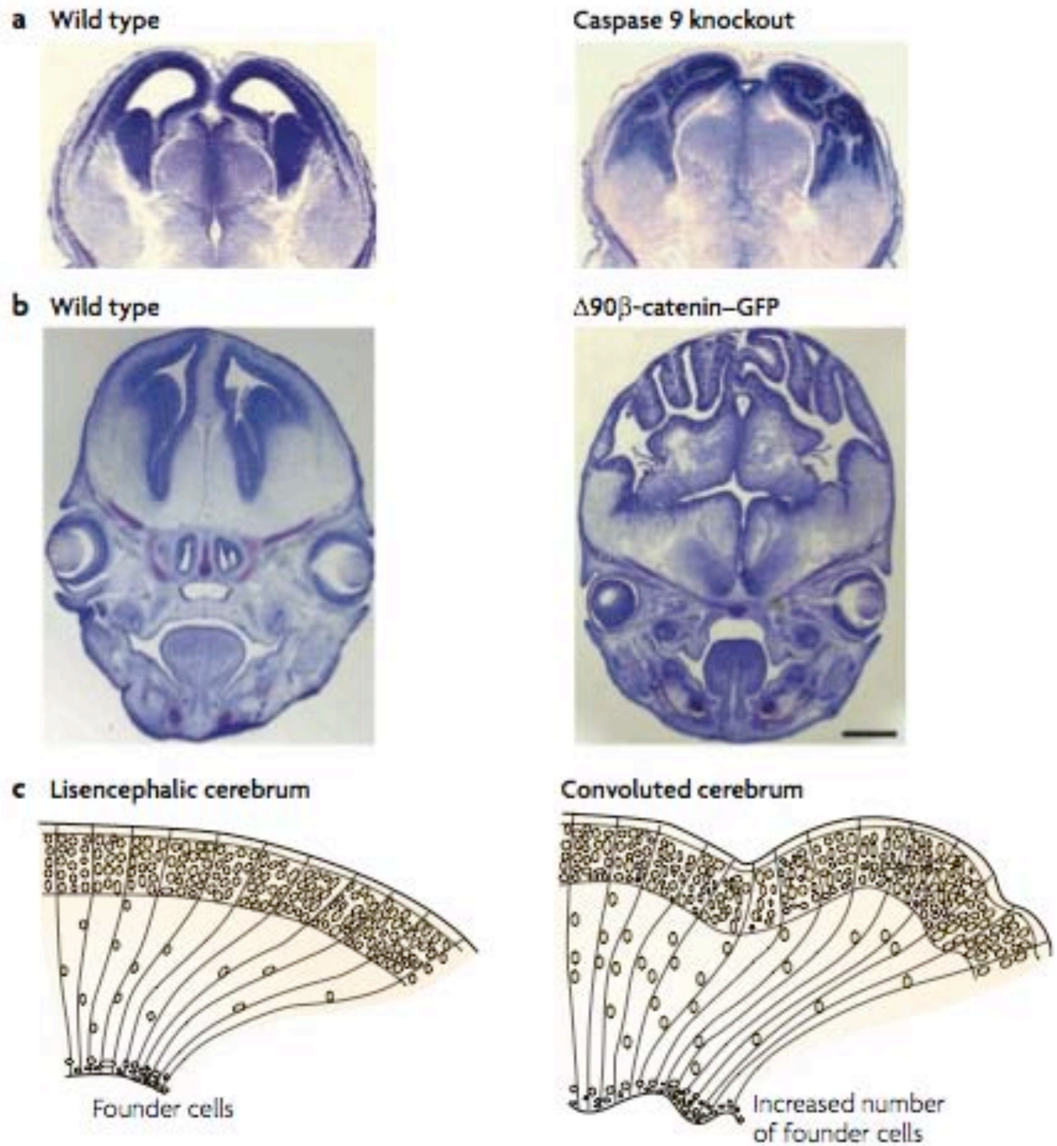




Evolution of the neocortex: a perspective from developmental biology

Rakic P

Nat Rev Neurosci
2009 vol. 10 (10) pp. 724-35



J. Comp. Neur., 124: 319–336.

Postnatal Hippocampal Neurogenesis in Rats [1]

JOSEPH ALTMAN AND GOPAL D. DAS
Psychophysiological Laboratory, Massachusetts Institute of Technology, Cambridge, Massachusetts

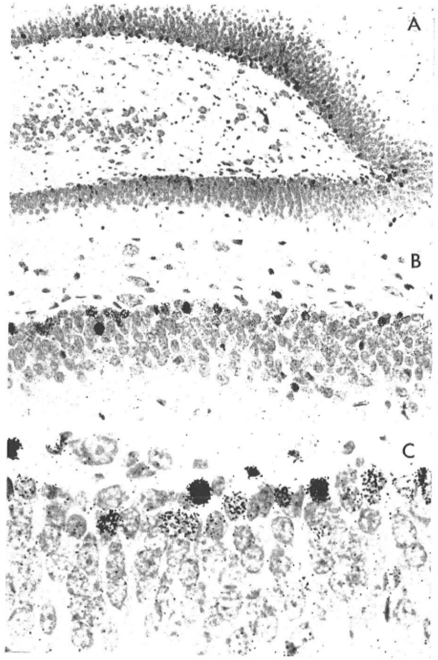


Fig. 1 Low and high power microphotographs of autoradiograms from the area of the dentate gyrus of the hippocampus in a rat injected with thymidine-H³ at the age of ten days and killed two months after the injection. Note labeling of granule cells, predominantly in the internal border (basal surface) of the granular layer. A, 100 ×; B, 256 ×; C, 640 ×.

Our interpretion of these results, namely that the granule cells of the dentate gyrus multiply at a high rate in young animals, a process which declines rapidly but does not cease altogether in the mature animals, is difficult to reconcile with the absence of signs of mitotic activity in differentiated granule cells. We have, accordingly (un-

dertaken to investigate the possibility that undifferentiated precursor cells take up thymidine, multiply, and subsequently differentiate into granule cells. This possibility was suggested to us by the presence of small cells with darkly staining nuclei in the inner border or base of the granular layer, a region where most of the labeled cells were encountered. There is little information in the literature about the properties of these small cells with dark nuclei, presumably because they are considered to be glia cells (they are sometimes described as astrocytes). However, in mature animals neuroglia cells are seldom encountered in the dentate gyrus, whereas in young animals, as we shall describe in detail later, these cells with small dark nuclei are quite abundant. We have, therefore, postulated that these are undifferentiated cells which can take up thymidine and multiply, and may subsequently differentiate into granule cells. If this hypothesis were correct, then we should find a larger proportion of labeled small cells with dark nuclei in animals killed soon after injection with thymidine-H³, whereas in animals surviving for longer periods after injection the labeled small cells should decrease and the labeled differentiated cells should increase at the expense of the former. We could investigate this hypothesis in th

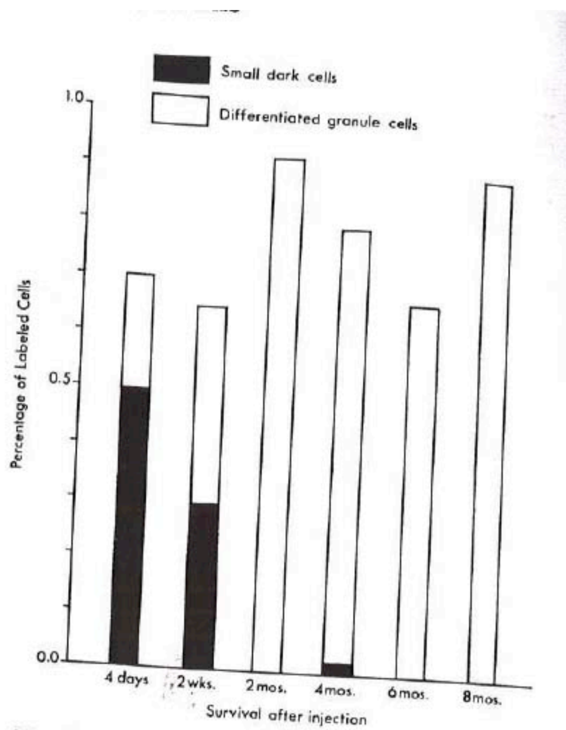
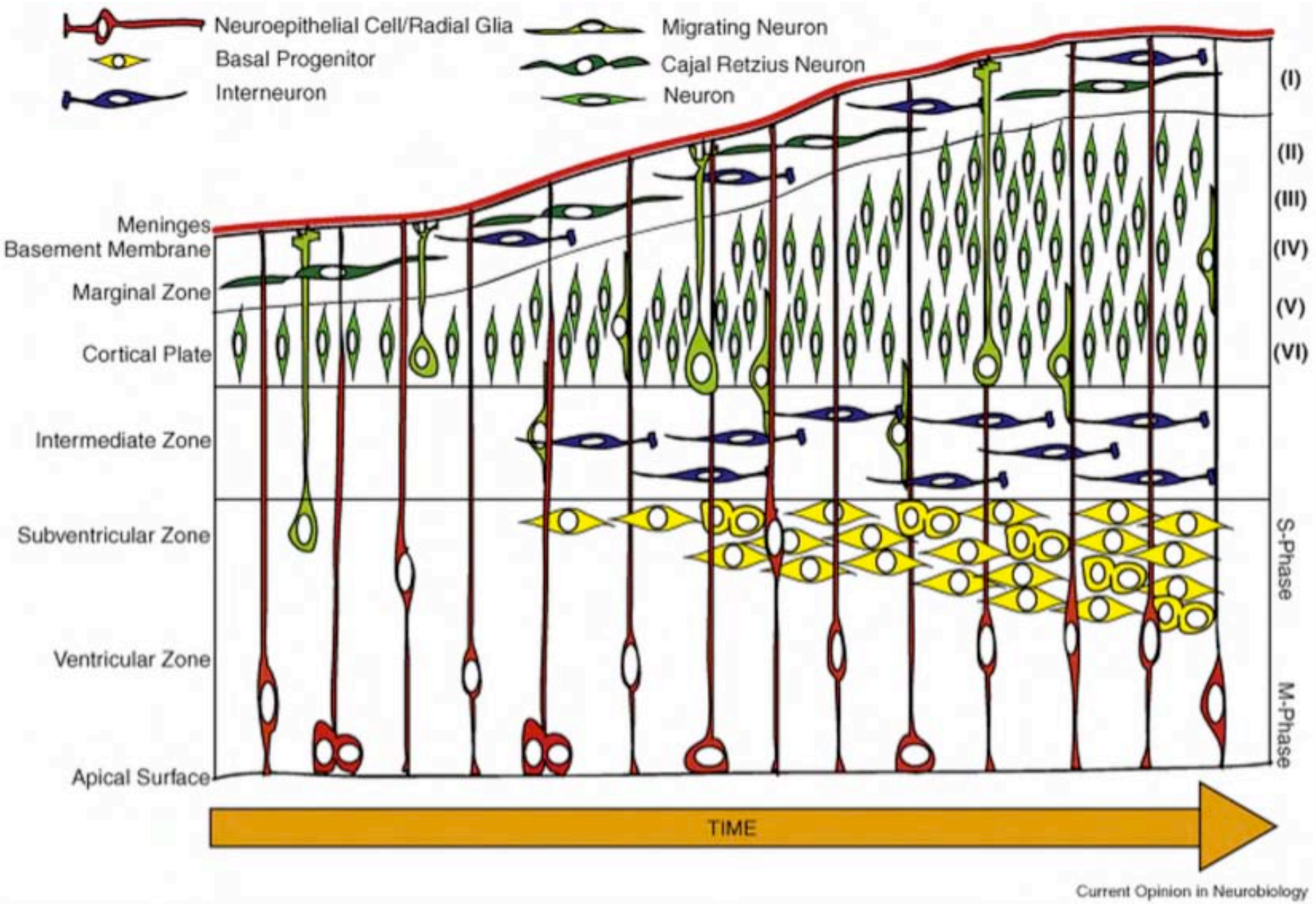


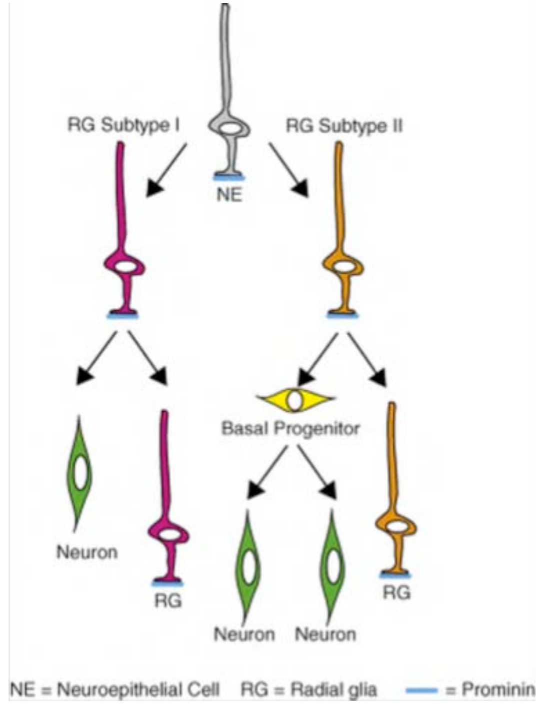
Fig. 5 Types of cells labeled in the granular layer in rats injected as adults (4 months), following which they survived for the periods indicated.

Stem cells niches during development--lessons from the cerebral cortex

Johansson PA, Cappello S, Götz M

Current Opinion in Neurobiology
2010 vol. 20 (4) pp. 400-7





Development and evolution of the human neocortex

Cell
2011 vol. 146 (1) pp. 18-36

Lui JH, Hansen DV, Kriegstein AR

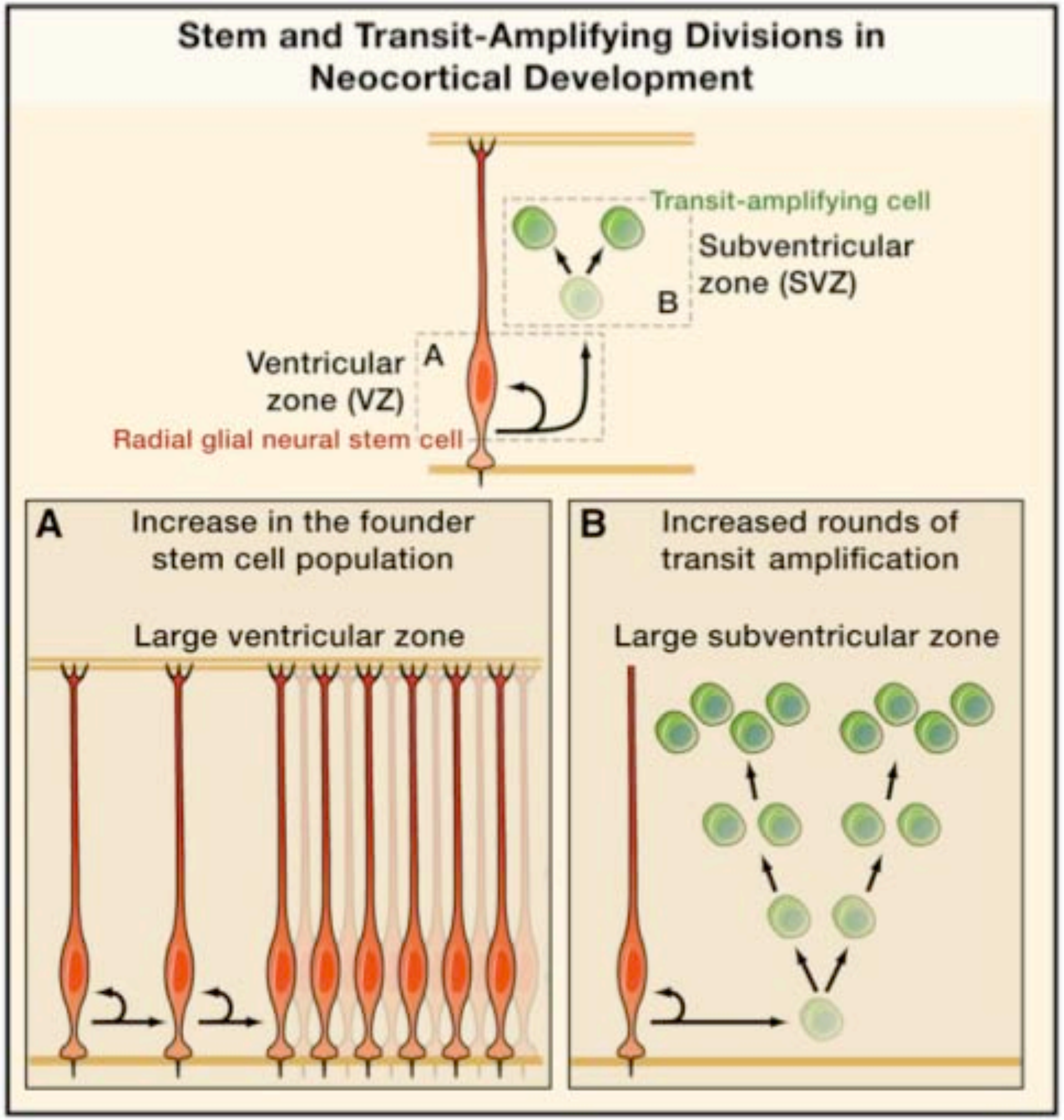
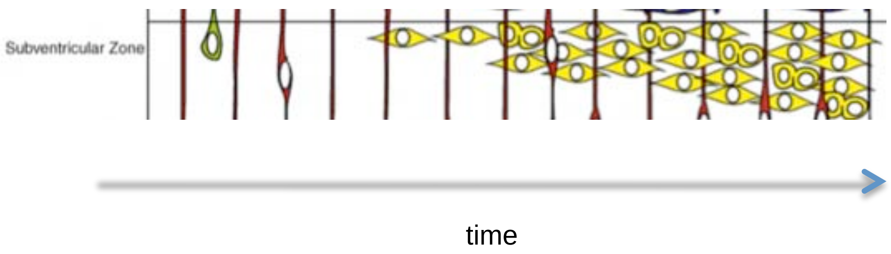
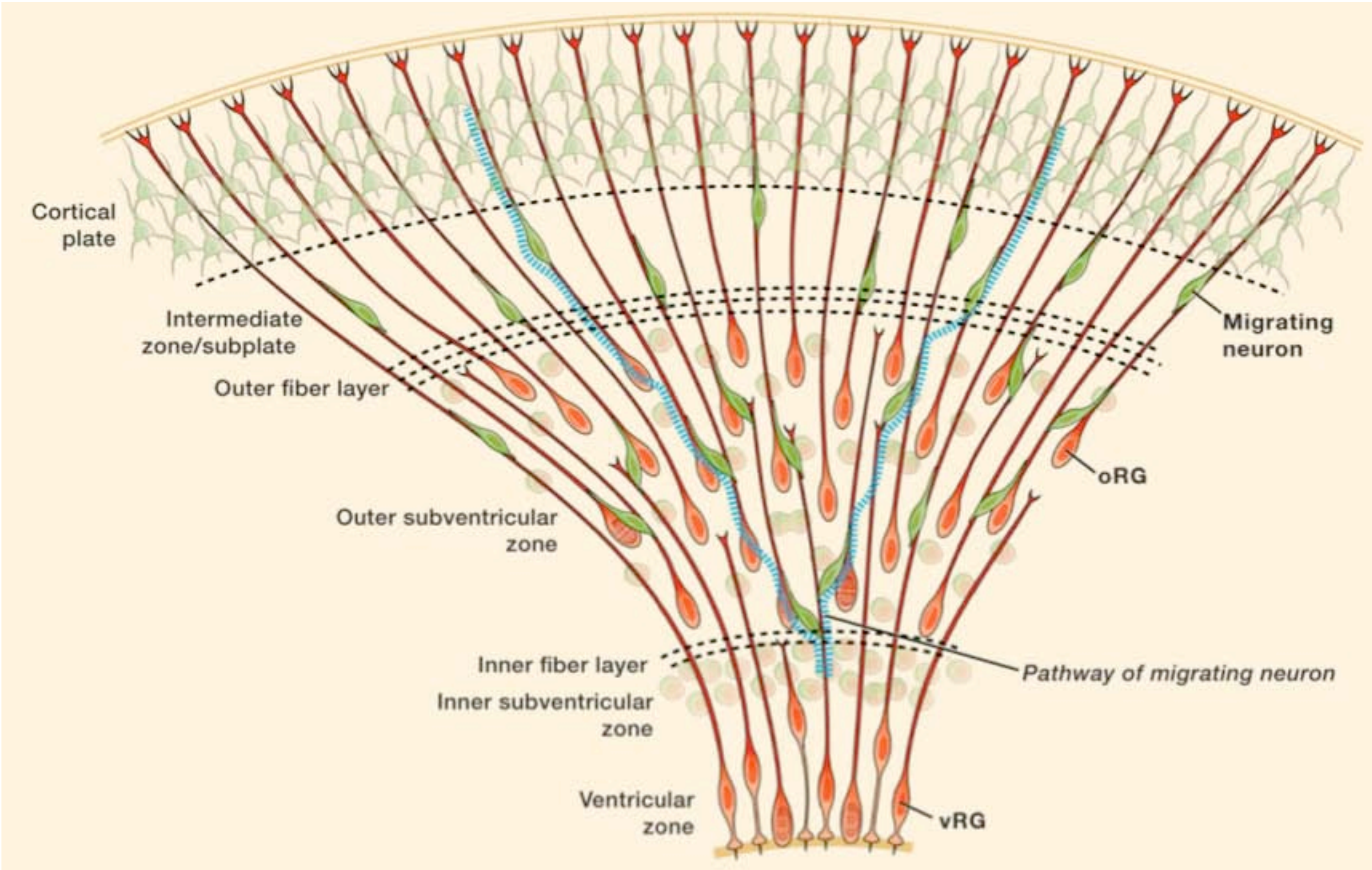
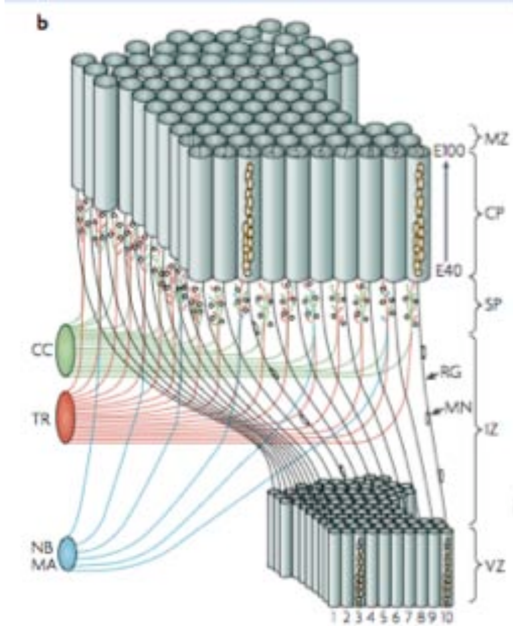
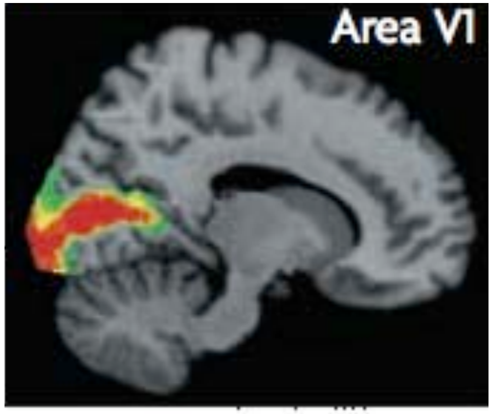


Figure 1. Progenitor Cell Expansion Can Underlie Neocortical Enlargement
Neuronal number is a key determinant of neocortex size and shape. Neurons are produced from a lineage of radial glia (RG) stem cells (red) and transit-amplifying intermediate progenitor (IP) cells (green). Expansion in one or both cell populations has been proposed as potential mechanisms that underlie neocortical expansion. Expansion of the founder RG cell population prior to the onset of neurogenesis (A) predicts a large ventricular zone (VZ). Expansion in the number of transit-amplifying divisions (B) predicts a large subventricular zone (SVZ).




Cortical plate
Intermediate zone/subplate
Outer fiber layer
Outer subventricular zone
Inner fiber layer
Inner subventricular zone
Ventricular zone
Migrating neuron
oRG
Pathway of migrating neuron
vRG


b
MZ
E100
CP
E40
SP
CC
RG
TR
MN
IZ
NB
MA
VZ
1 2 3 4 5 6 7 8 9 10


Area V1

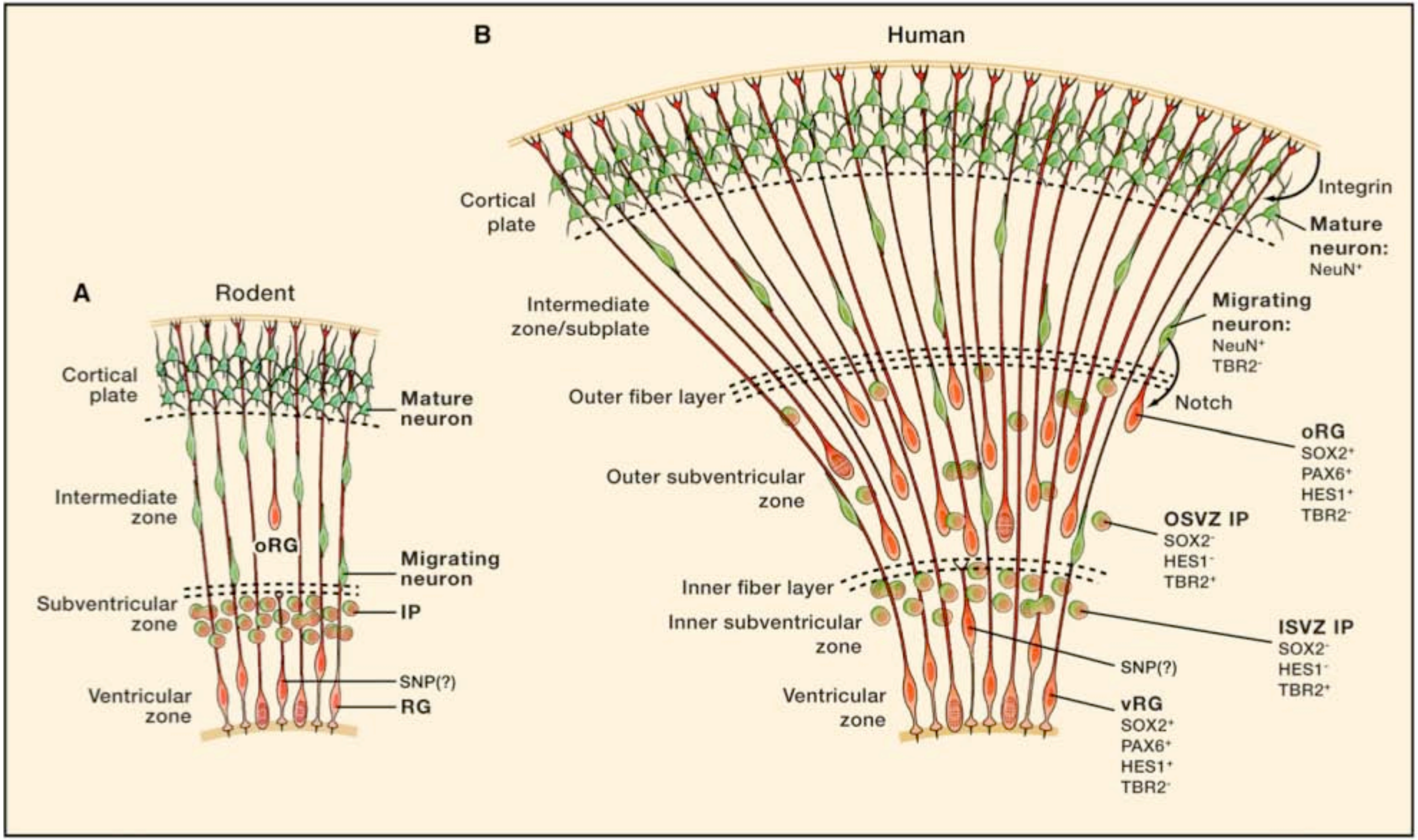


Figure 4. Contrasting Rodent and Human Neocortical Development

(A) Current views of rodent corticogenesis are illustrated. Radial glial (RG) cells most often generate intermediate progenitor (IP) cells that divide to produce pairs of neurons. These neurons use RG fibers to migrate to the cortical plate. The historical view of neocortical development was that RG and neuronal progenitor cells were lineally distinct and that RG did not have a role in neurogenesis. Our current appreciation of the lineage relationship between RG cells, IP cells, and neurons has revised this view. The recent observation that small numbers of outer subventricular zone radial glia-like (oRG) cells exist in the mouse is also illustrated.

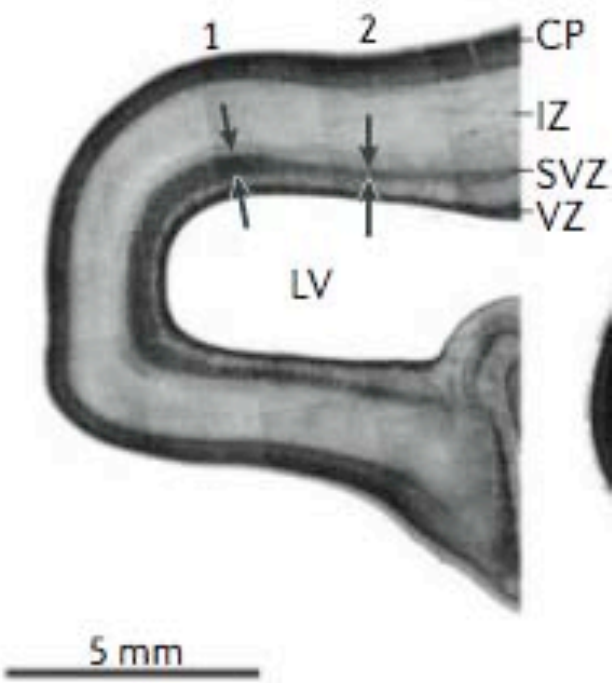
(B) We highlight the lineage of oRG cells, IP cells, and migrating neurons (red to green) present in the human outer subventricular zone (OSVZ) and the increased number of radial fibers that neurons can use to migrate to the cortical plate. The number of ontogenetic "units" is significantly increased with the addition of oRG cells over ventricular RG (vRG) cells. Maintenance of oRG cells by Notch and integrin signaling is shown. Short neural precursors (SNP), a transitional cell form between RG and IP cells, are also depicted in (A) and (B). For simplicity, we do not illustrate all of the cell types described in Figure 2E.

Patterns of neural stem and progenitor cell division may underlie evolutionary cortical expansion

Nat Rev Neurosci
2006 vol. 7 (11) pp. 883–90

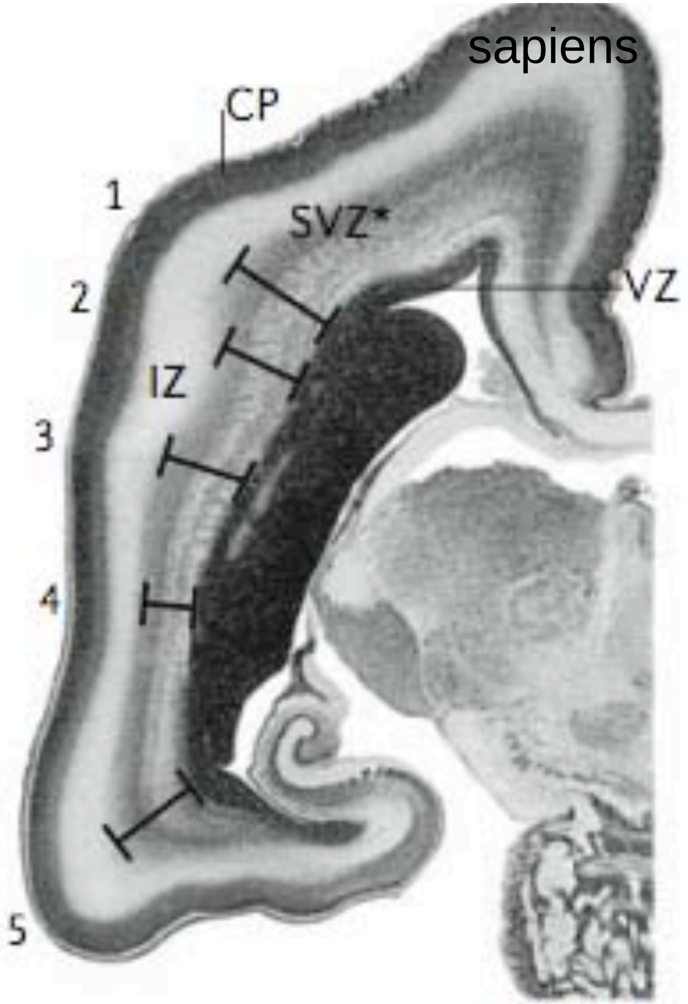
Kriegstein A, Noctor S, Martínez-Cerdeño V

macaque

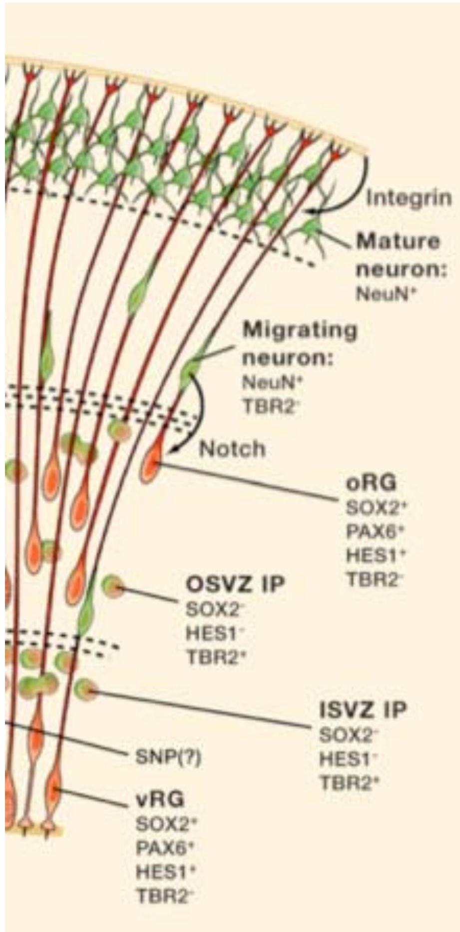


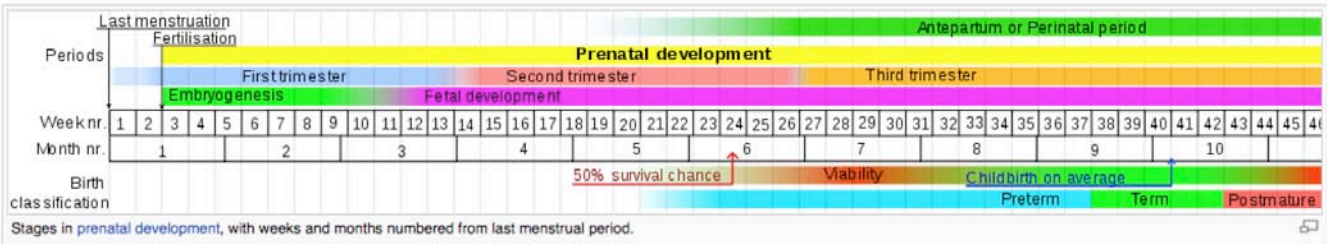
E78

sapiens



GW20

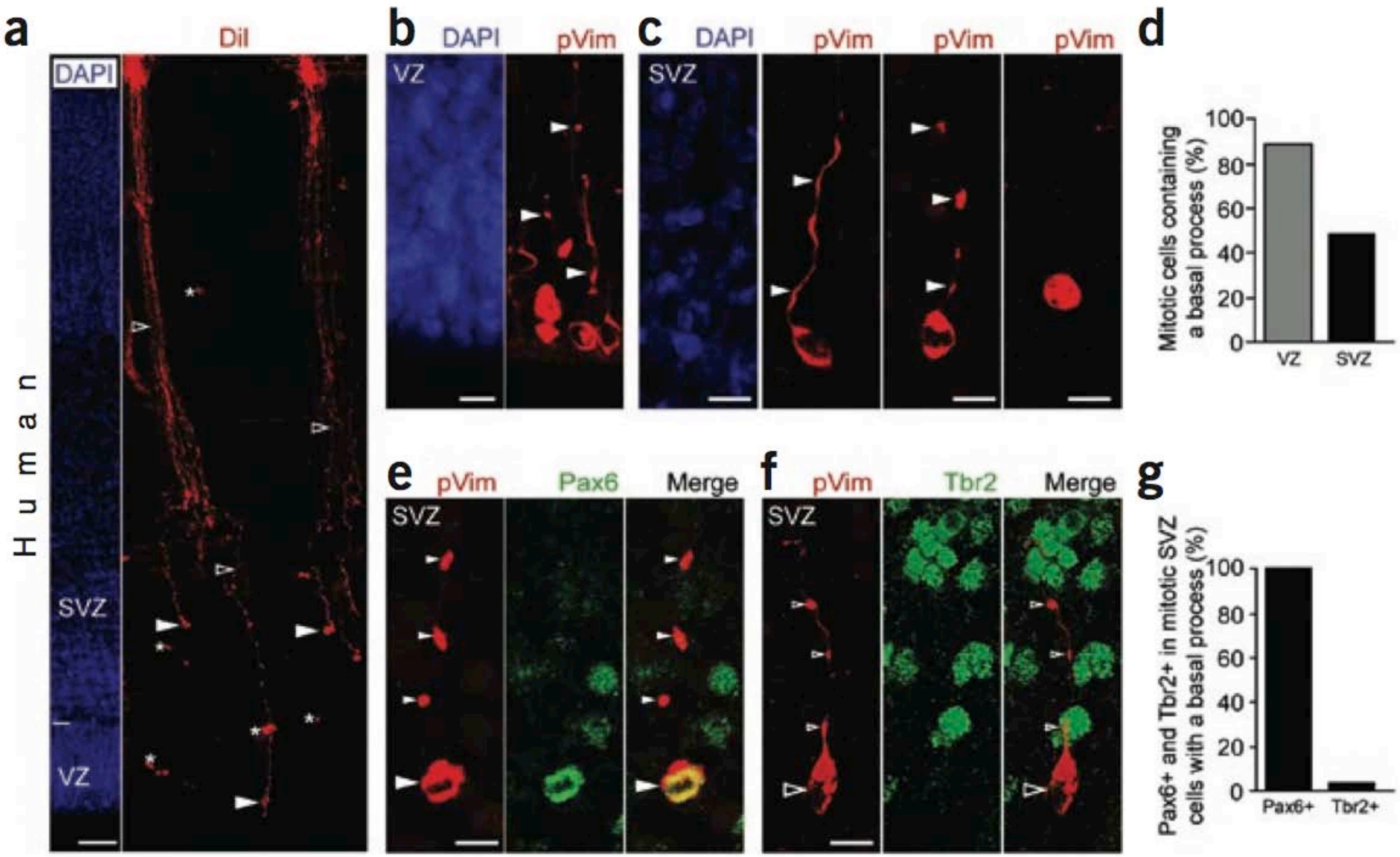


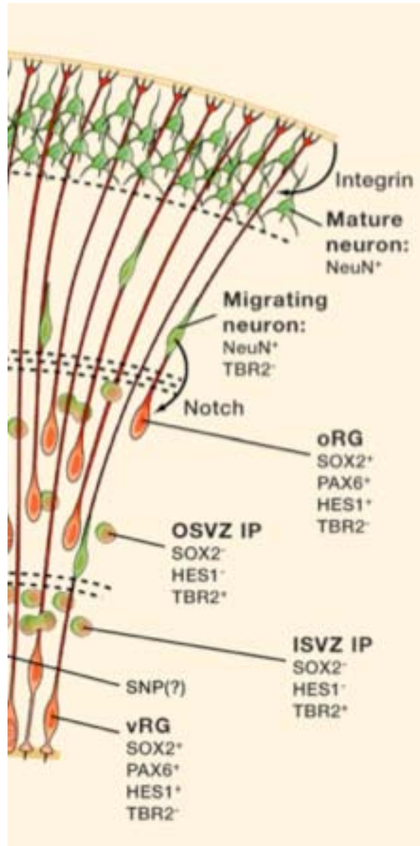


OSVZ progenitors of human and ferret neocortex are epithelial-like and expand by integrin signaling

Nature Neuroscience
2010 vol. 13 (6) pp. 690-9

Fietz SA, Kelava I, Vogt J, Wilsch-Bräuninger M, Stenzel D, Fish JL, Corbeil D, Riehn A, Distler W, Nitsch R, Huttner WB

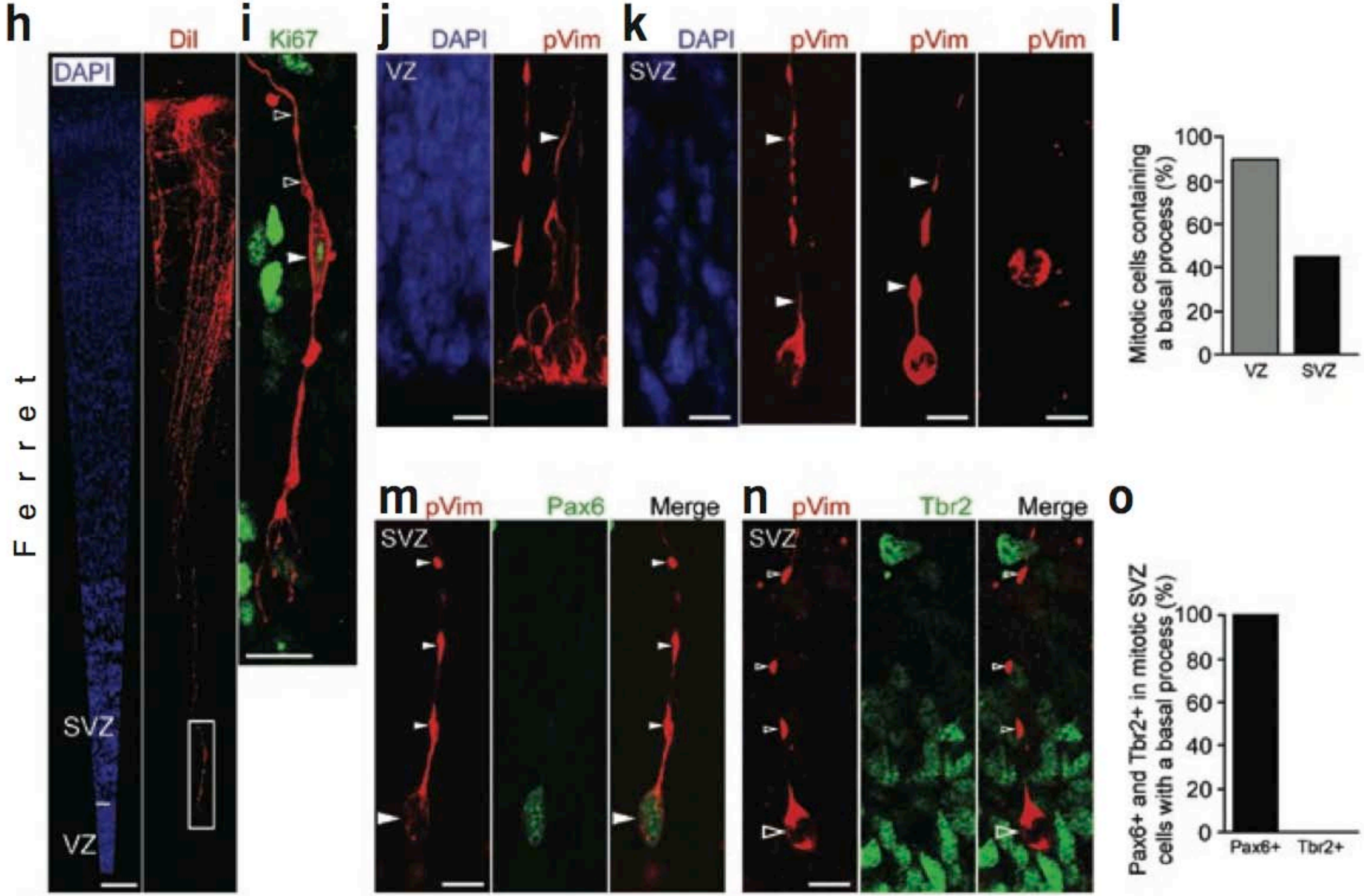




OSVZ progenitors of human and ferret neocortex are epithelial-like and expand by integrin signaling

Fietz SA, Kelava I, Vogt J, Wilsch-Bräuninger M, Stenzel D, Fish JL, Corbeil D, Riehn A, Distler W, Nitsch R, Huttner \

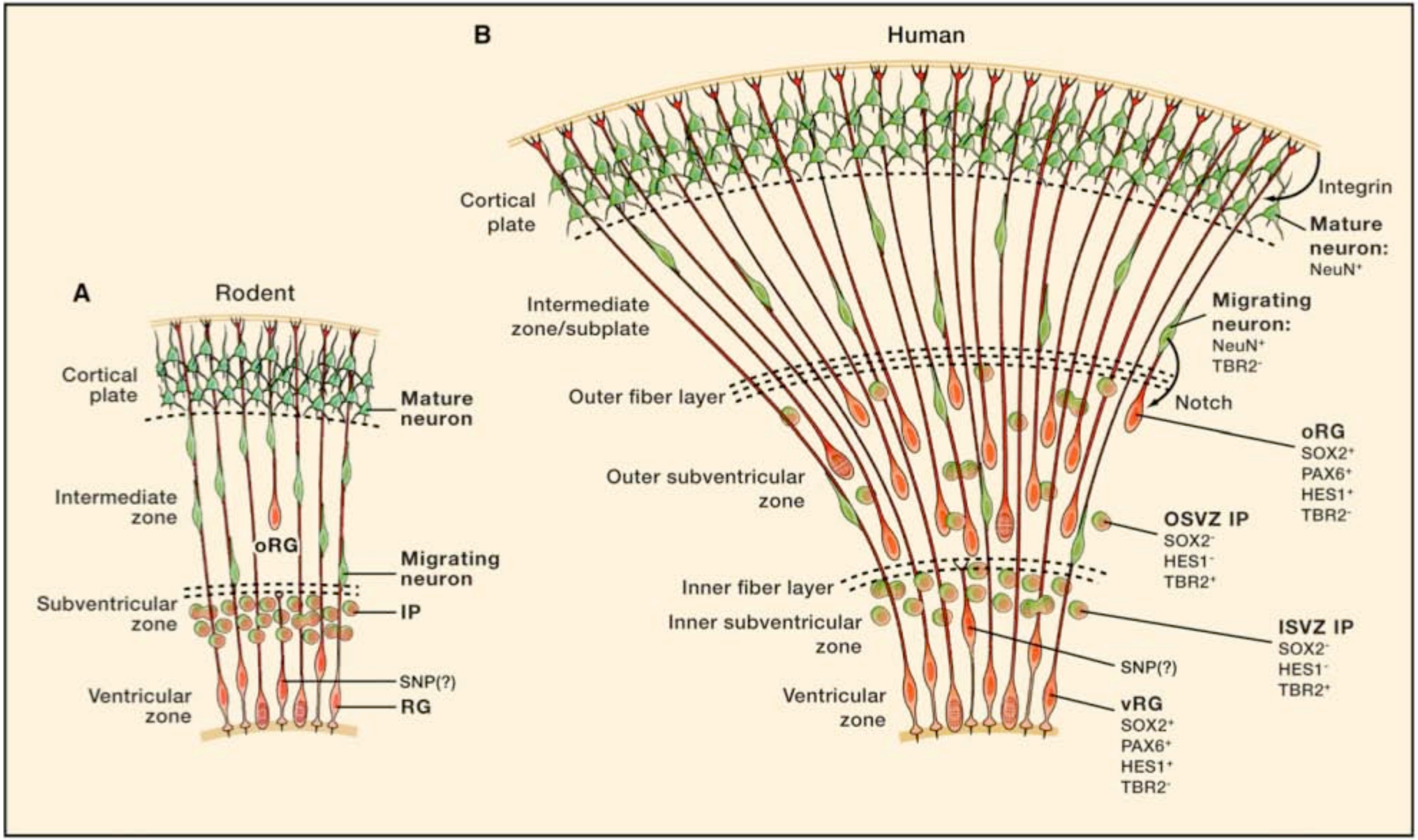
Nature Neuroscience
2010 vol. 13 (6) pp. 690-9



Development and evolution of the human neocortex

Cell
2011 vol. 146 (1) pp. 18-36

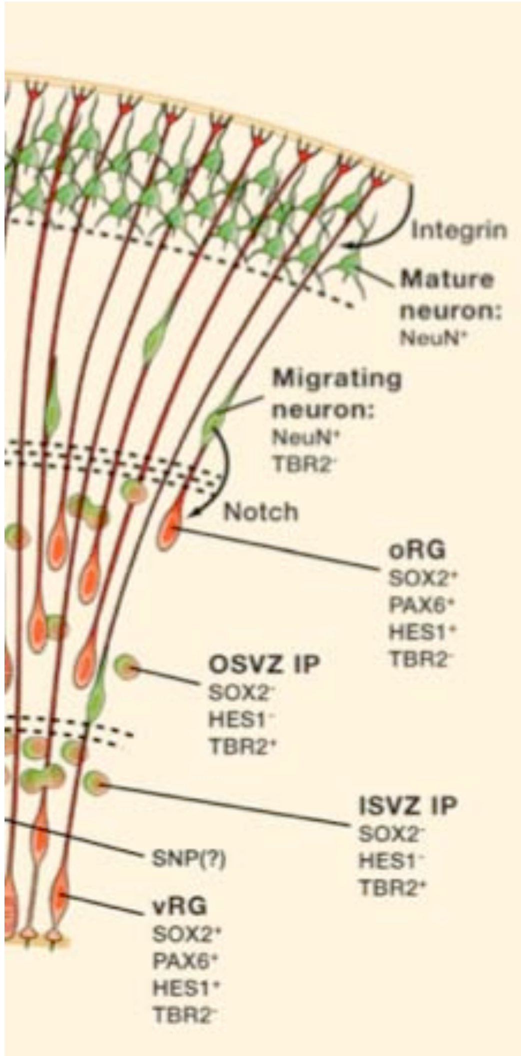
Lui JH, Hansen DV, Kriegstein AR



Development and evolution of the human neocortex

Lui JH, Hansen DV, Kriegstein AR

Cell
2011 vol. 146 (1) pp. 18-36



OSVZ progenitors of human and ferret neocortex are epithelial-like and expand by integrin signaling

Fietz SA, Kelava I, Vogt J, Wilsch-Bräuninger M, Stenzel D, Fish JL, Corbeil D, Riehn A, Distler W, Nitsch R, Huttner WB

Nature Neuroscience
2010 vol. 13 (6) pp. 690-9