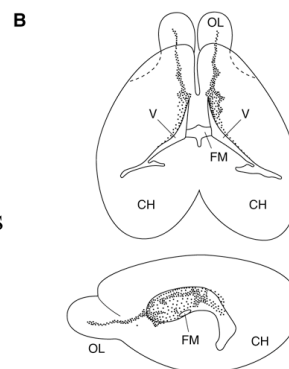
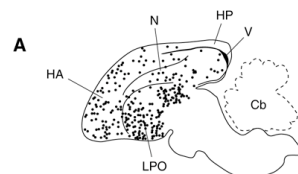
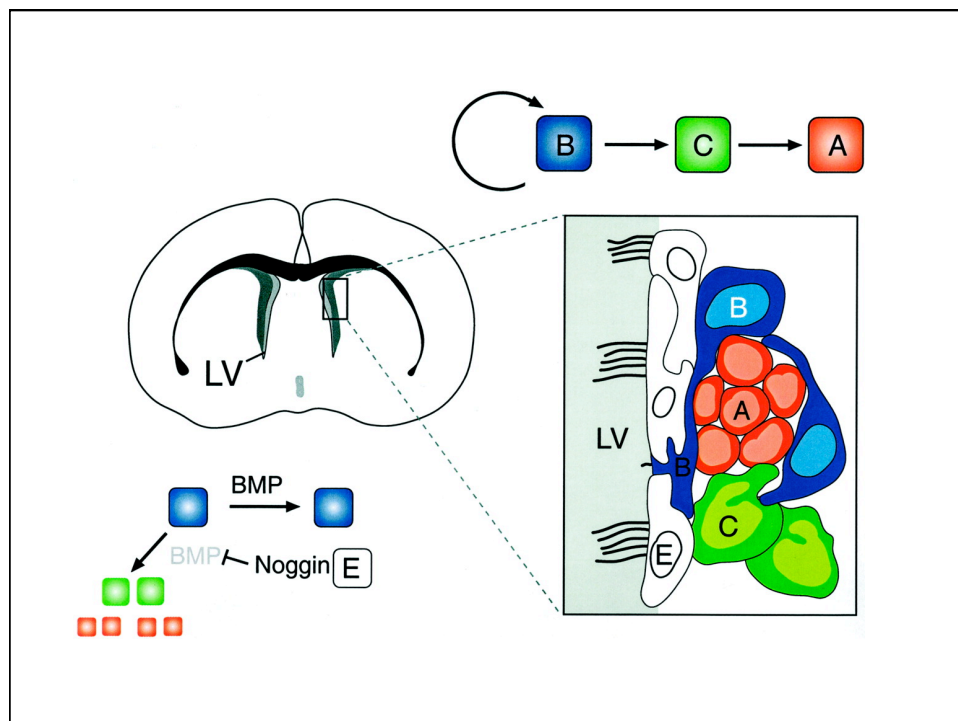
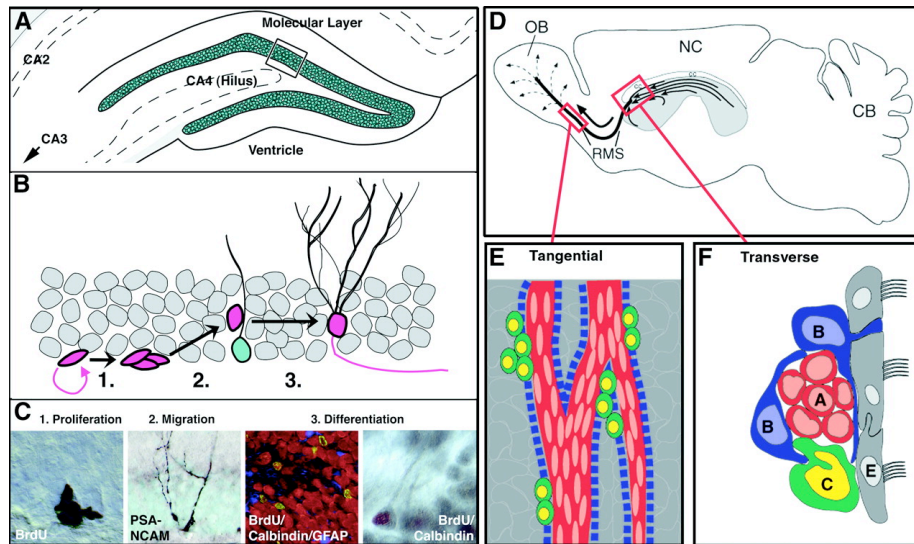


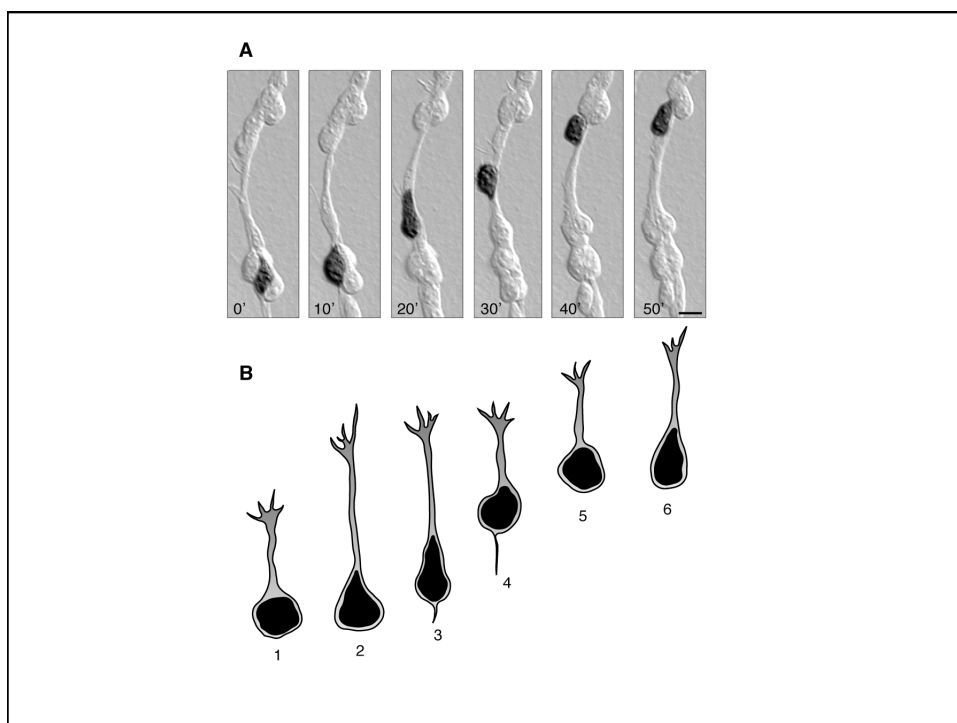
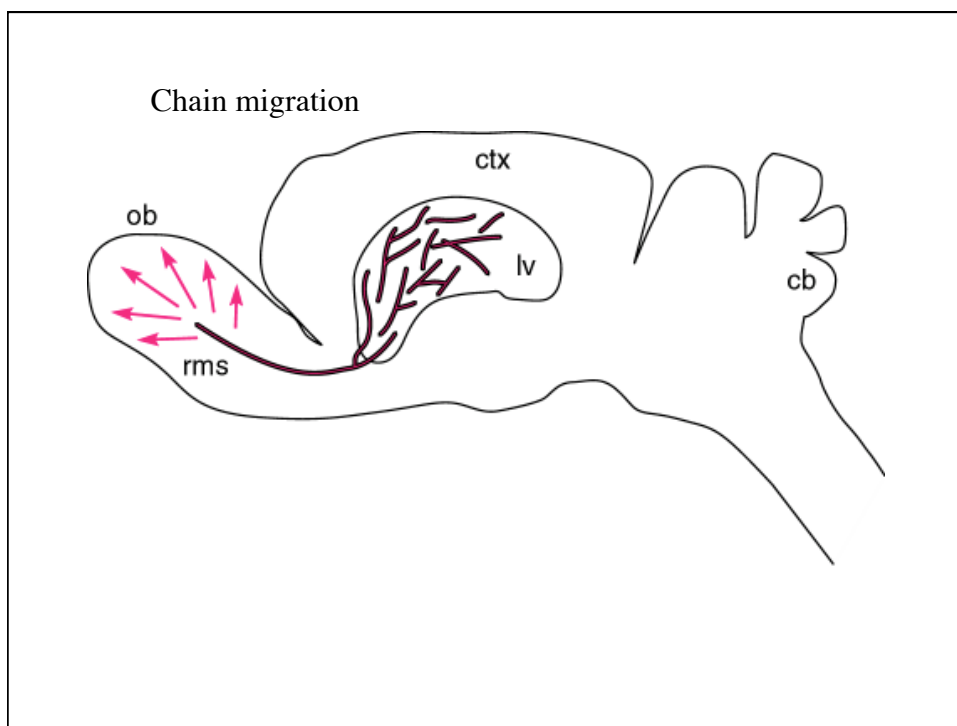
In the early 80s, Fernando Nottebohm reported that neurogenesis continues throughout life in songbirds.



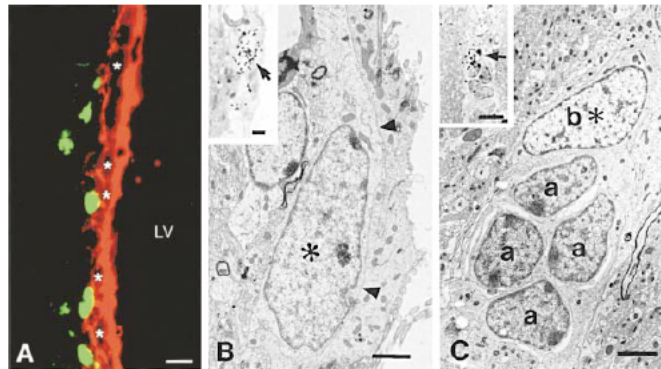
In the late 60s, Joe Altman reported that in the hippocampus and the subventricular zone, neurogenesis continues in adult animals.

Hippocampus and subventricular zone are the two regions of persistent neurogenesis in the adult mammalian brain

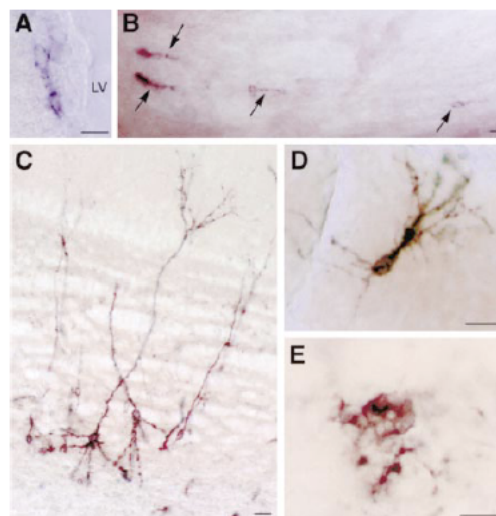


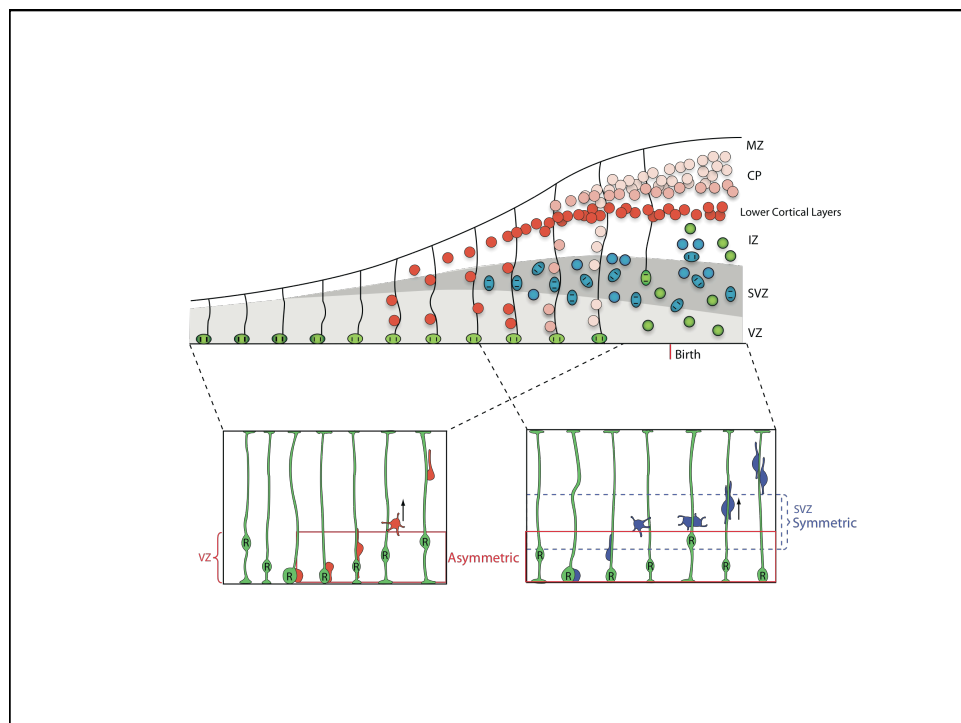
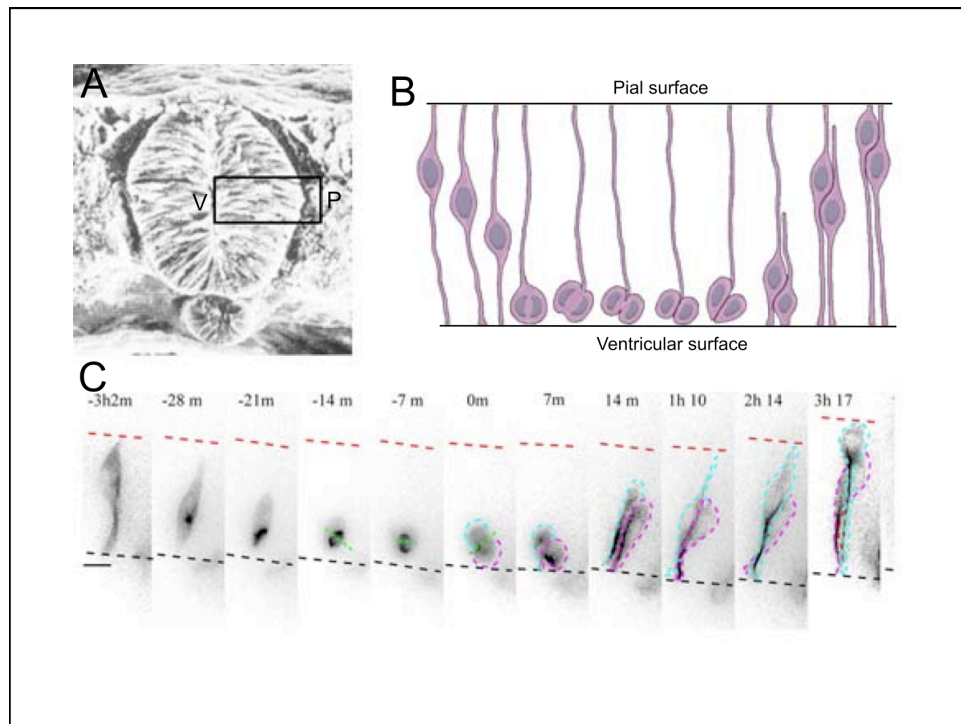


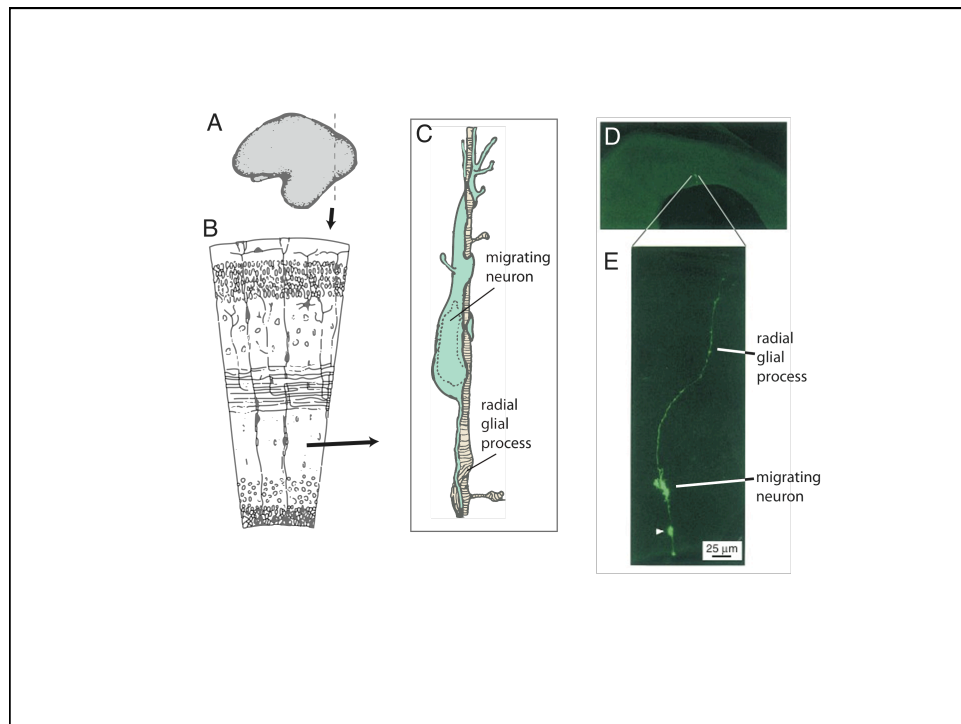
Cells at the ventricle are labeled with BrdU



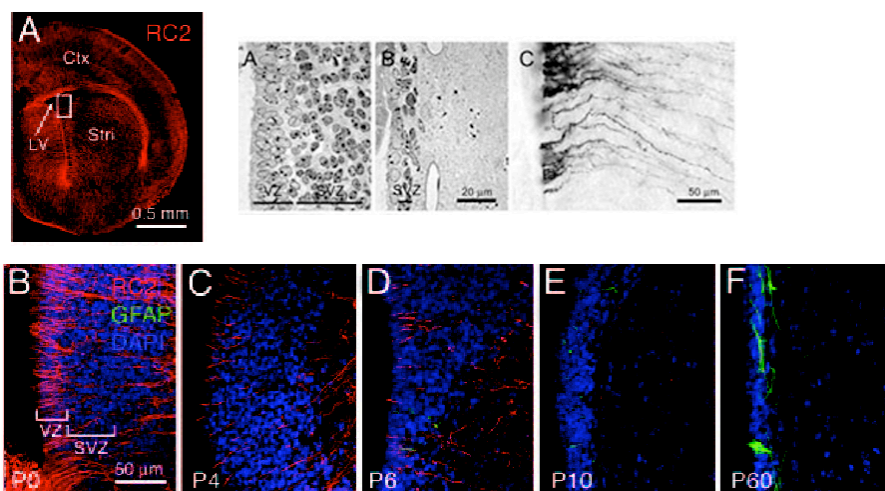
GFAP-Tva mice infected with a reporter/
retrovirus have labeled neurons in the
olfactory bulb





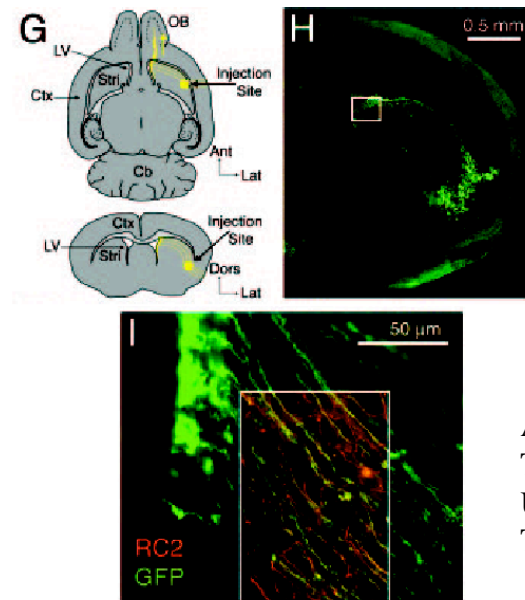


Where do the neural stem cells in the adult brain come from?



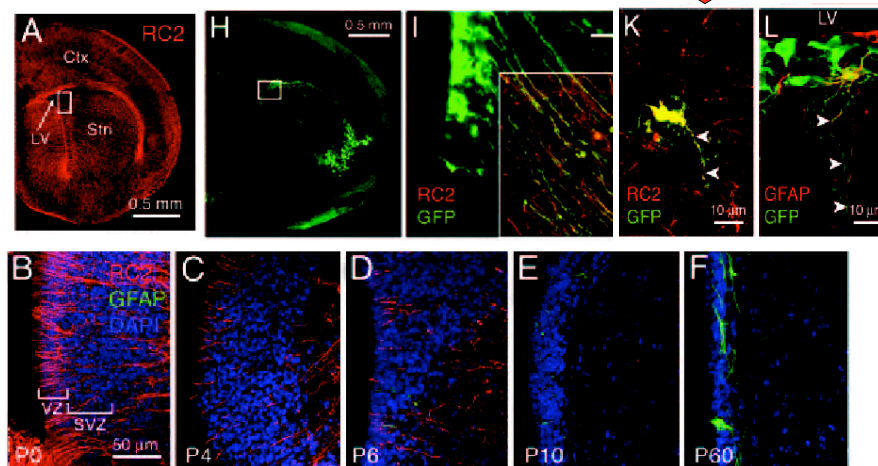
Radial glia disappear and astrocytes differentiate.....

Label the radial glia in the postnatal brain with GFP adenovirus

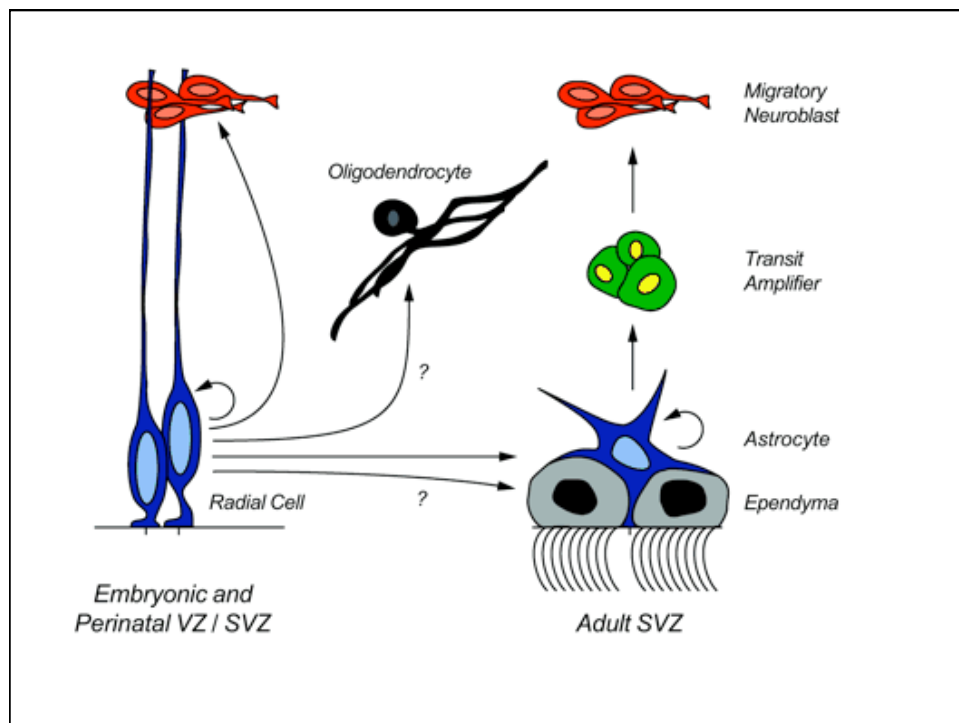
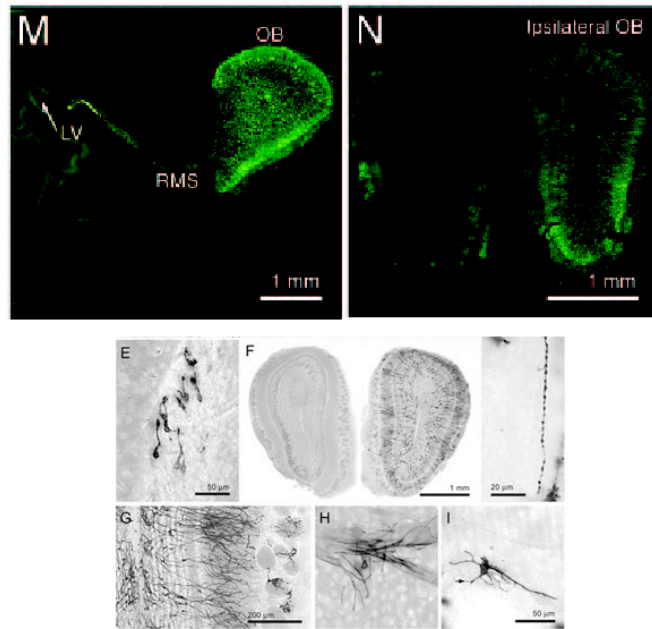


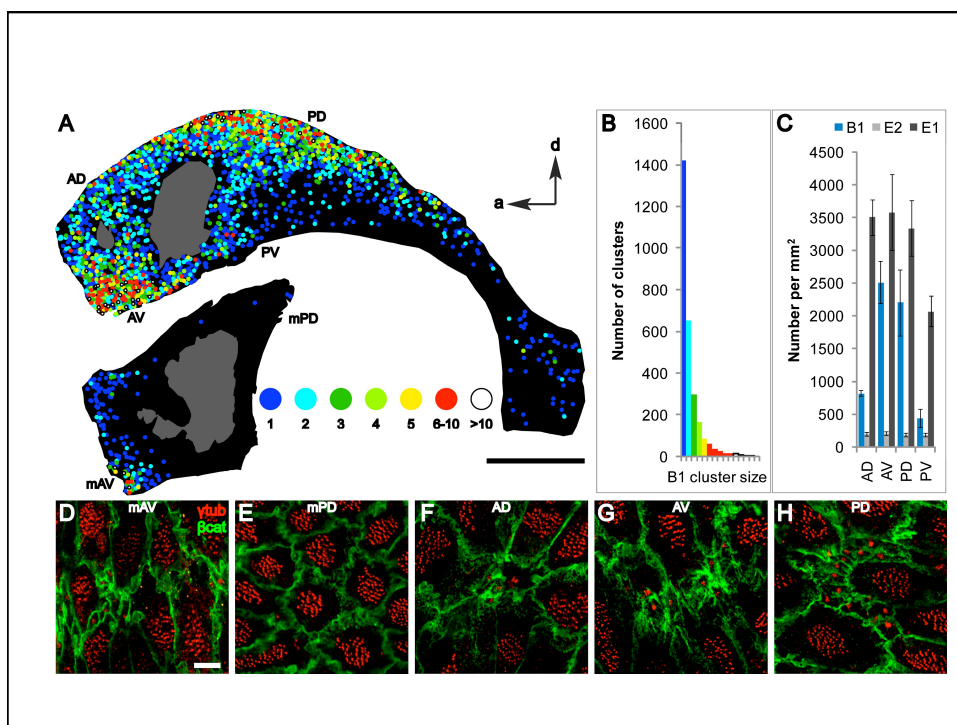
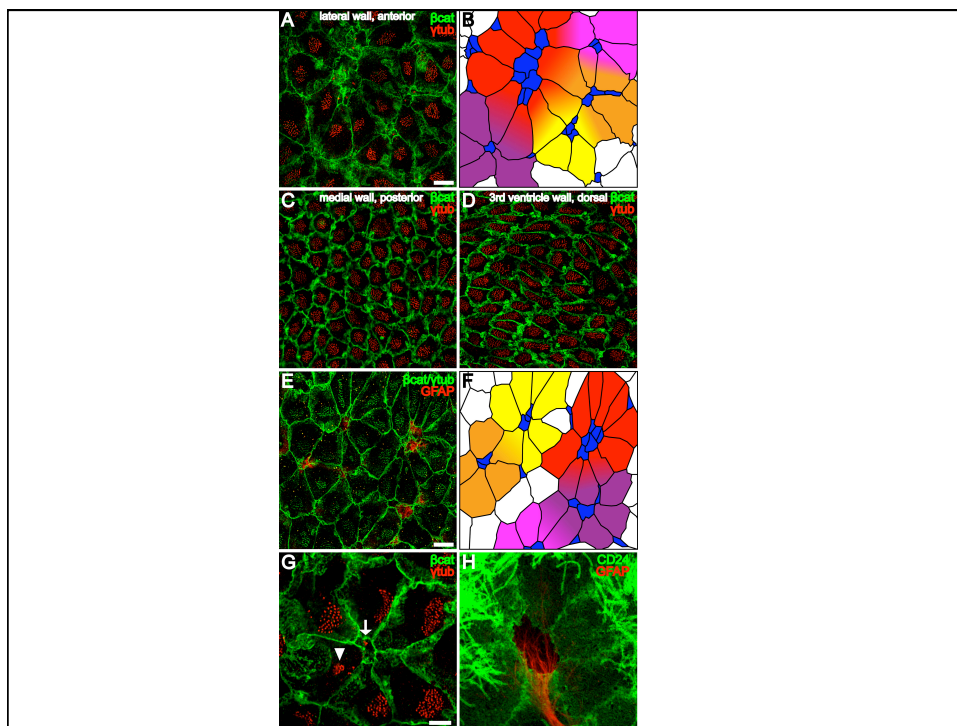
And then let
The mice grow
Up and see what
They become

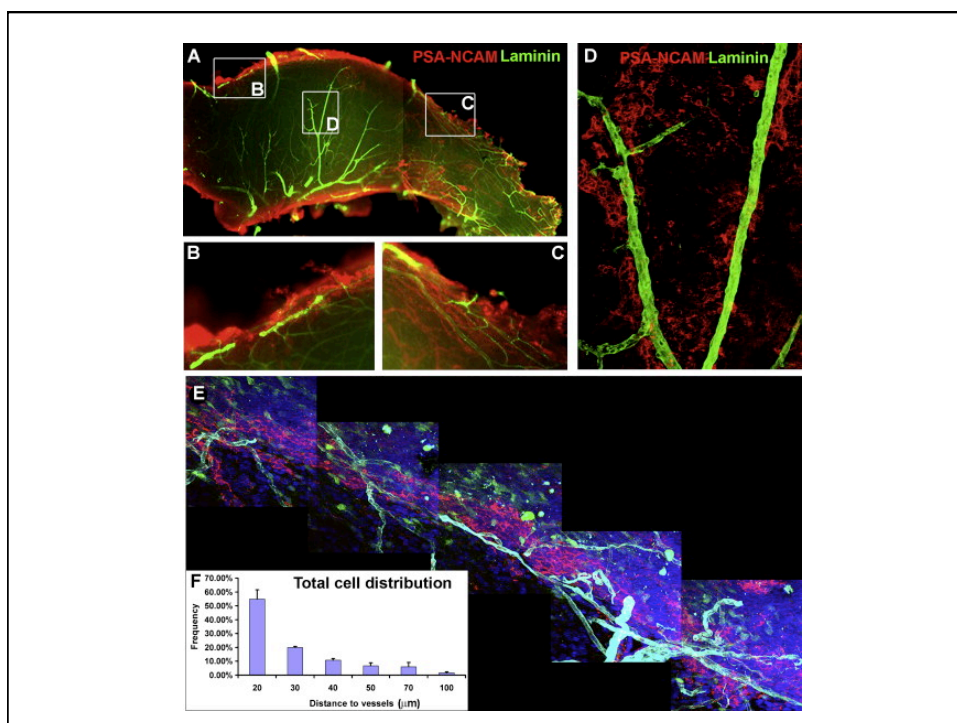
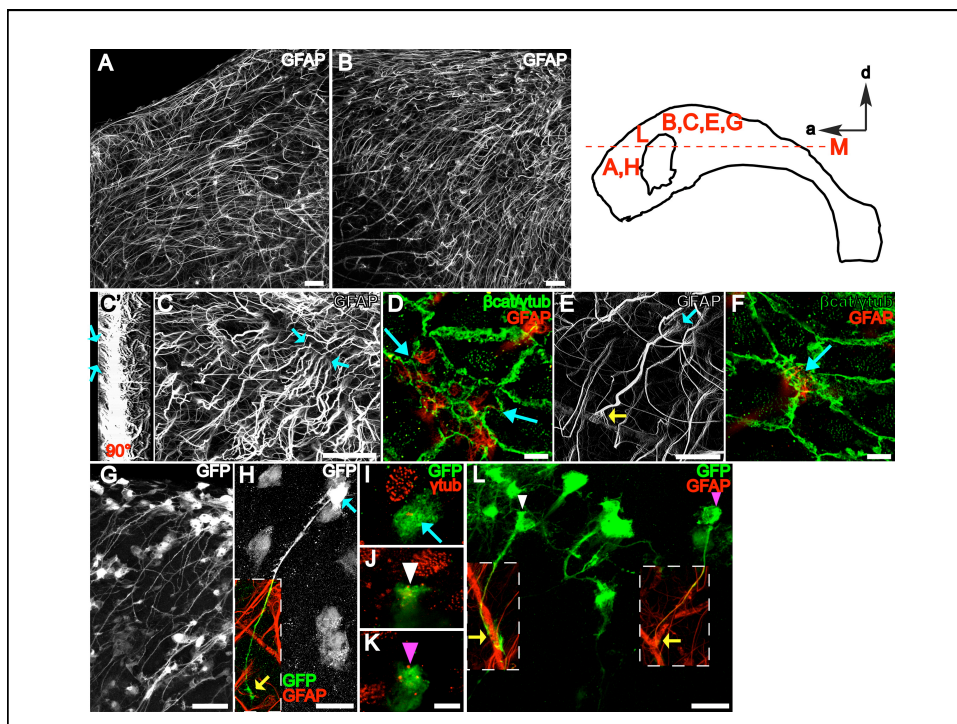
The GFP labeled radial glia develop into astrocytes:

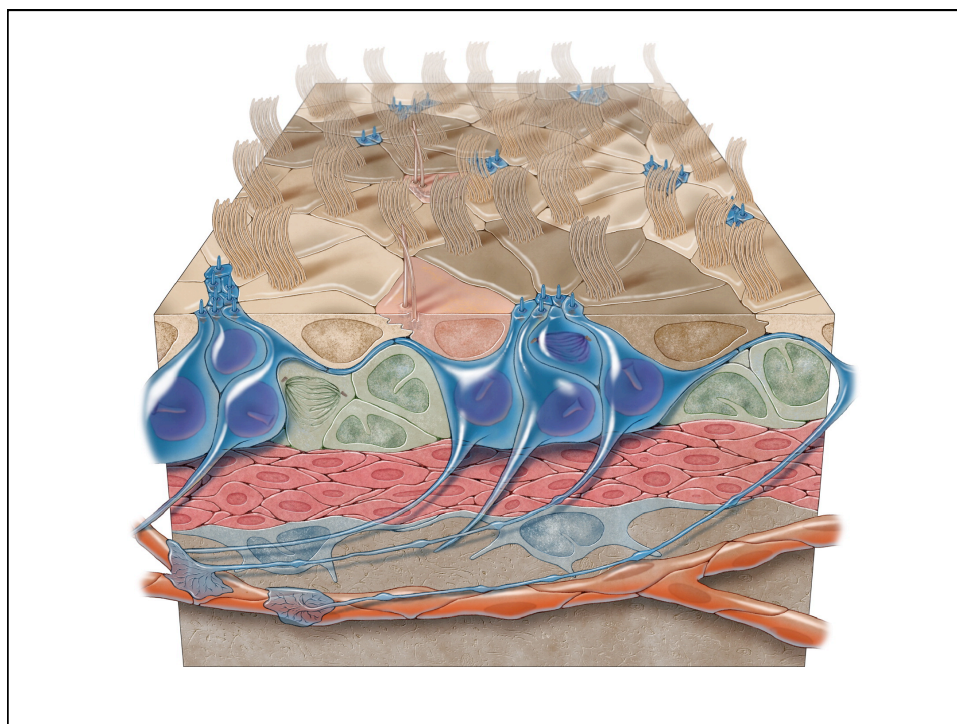


The progeny of the radial glia supply the RMS in adult mice:

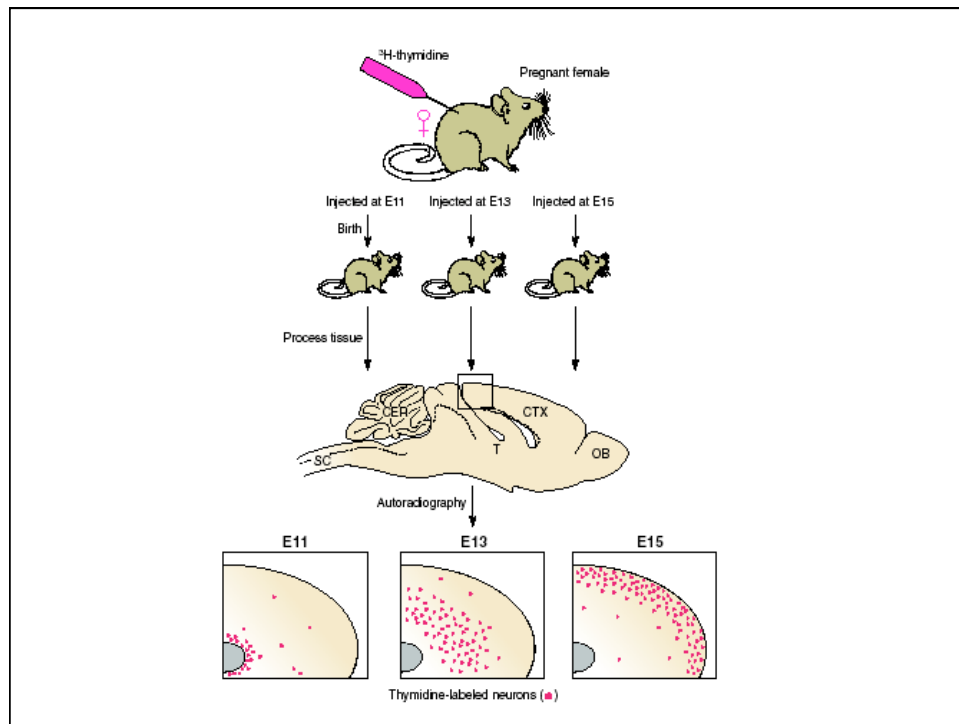




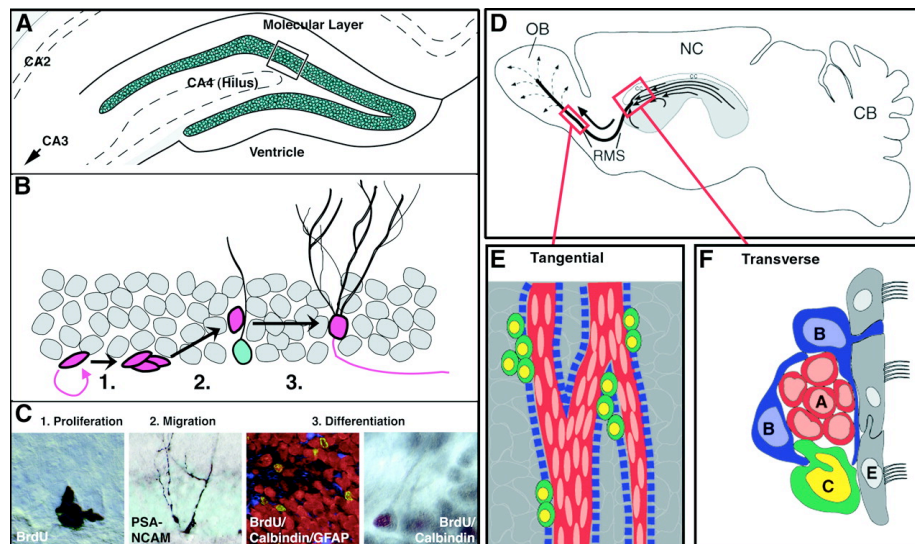




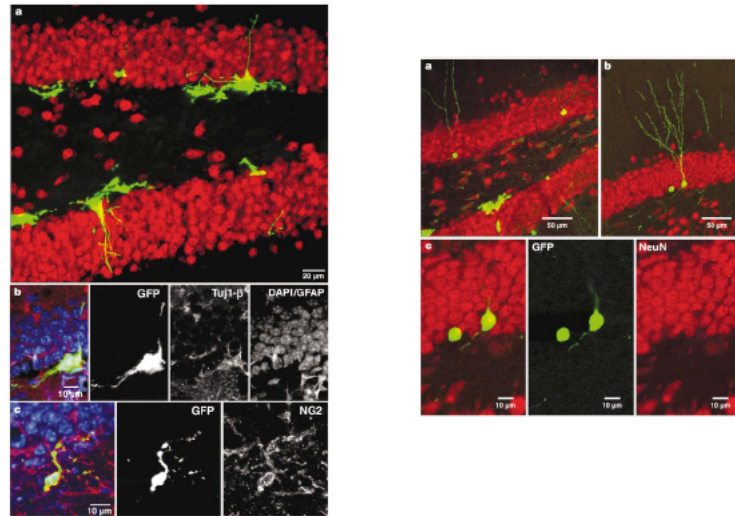
CLOSE				
Table 1. Summary of Factors Used to Manipulate NSC Behavior				
	Region	Outcome	Reference	
Environmental Factors				
LIF	SVZ/HZ	NSC self-renewal	(Bauer and Patterson, 2006)	
CNTF	SVZ/HZ	self-renewal, proliferation, neuronal differentiation	((Emsley and Hagg, 2003) and [Shimazaki et al., 2001])	
Noggin	SVZ	neurogenesis	(Lim et al., 2000)	
Noggin+BDNF	SVZ	striatal medium spiny neurons	(Chmielewski et al., 2004)	
EGF	SVZ	astrocytes; conversion of type c cells; oligodendrocytes	([Aguirre and Gallo, 2007], [Doetsch et al., 2002] and [Kuhn et al., 1997])	
PDGF	SVZ	type B cell proliferation, Oligodendrocytes	(Jackson et al., 2006)	
bFGF	SVZ	neurogenesis	(Kuhn et al., 1997)	
BMP	SVZ	neurogenesis/gliogenesis	([Colak et al., 2008] and [Lim et al., 2000])	
Wnt	SVZ/HZ	proliferation/neurogenesis	([Adachi et al., 2007] and [Liu et al., 2005])	
SHH	SVZ/HZ	proliferation	([Ahn and Joyner, 2005], [Lai et al., 2003], [Machold et al., 2003] and [Palma et al., 2005])	
PDGF	SVZ	self-renewal	(Ramirez-Castillejo et al., 2006)	
RNA/DNA Delivery				
Mash1	HC	oligodendrocytes	(Jesseberger et al., 2008)	
Pax6	SVZ	dopaminergic periglomerular neurons	([Hack et al., 2005] and [Kohwi et al., 2005])	
Olig2	SVZ	oligodendrocytes	(Hack et al., 2005)	
Dlx2	SVZ	dopaminergic periglomerular neurons	(Brill et al., 2008)	
TLR2/4 siRNA	SVZ/HZ	neurogenesis	(Rolls et al., 2007)	
miRNA124, miRNA 137	SVZ	neurogenesis	(Silber et al., 2008)	
Reprogramming Genes				
Oct4/Klf4		5 days postn. pluripotent cells	(Kim et al., 2008)	
Small Molecules				
VPA	AHP	neurogenesis/gliogenesis	(Hsieh et al., 2004)	
Fluoxetine	HC	neurogenesis	(Santarelli et al., 2003)	
Cyclopamine	HC	↓proliferation	(Lai et al., 2003)	
Isosaxozoles	AHP	neurogenesis/gliogenesis	(Schneider et al., 2008)	



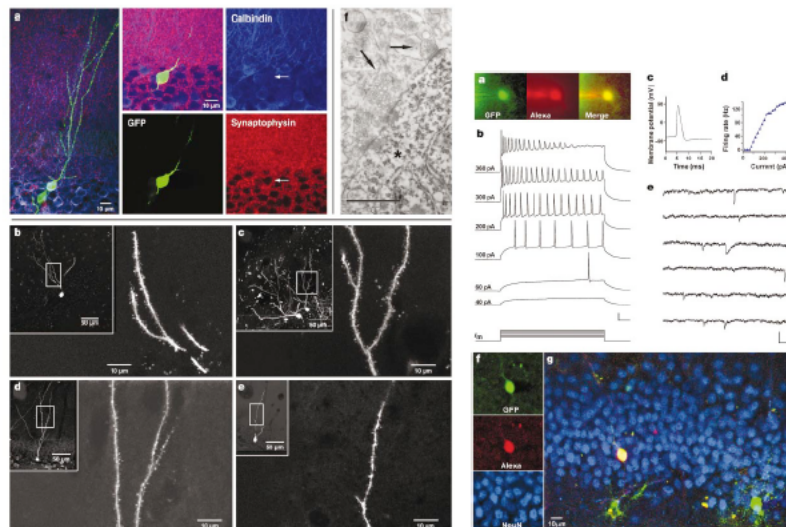
Hippocampus and subventricular zone are the two regions of persistent neurogenesis in the adult mammalian brain

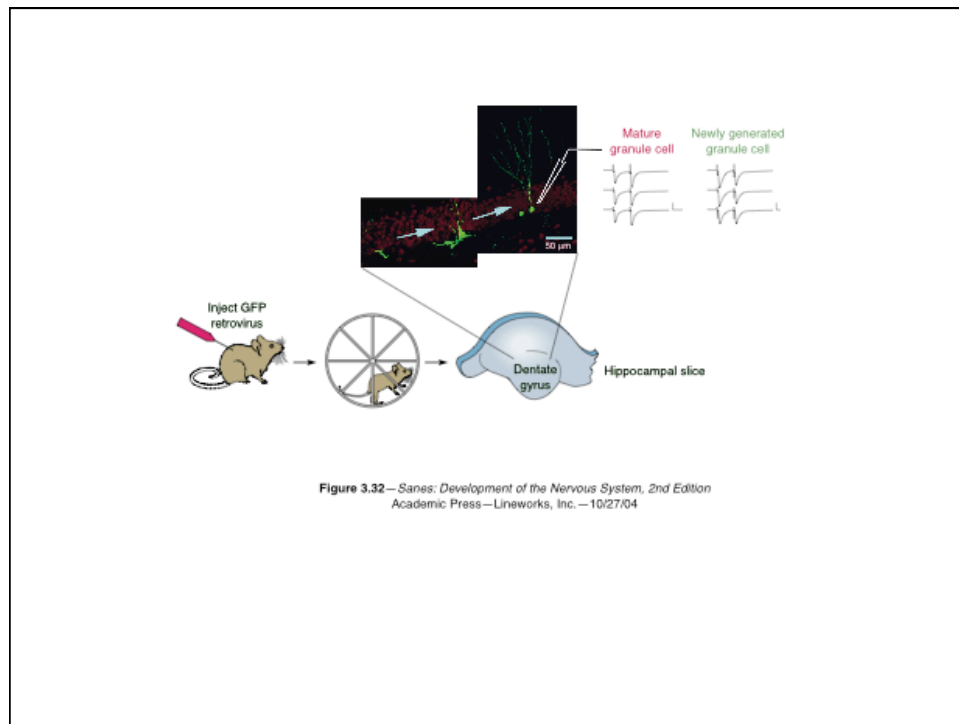


Neurogenesis in adult hippocampus

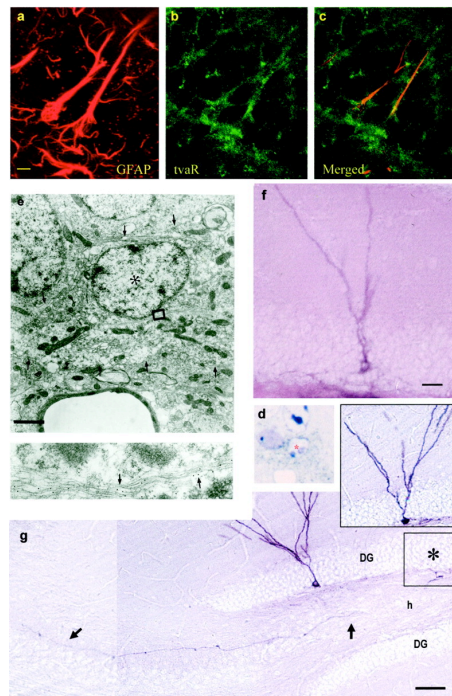


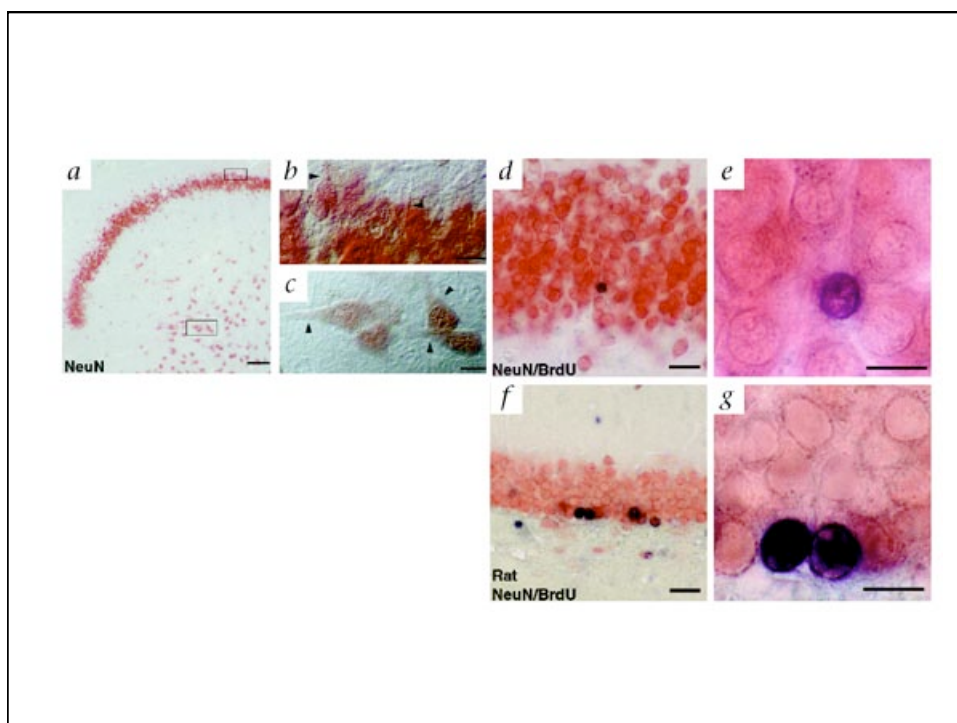
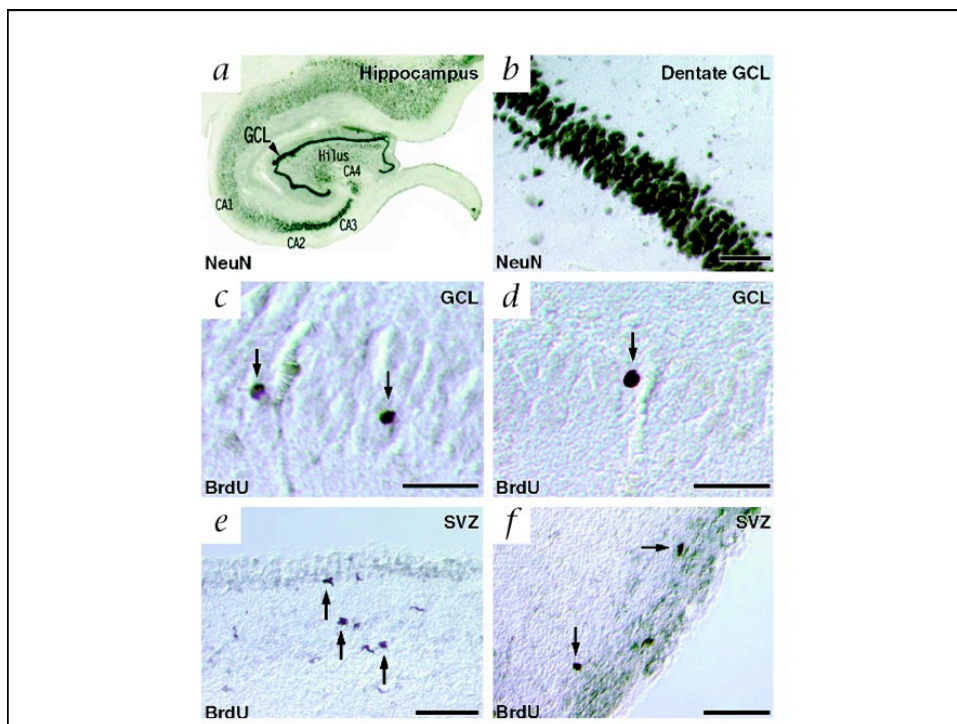
New hippocampal neurons integrate into the circuit

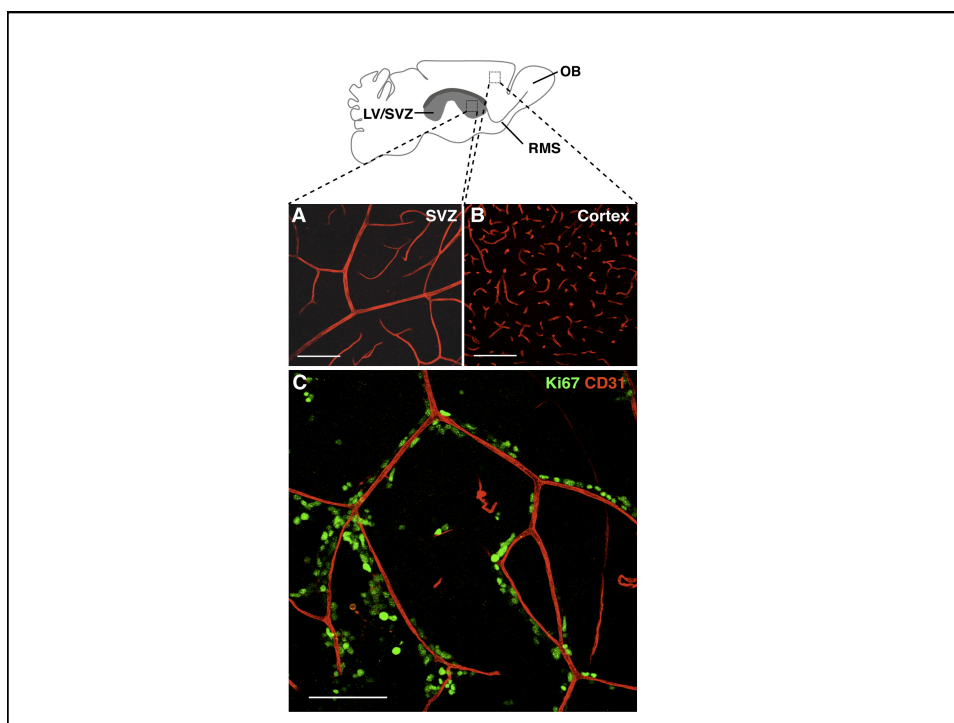
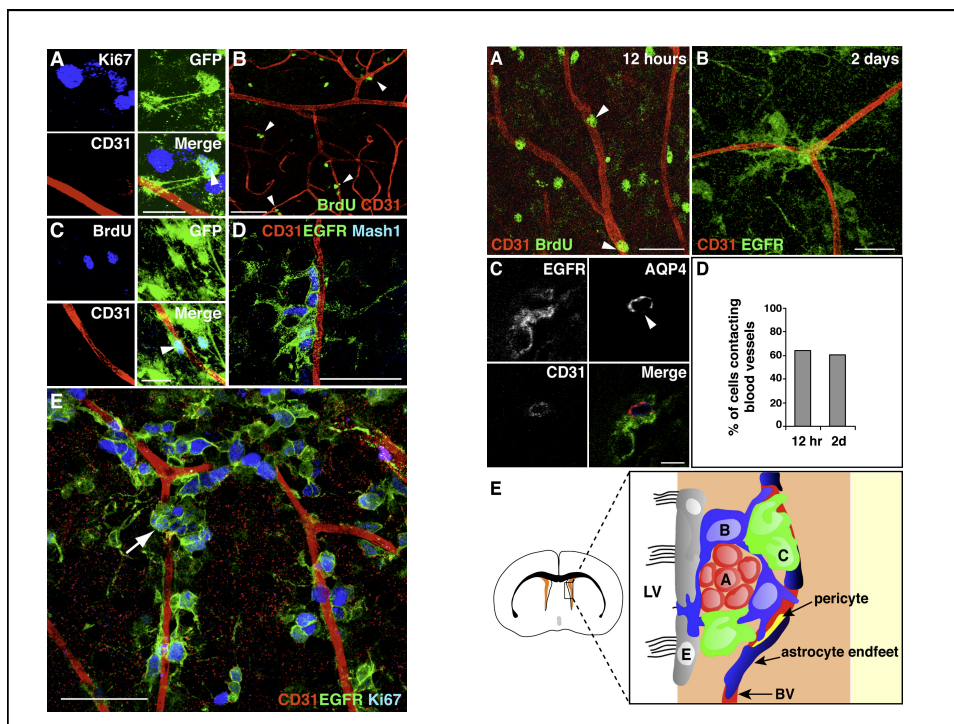




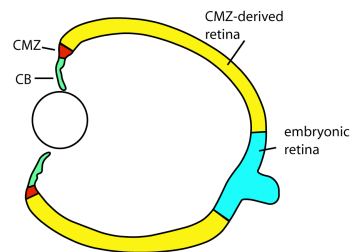
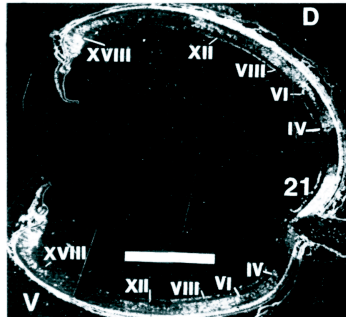
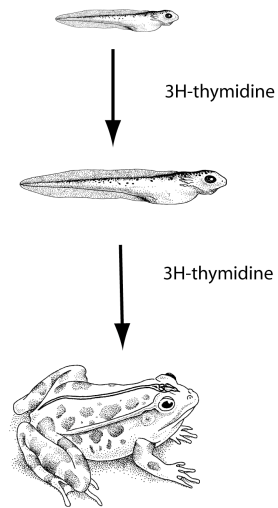
GFAP-Tva mice
infected with
retrovirus also have
labeled cells in the
hippocampus



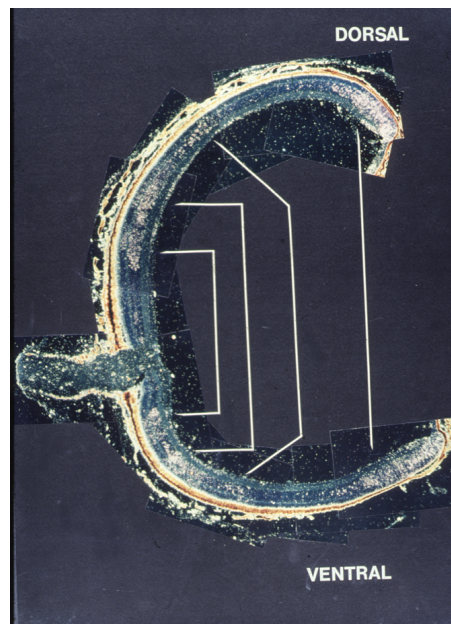
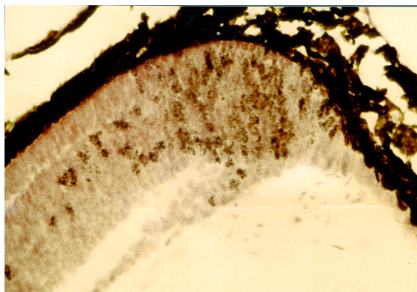




The retina of amphibians and fish grow throughout much of their life



Frog retina grows by adding annuli of new cells at the peripheral retinal margin via a stem cell zone called the CMZ.

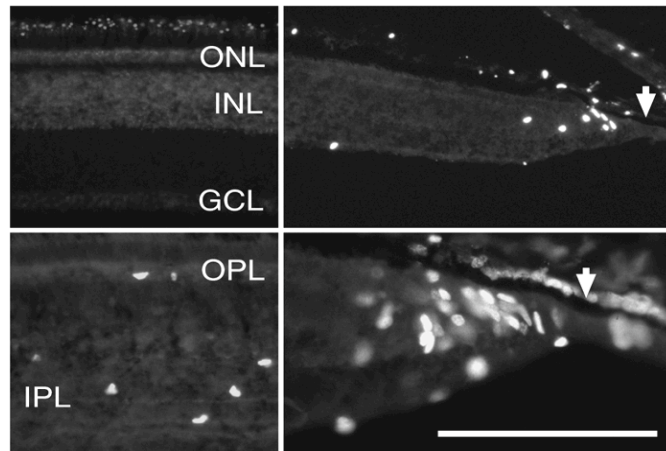


From Reh and Constantine-Paton, 1981

The retinal margin of the chicken contains retinal progenitor cells.

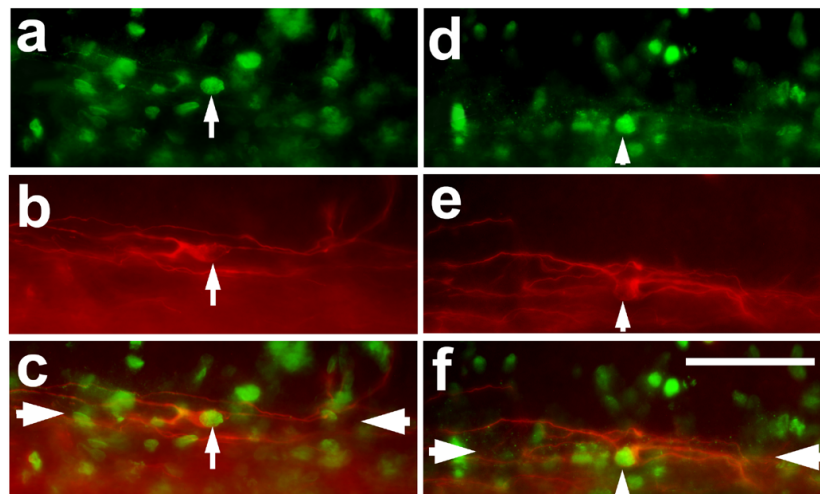


Inject BrdU
Intraocularly:
Up to 1 month
posthatch

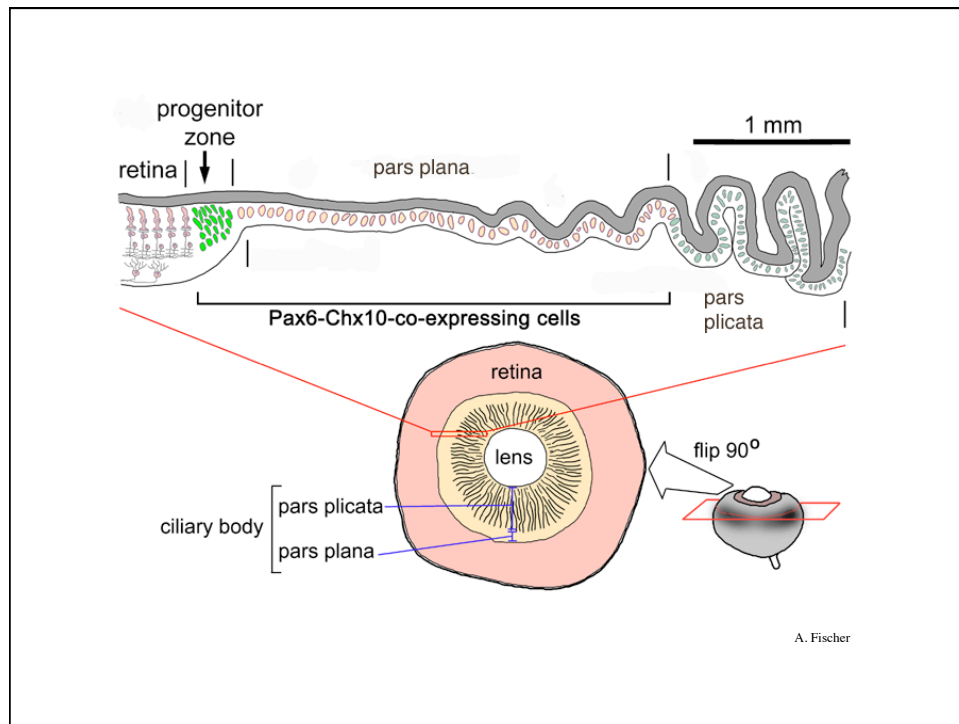


Fischer and Reh, 2000

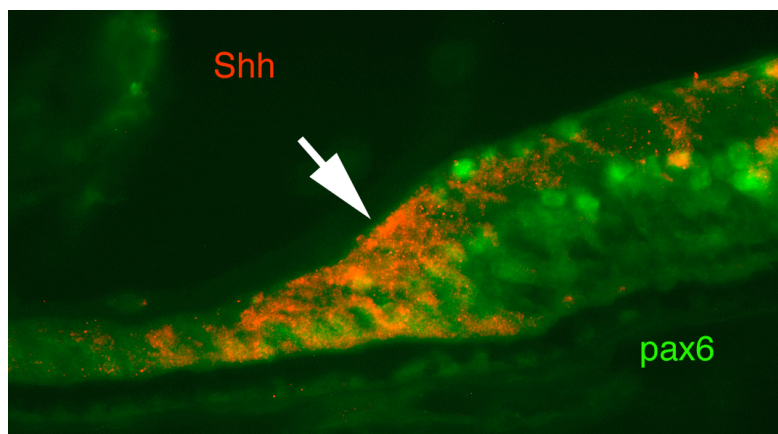
Newly generated ganglion cells at the CMZ after FGF treatment



Fischer and Reh, 2002

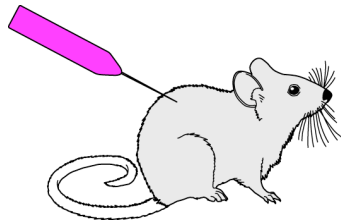


Sonic hedgehog is concentrated at the CMZ in birds



Moshiri et al, 2004

The adult rodent eye normally lacks a CMZ



Inject BrdU from
Postnatal day 13-15

