

How to use the Allen Brain Atlas

Allen Brain Atlas Overview - Project of the Allen Institute for Brain Science

- Objective to “fuel discovery” by creating free atlases.
- Initiated in 2003 with a \$100 million donation from Microsoft co-founder Paul Allen
- First public atlas available in 2006, and by 2012 there were seven atlases published:
mouse, human, developing mouse, developing human, mouse connectivity, non-human primate, mouse spinal cord
- There are three related projects with databanks:
Glioblastoma, Mouse diversity, Sleep
- Techniques for creating atlases:
Mainly in situ hybridization of postmortem brains, and “scanning technology”
- The Brain Explorer
Downloadable 3-D interactive brain explorer
- Note that at the bottom of the Allen Brain Atlas Wikipedia page is a link to:
List of neuroscience databases
23 databases shown
EMAGE
A UK funded mouse brain atlas using in situ hybridization, IHC, and reporters

ALLEN BRAIN ATLAS
DATA PORTAL

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Welcome Announcements Highlights Tutorials Search API Help

A growing collection of online public resources integrating extensive gene expression and neuroanatomical data, complete with a novel suite of search and viewing tools.

Get started with tutorials offering introductory overviews and guided tours.

Mouse Brain
A genome-wide, high-resolution atlas of gene expression throughout the adult mouse brain

Human Brain
A multi-modal, multi-resolution atlas detailing gene expression across the adult human brain

Developing Mouse Brain
A detailed atlas of gene expression across mouse brain development

Developing Human Brain
A detailed atlas of gene expression across human brain development

Mouse Connectivity
A high-resolution map of neural connections in the mouse brain

Non-Human Primate
A detailed atlas of gene expression across postnatal primate brain development

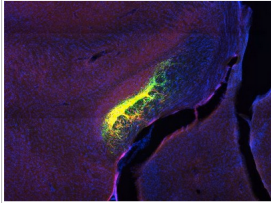
Mouse Spinal Cord
A genome-wide, high-resolution atlas of gene expression throughout the mouse spinal cord

Glioblastoma
A unique platform for exploring human glioblastoma at the cellular and molecular levels

Reference Atlases
High resolution mouse and human adult and developmental brain reference atlases

API
Programmatic access to published data through an application programming interface

HIGHLIGHTS



Axon terminals within the subthalamic nucleus are labeled with red and green fluorescent proteins after injection of the globus pallidus in the postnatal day 56 mouse.

[More highlights](#)

ANNOUNCEMENTS - Updated October 24, 2013

What's New - Latest Data Release October 24, 2013

Educational and Training Resources

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☒ Gene Search Enter Gene Name, Gene Symbol, NCBI Accession Number or Entrez Gene ID

☐ Differential Search

☐ Fine Structure Search

☐ Bulk Search ☐ Show exact matches only

☐ Human Differential Search

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Browse by Differential Expression

Isocortex	Field CA1	Regular nucleus of the thalamus
Cerebral cortex, layer 2-3	Field CA3	Epithalamus
Cerebral cortex, layer 4	Dentate gyrus	Hypothalamus
Cerebral cortex, layer 5	Entorhinal area	Midbrain
Cerebral cortex, layer 6a	Striatum	Periaqueductal gray
Main olfactory bulb	Lateral septal complex	Pons
Accessory olfactory bulb	Pallidum	Medulla
Piriform area	Cerebellum	Inferior olivary complex
Hippocampal region	Thalamus	

Allen Mouse Brain Atlas

Search the data

Use Gene Search to find ISH data for a specific gene of interest [\[more\]](#)

Use Correlation to find genes with similar spatial expression profiles to a gene selected from Gene Search returns [\[more\]](#)

About the Allen Mouse Brain Atlas

A genome-wide, high-resolution atlas of gene expression throughout the adult mouse brain

Key features:

- In situ* hybridization image data with cellular-level resolution
- Anatomic reference atlas
- Advanced search and visualization tools
- Brain Explorer® 3-D viewer

[\[more\]](#)

See publication in Nature

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☐ Bulk Search ☐ Show exact matches only
☐ Human Differential Search

RGs8

Showing page 1 of 1

Experi...	Gene Sym...	Gene Name	Probe Name	Orienta...	Plane	Expression S...
☐ 69445397	Rgs8	regulator of G-protein signaling 8	RP_050419_0...	Antisense	sagittal	
☐ 71020445	Rgs8	regulator of G-protein signaling 8	RP_050419_0...	Antisense	coronal	

Correlation

Basic cell groups and regions (grey) ▾

☐ Coronal data only

BrainExplorer [View in 3D](#)

Related Institute Data

Can click on “3D” to enter Brain Explorer, but you would have to download the stand-alone app

Click on one, 3-d data are revealed

Click here on the experiment to view ISH data



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RGs8

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Correlation Rgs8

Basic cell groups and region (grey) ▾

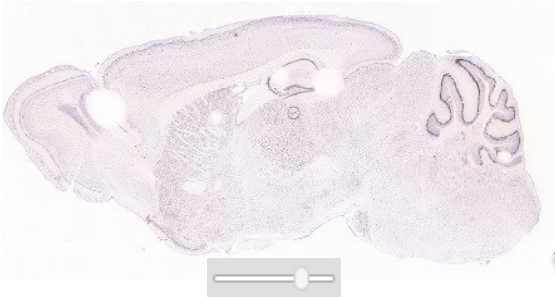
☐ Coronal data only

BrainExplorer [View in 3D](#)

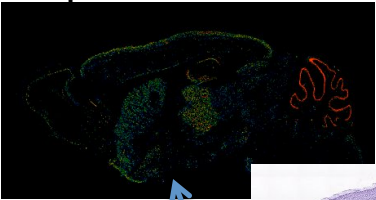
Related Institute Data

Mouse

Contrast Slider



Expression



Nissl



Thumbnails

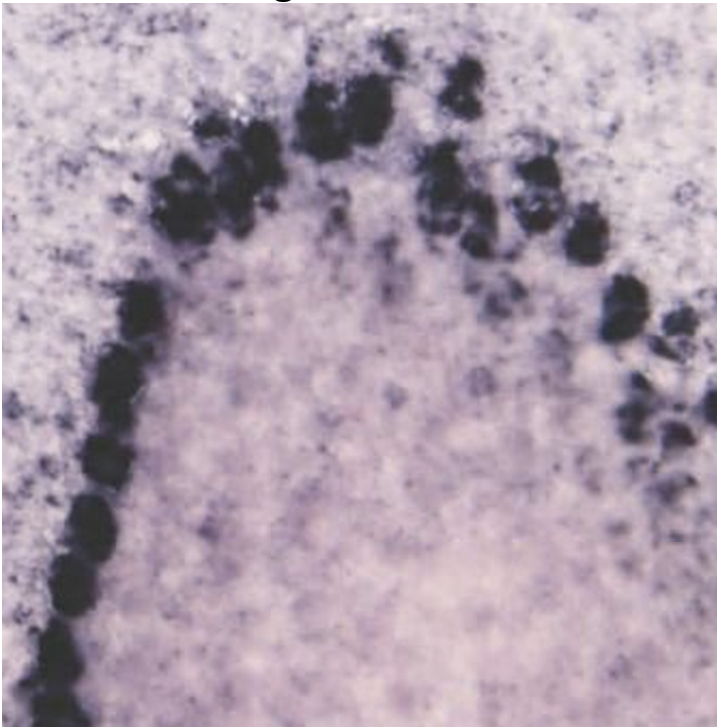


Rgs8 - RP_050419_01_A11 - sagittal

Experiment	
Gene	Rgs8
Probe Type	RNA
Probe Orientation	Antisense
Plane of Section	sagittal
Treatments	ISH
Specimen 05-0904	
Organism	Mus musculus
Strain	C57BL/6J
Age	56
Sex	M
Related Institute Data	
MOUSE	



Large window zoom



Franz Nissl

From Wikipedia, the free encyclopedia

(Redirected from [Nissl](#))

Franz Nissl (9 September 1860, [Frankenthal](#) – 11 August 1919, [Munich](#)) was a [German medical researcher](#). He was a noted [neuropathologist](#).

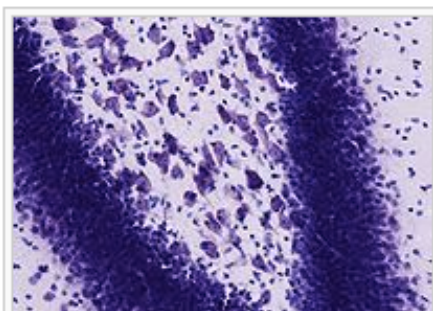


Image of a Nissl-stained histological section through the [rodent hippocampus](#) showing various classes of neurons.

Named histology concepts [\[edit\]](#)

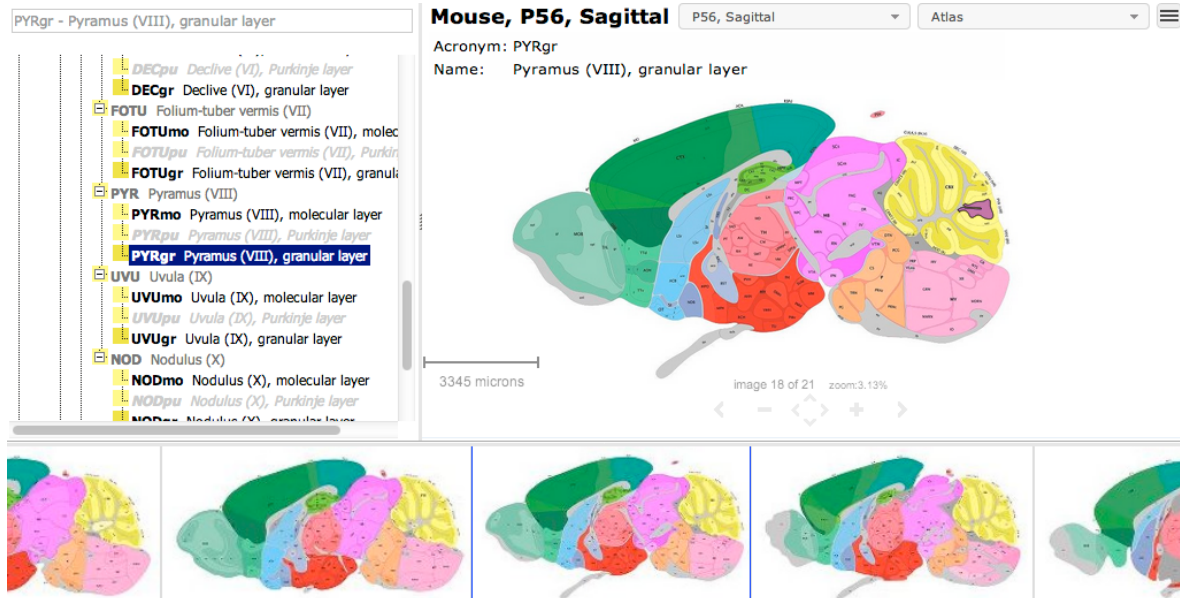
The **Nissl method** refers to staining of the cell body, and in particular [endoplasmic reticulum](#). This is done by using various basic dyes (e.g. [aniline](#), [thionine](#), or [cresyl violet](#)) to stain the negatively charged [RNA](#) blue, and is used to highlight important structural features of neurons. The **Nissl substance** ([rough endoplasmic reticulum](#)) appears dark blue due to the staining of ribosomal RNA, giving the cytoplasm a mottled appearance. Individual granules of extranuclear RNA are named **Nissl granules** ([ribosomes](#)). DNA present in the [nucleus](#) stains a similar color.

Reference Atlas

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☒ Gene Search Enter Gene Name, Gene Symbol, NCBI Accession Number or Entrez Gene ID
☐ Differential Search Search
☐ Fine Structure Search
☐ Bulk Search ☐ Show exact matches only
☐ Human Differential Search



Differential Gene Search – an actual application of the atlas

The screenshot displays the Allen Brain Atlas web application interface for Differential Gene Search. The top navigation bar includes links for Home, Mouse Brain (selected), Developing Mouse Brain, Human Brain, Mouse Connectivity, and More. Below this, a secondary navigation bar contains links for ISH Data, Reference Atlas, AGEA, Brain Explorer, Related Studies (dropdown), Documentation, and Help.

On the left side, there are radio buttons for different search methods: Gene Search, Differential Search (selected), Fine Structure Search, Bulk Search, and Human Differential Search. To the right of these buttons are input fields for Target Structure(s) and Contrast Structure(s).

Below the search options is a section titled "Browse by Differential Expression" which lists various brain regions in two columns. The regions listed include Isocortex, Cerebral cortex, layer 2-3, Cerebral cortex, layer 4, Cerebral cortex, layer 5, Cerebral cortex, layer 6a, Main olfactory bulb, Accessory olfactory bulb, Piriform area, Hippocampal region, Field of vision, Dentate gyrus, Entorhinal cortex, Striatum, Lateral septum, Pallidum, Cerebellar cortex, and Thalamus.

The main content area on the right shows a hierarchical tree structure of brain regions. The tree is rooted at "grey" (Basic cell groups and regions) and branches down to "CBN" (Cerebellar nuclei). The regions listed in the tree are: CH (Cerebrum), CTX (Cerebral cortex), CTXpl (Cortical plate), Isocortex, OLF (Olfactory areas), HPF (Hippocampal formation), CTXsp (Cortical subplate), CNU (Cerebral nuclei), STR (Striatum), PAL (Pallidum), BS (Brain stem), IB (Interbrain), TH (Thalamus), HY (Hypothalamus), MB (Midbrain), HB (Hindbrain), P (Pons), MY (Medulla), CB (Cerebellum), CBX (Cerebellar cortex), and CBN (Cerebellar nuclei). The CBN region is highlighted in blue.

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☐ Gene Search
☒ Differential Search
☐ Fine Structure Search
☐ Bulk Search
☐ Human Differential Search

Target Structure(s)
CBN

Contrast Structure(s)
grey

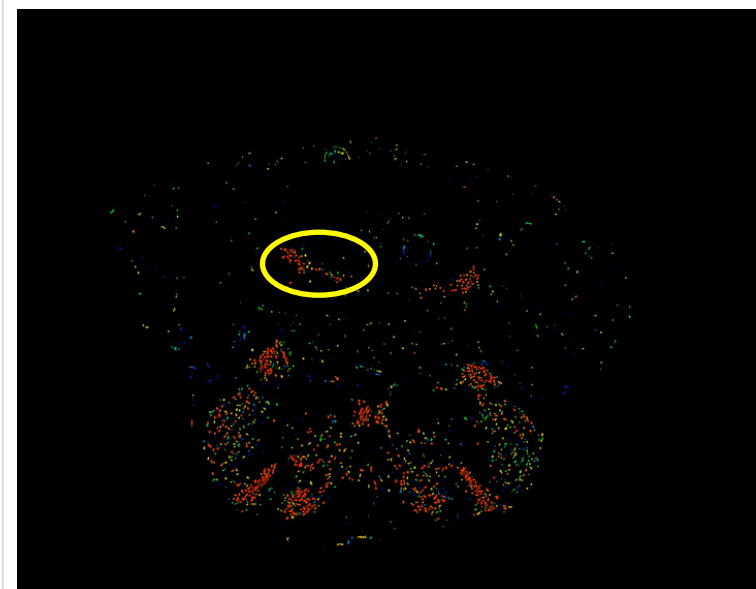
Coronal data only:
Expression threshold (4.7):

Search

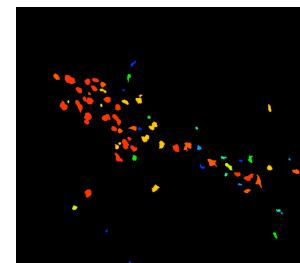
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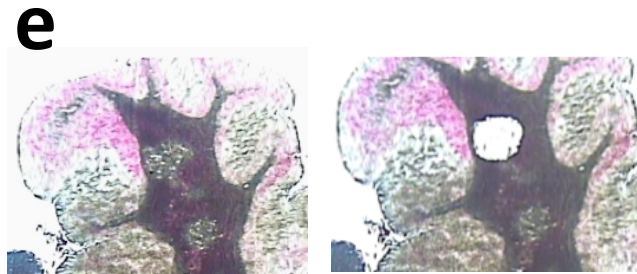
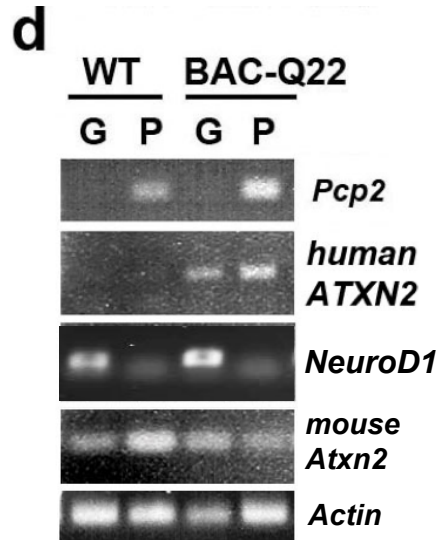
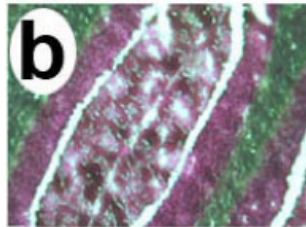
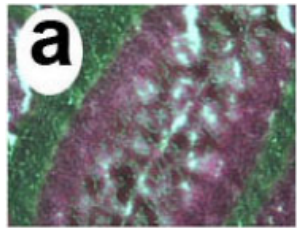
☐	Fold Ch...	Experi...	Gene Sy...	Gene Name	Probe Name	Orient...	Plane	Expression S...
☐	9.441	73930835	Cabp7	calcium binding protein 7	RP_051214_0...	Antisense	coronal	
☐	9.077	69672198	F5	coagulation factor V	RP_050428_0...	Antisense	sagittal	
☐	7.359	71280670	Esrrg	estrogen-related receptor gamma	RP_050818_0...	Antisense	sagittal	
☐	5.780	70301275	Sgpp2	sphingosine-1-phosphate phosphatase 2	RP_050309_0...	Antisense	coronal	
☐	5.722	73521000	Nxph4	neurexophilin 4	RP_051101_0...	Antisense	coronal	
☐	5.577	70436743	Spp1	secreted phosphoprotein 1	RP_050310_0...	Antisense	coronal	
☐	5.446	75651185	Spp1	secreted phosphoprotein 1	RP_060518_0...	Antisense	coronal	
☐	5.288	71670697	Steap2	six transmembrane epithelial antigen of pro...	RP_050512_0...	Antisense	coronal	
☐	5.157	74743257	Nrg1	neuregulin 1	RP_060220_0...	Antisense	coronal	
☐	5.114	71717686	Sh3bgr2	SH3 domain binding glutamic acid-rich prot...	RP_050808_0...	Antisense	coronal	
☐	5.081	72081560	Kcng4	potassium voltage-gated channel, subfamil...	RP_051017_0...	Antisense	coronal	
☐	4.964	70303534	Acyp2	acylphosphatase 2, muscle type	RP_050609_0...	Antisense	sagittal	
☐	4.811	70813924	Kctd9	potassium channel tetramerisation domain ...	RP_050725_0...	Antisense	coronal	
☐	4.681	68632172	Tlr	transthyretin	RP_050125_0...	Antisense	sagittal	
☐	4.639	72081416	Acadl	acyl-Coenzyme A dehydrogenase, long-chain	RP_051017_0...	Antisense	coronal	
☐	4.322	70305592	Cabp7	calcium binding protein 7	RP_050609_0...	Antisense	sagittal	
☐	4.293	68667079	Slo4a2	solute carrier family 4 (anion exchanger), m...	RP_050201_0...	Antisense	sagittal	
☐	4.278	73930836	Emb	embigin	RP_051214_0...	Antisense	coronal	
☐	4.018	68845825	Kcng4	potassium voltage-gated channel, subfamil...	RP_050224_0...	Antisense	sagittal	
☐	3.986	79762548	S100b	S100 protein, beta polypeptide, neural	RP_071204_0...	Antisense	sagittal	
☐	3.972	71064290	Il16	interleukin 16	RP_050808_0...	Antisense	coronal	
☐	3.799	71610865	Elovl5	ELOVL family member 5, elongation of lon...	RP_050927_0...	Antisense	sagittal	
☐	3.730	69015350	Spp1	secreted phosphoprotein 1	RP_050310_0...	Antisense	sagittal	
☐	3.651	74988616	Klk6	kalikrein related-peptidase 6	RP_060315_0...	Antisense	coronal	
☐	3.581	69887331	Steap2	six transmembrane epithelial antigen of pro...	RP_050512_0...	Antisense	sagittal	
☒	3.496	72128747	Ankrd34b	ankyrin repeat domain 34B	RP_051017_0...	Antisense	coronal	
☐	3.491	73512185	Hcn2	hyperpolarization-activated, cyclic nucleotid...	RP_050705_0...	Antisense	coronal	
☐	3.475	74511967	Serpnb1c	serine (or cysteine) peptidase inhibitor, clad...	RP_060220_0...	Antisense	coronal	
☐	3.459	71668992	Panx2	pannexin 2	RP_050607_0...	Antisense	sagittal	
☐	3.332	75081396	Plcl1	phospholipase C-like 1	RP_060315_0...	Antisense	coronal	
☐	3.313	72472765	Cerk	ceramide kinase	RP_051101_0...	Antisense	coronal	

View Selections (1)
Clear Selections

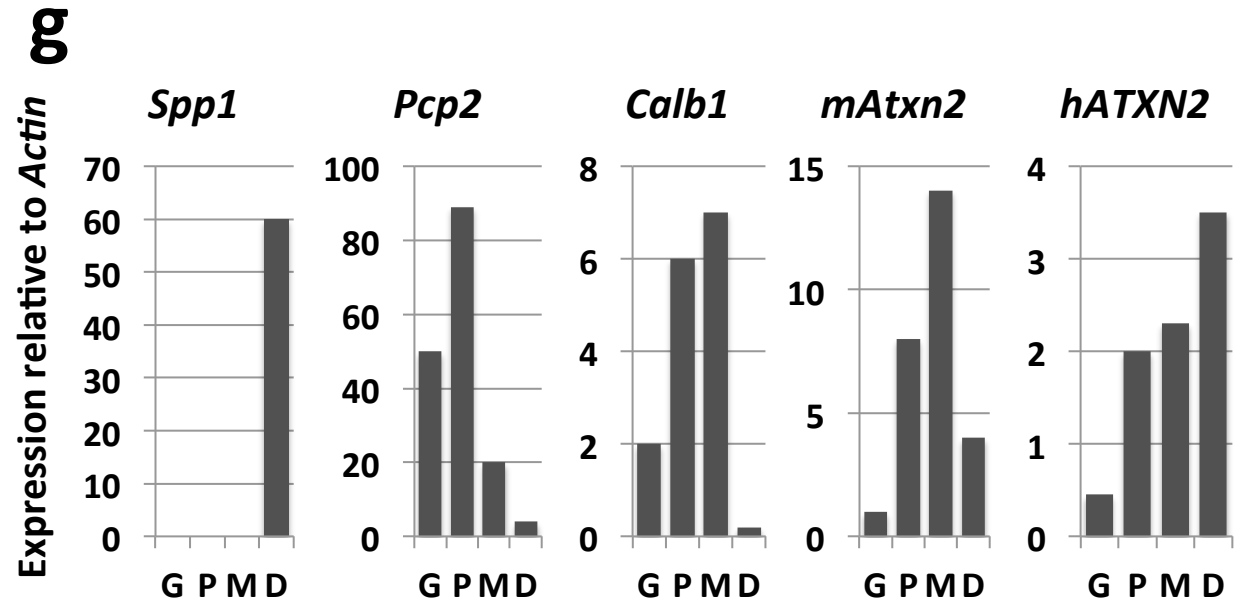
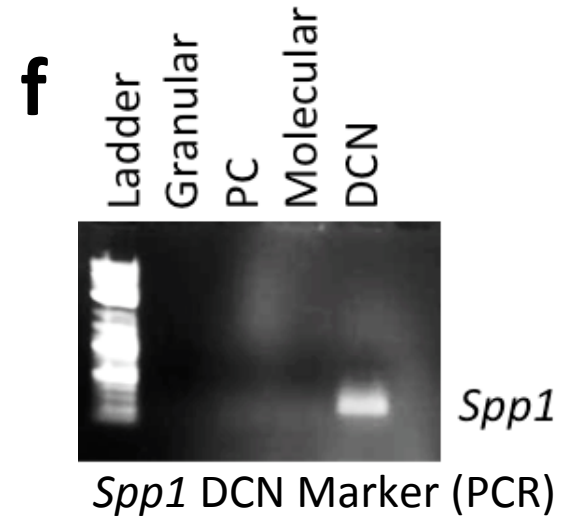


Ssp1 ISH





DCN Before & After LCM

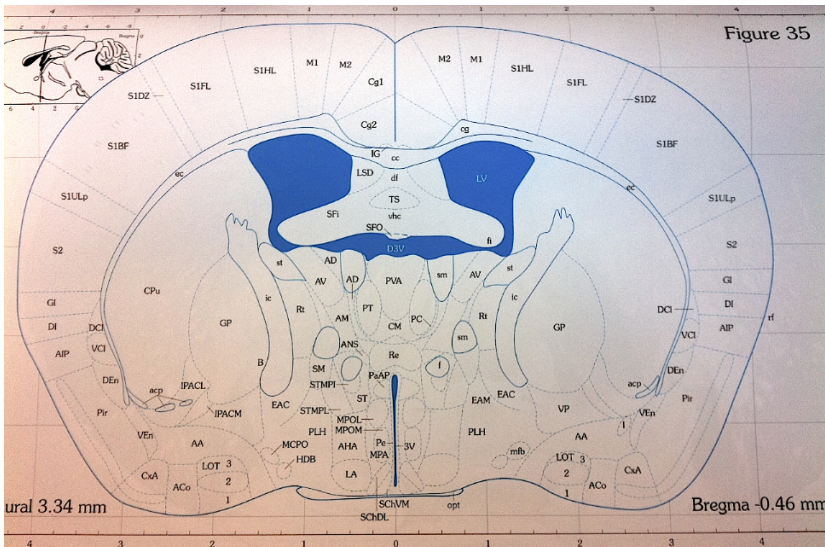
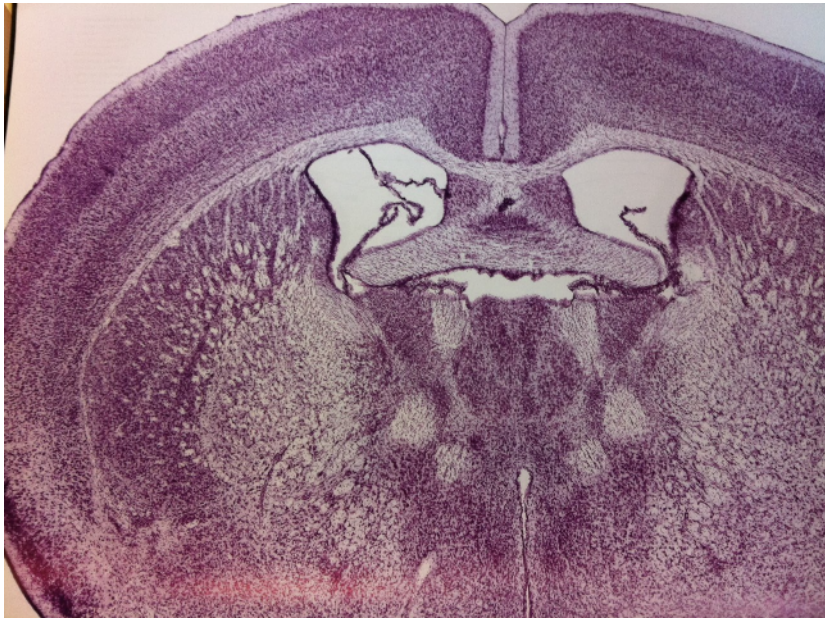


Stereotaxic Coordinates

Franklin and Paxinos

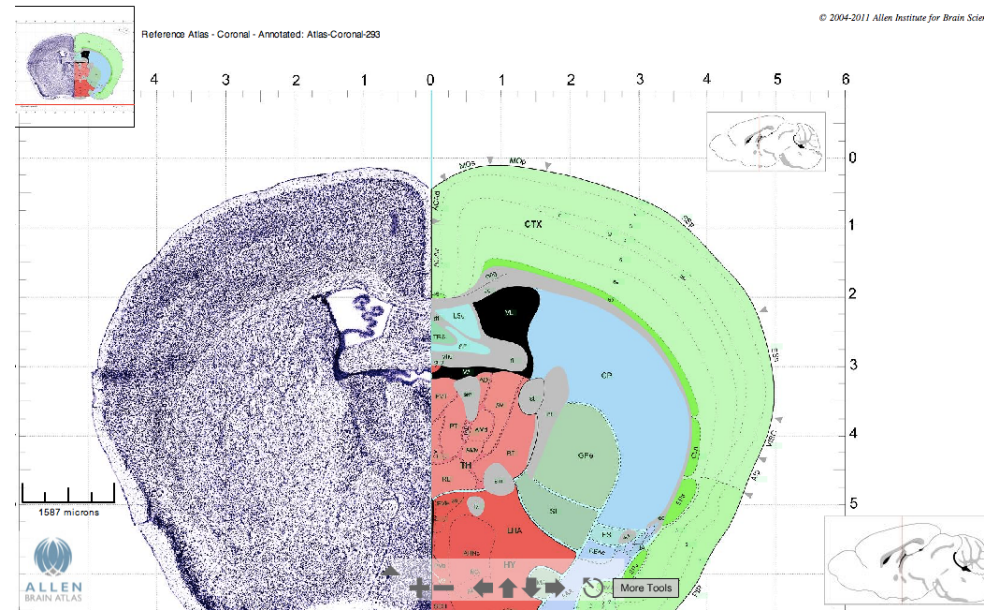
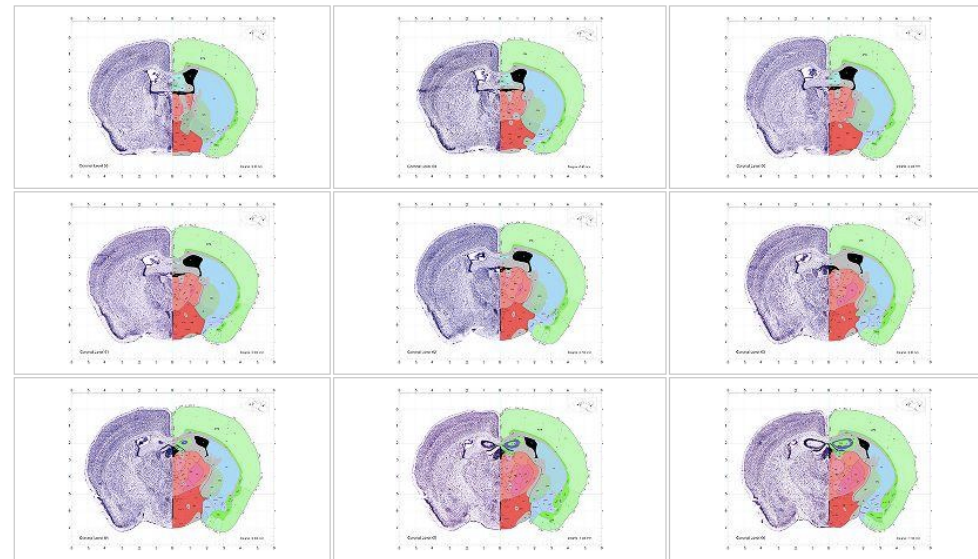
The Mouse Brain in Stereotaxic Coordinates

-0.46 x 1 x 2.5



Allen Atlas

-0.48 x 1 x 2.5



http://help.brain-map.org/download/attachments/2818171/InjectionSites_and_StereotaxicCoordinates.pdf?version=1&modificationDate=1382469912361



ALLEN Mouse Brain Connectivity Atlas

TECHNICAL WHITE PAPER: INJECTION SITES AND STEREOTAXIC COORDINATES

Table 1. Stereotaxic coordinates used for axonal projection mapping study.

Brain region (primary structure infected by rAAV)	Reference atlas acronym	Mouse strain	Experiment ID	AP	ML	DV	Angle°
Abducens nucleus	VI	Chat-IRES-Cre	168616111	-5.52	0.50	3.75	0
Accessory olfactory bulb	AOB	C57BL/6J	120812686	3.20	1.00	1.40	0
Accessory olfactory bulb	AOB	Syt17-Cre_NO14	161178152	3.00	1.00	1.50	0
Accessory olfactory bulb	AOB	Cdhr1-Cre_KG66	182686228	3.08	1.00	1.75	0
Accessory olfactory bulb	AOB	Gad2-IRES-Cre-1210	266563321	3.08	1.00	1.75	0
Accessory olfactory bulb	AOB	Efr3a-Cre_NO108-31	267760731	2.80	1.25	1.30, 1.67	0
Accessory olfactory bulb	AOB	378-1882	272918345	3.70	1.50	0.40	0
Agranular insular area	AI	C57BL/6J	112596790	1.78	2.40, 2.80	2.24	0
Agranular insular area	AI	Htr2a-Cre_KM207-3446	262536037	1.78	2.40, 2.80	2.25	0
Agranular insular area, dorsal part	Ald	Ntsr1-Cre_GN220	159322514	1.78	2.40, 2.80	2.24	0