

The Organisation of the Forebrain

A Workbook

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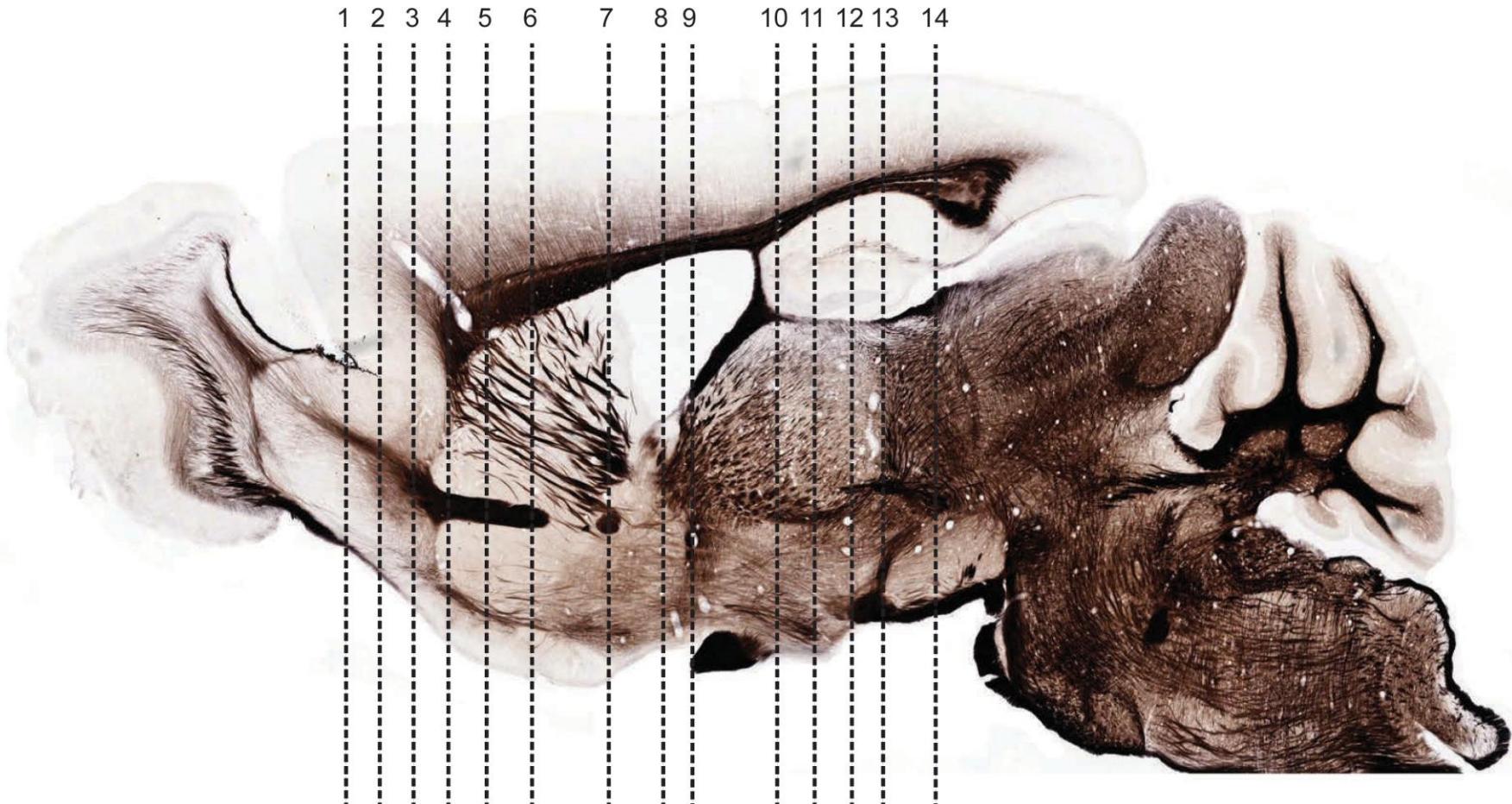
THE BRAIN OF THE MOUSE

The following images of sections from the brains of the mouse produced in the Paxinos laboratory produced by Erika Gyengesi¹. The coronal sections on the left are Gallyas silver-stained and the adjacent sections on the right are Nissl stained.

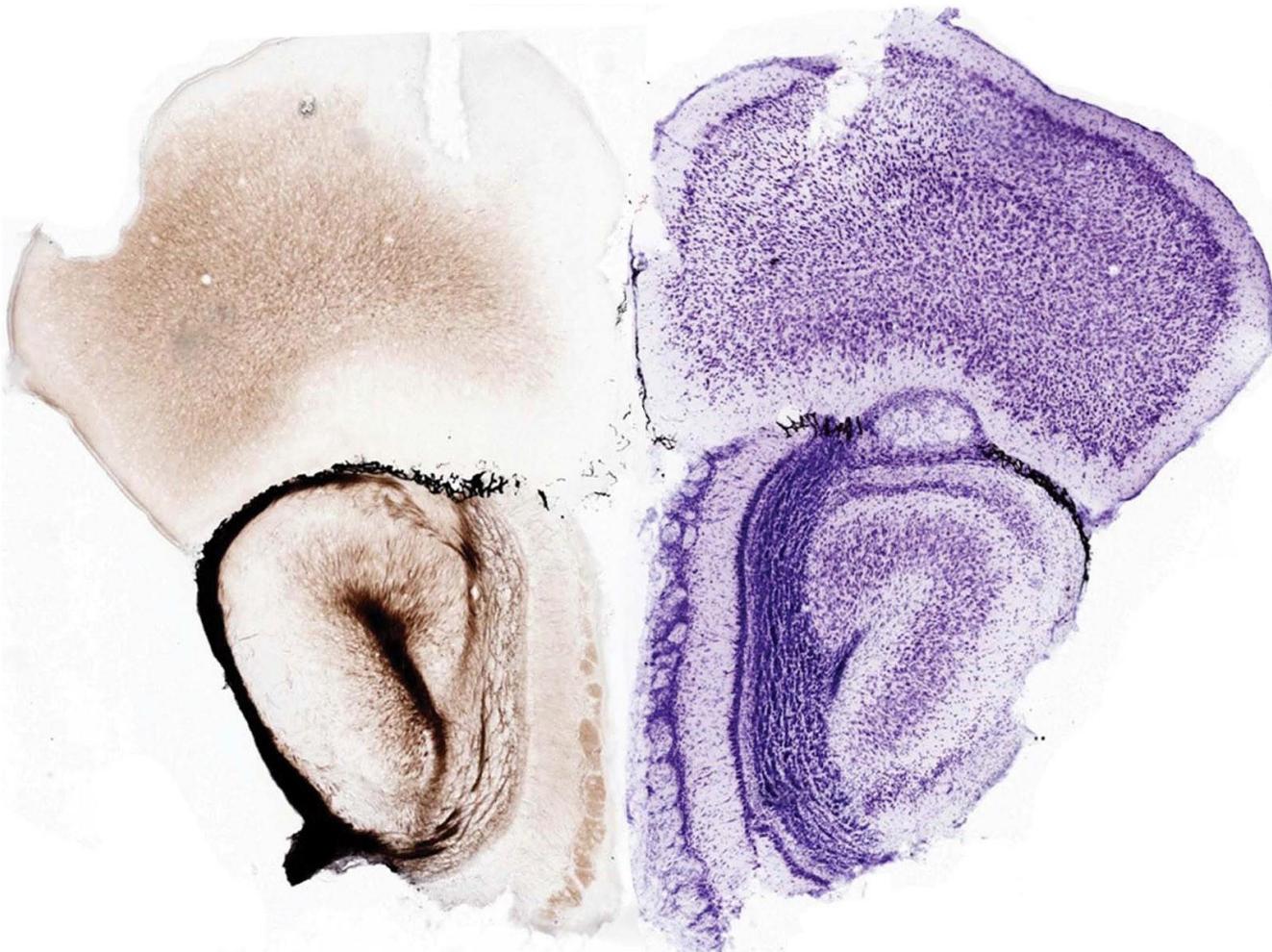
There is a list of structures to identify in each section. Use the abbreviations provided to label the structures. The abbreviations are from the Paxinos and Watson atlas of the rat brain, which has been cited over 60,000 times. Each abbreviation is unique and the construction of abbreviations has consistently followed a number of rules:

1. All cellular areas (nuclei, cortical areas etc.) begin with a capital letter
2. All fibre bundles (tracts and nerves) begin with a lower case letter
3. All parts of the ventricular system begin with a capital letter

¹. Gyengesi E, Calabrese E, Sherrier MD, Johnson GA, Paxinos G, Watson C (2013) Semi-automated 3D segmentation of major tracts in the rat brain—comparing DTI with standard histological methods. *Brain Struct Funct* 219:539-550. doi: 10.1007/s00429-013-0516-8



Rostral-caudal levels of the mouse brain sections in this workbook
(Gallyas myelin silver stain, sagittal section)

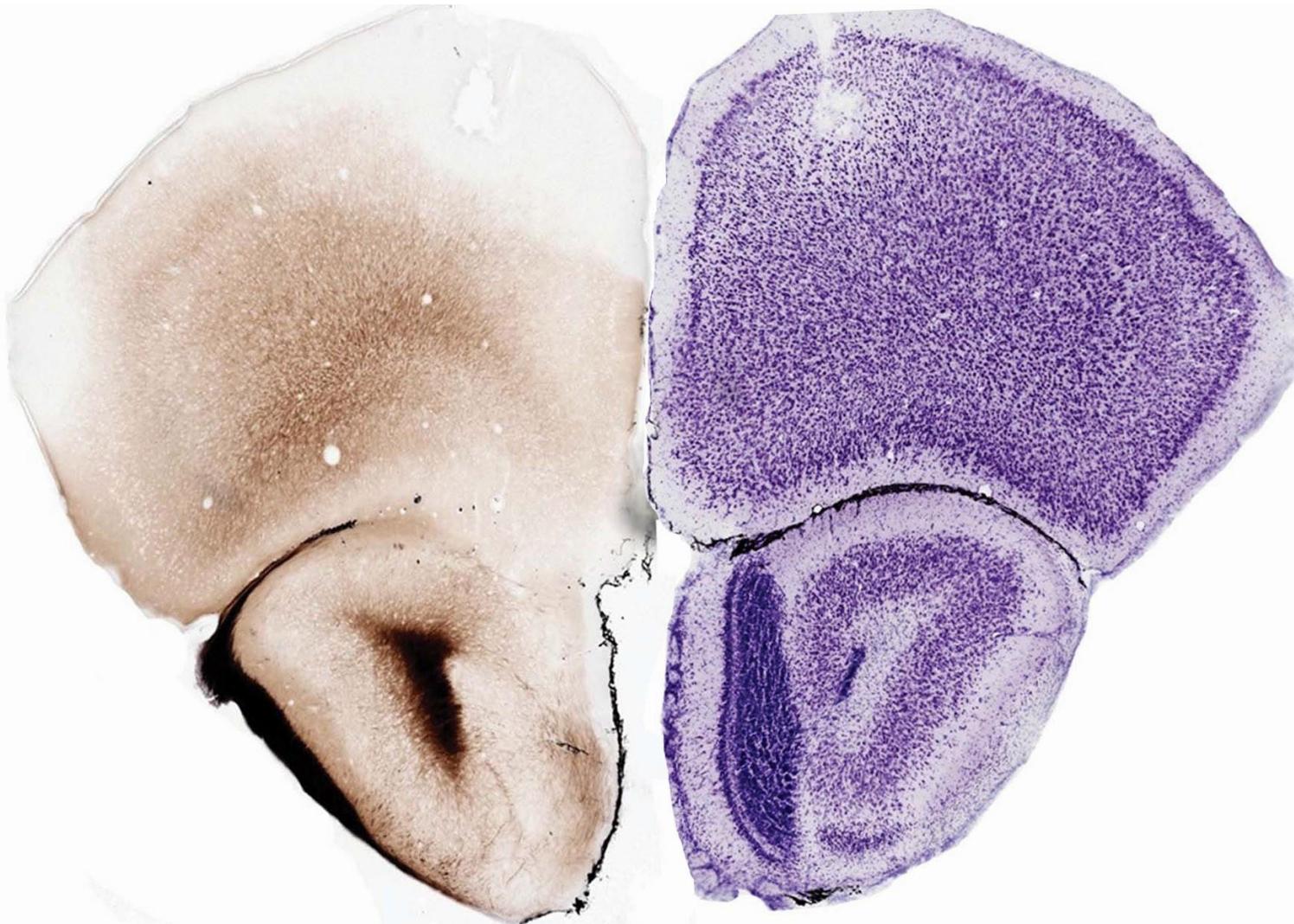


MOUSE Figure 1

anterior commissure, intrabulbar part (**aci**)
frontal cortex, area A (**FrA**)

lateral olfactory tract (**lo**)
olfactory formation (**OF**)

accessory olfactory bulb (**AOB**)
olfactory ventricle (**OV**)

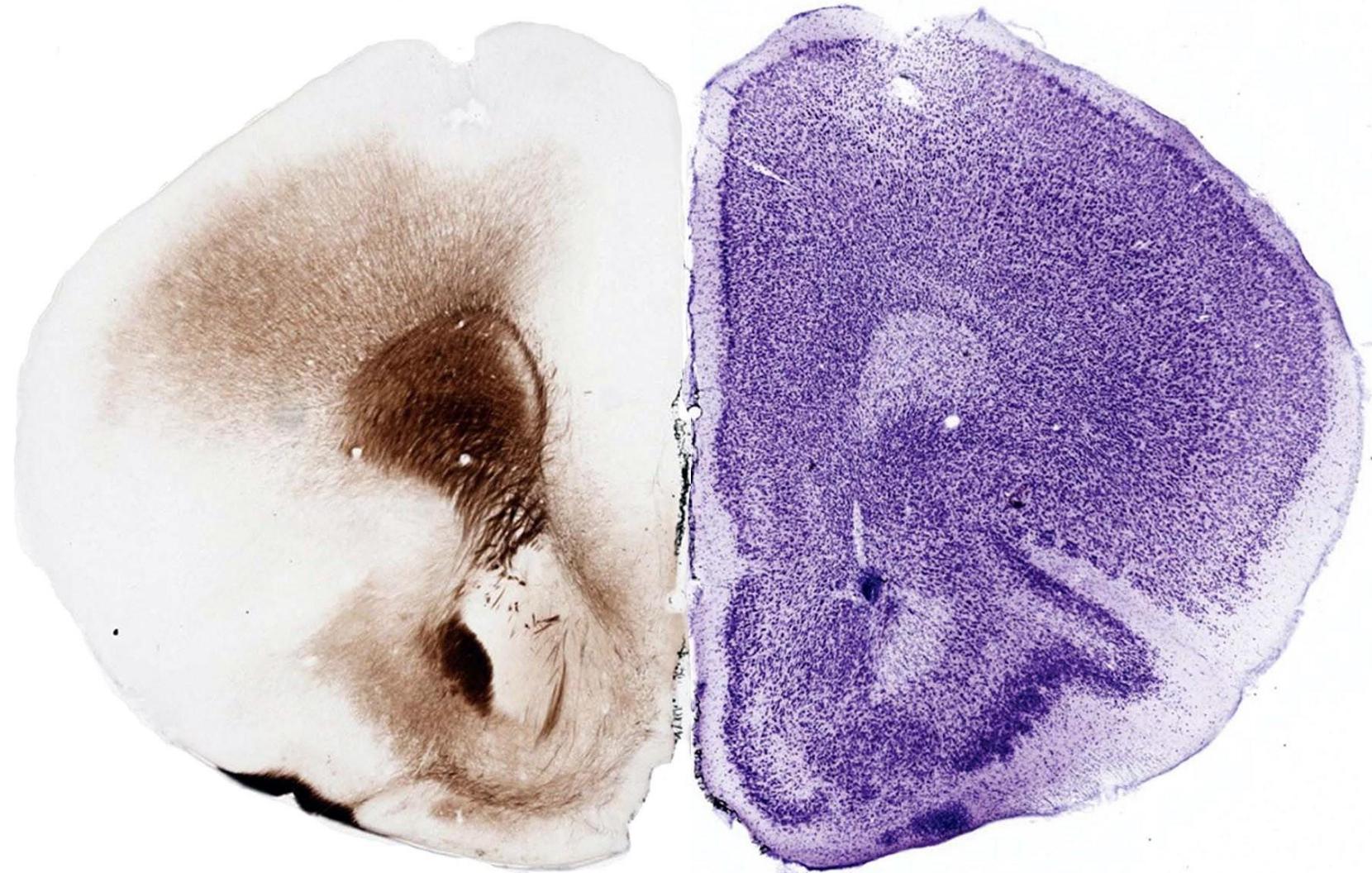


MOUSE Figure 2

anterior commissure, intrabulbar part (**aci**)
frontal cortex, area A (**FrA**)

lateral olfactory tract (**lo**)
olfactory formation (**OF**)

olfactory ventricle (**OV**)
anterior olfactory area (**OA**)

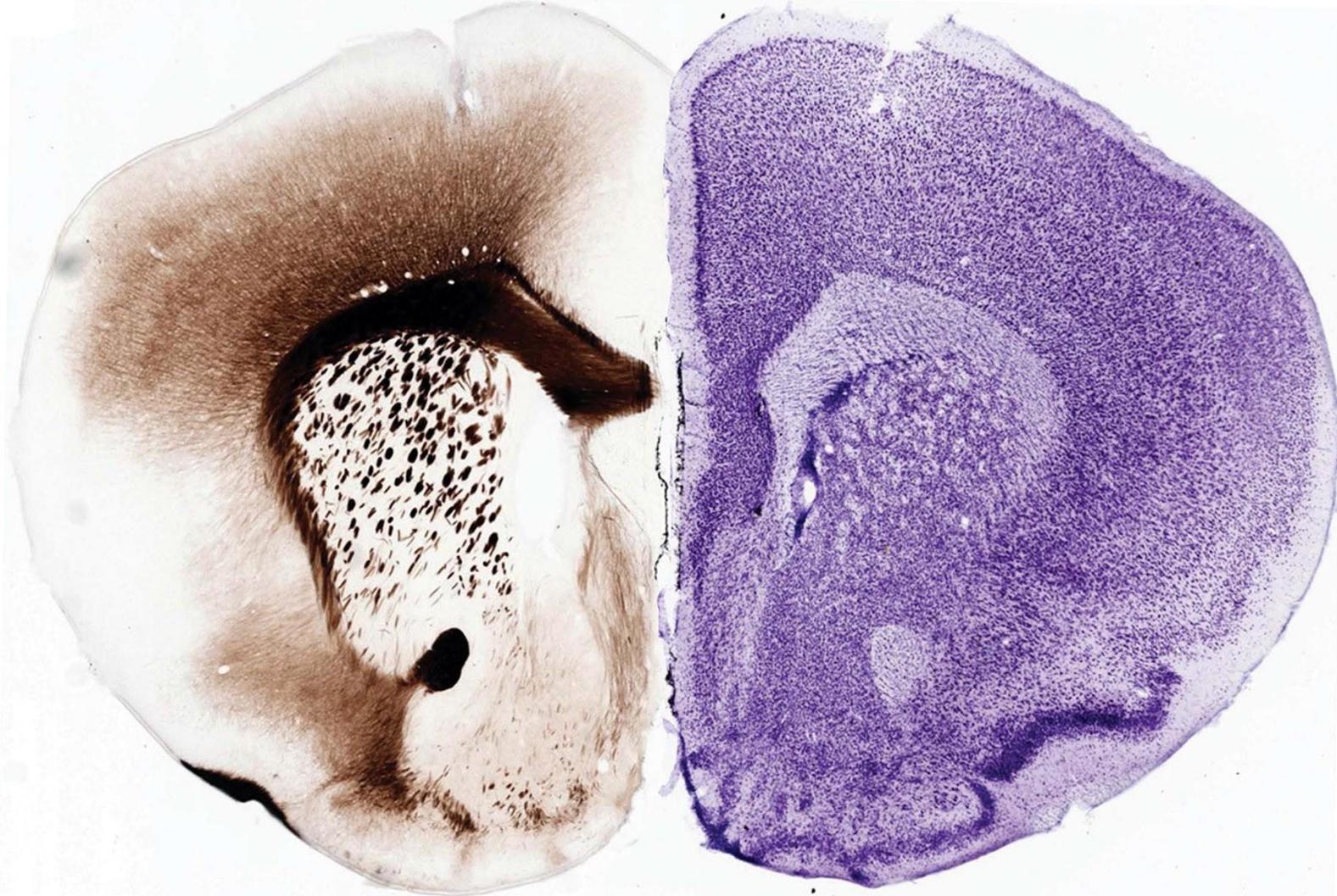


MOUSE Figure 3

anterior commissure, anterior limb (**aca**)
cingulum (**cg**)

forceps minor (**fmi**)
lateral olfactory tract (**lo**)
olfactory ventricle (**OV**)

piriform (olfactory) cortex (**Pir**)
olfactory tubercle (**Tu**)



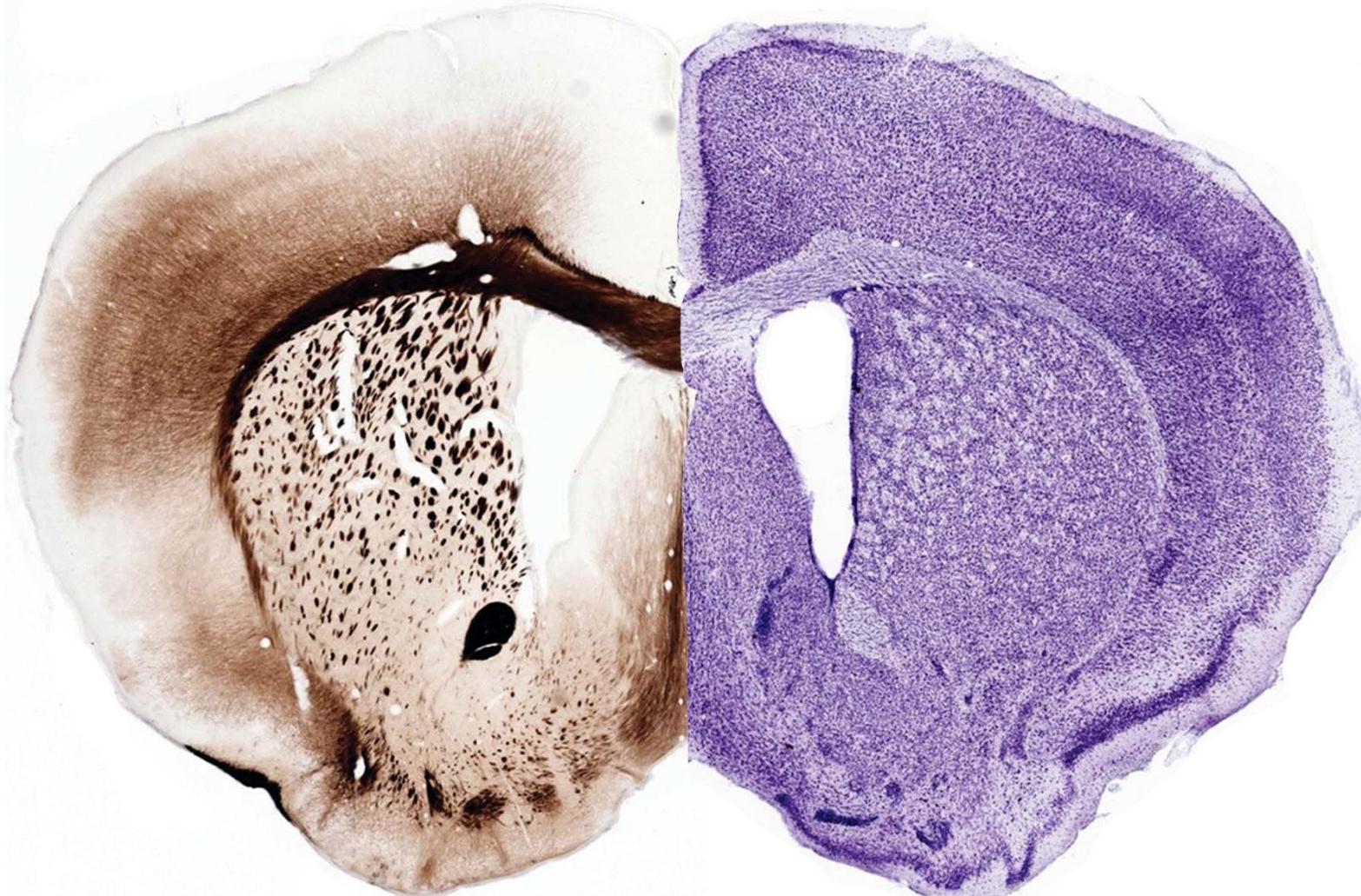
MOUSE Figure 4
anterior commissure, anterior
limb (**aca**)

accumbens nucleus (**Acb**)
cingulum (**cg**)
lateral olfactory tract (**lo**)

genu of corpus callosum
(**gcc**)
caudate putamen (**CPu**)

external capsule (**ec**)
lateral ventricle (**LV**)
piriform (olfactory) cortex (**Pir**)

olfactory tubercle (**Tu**)
motor cortex (**M1**)
somatosensory cortex (**S1**)



MOUSE Figure 5

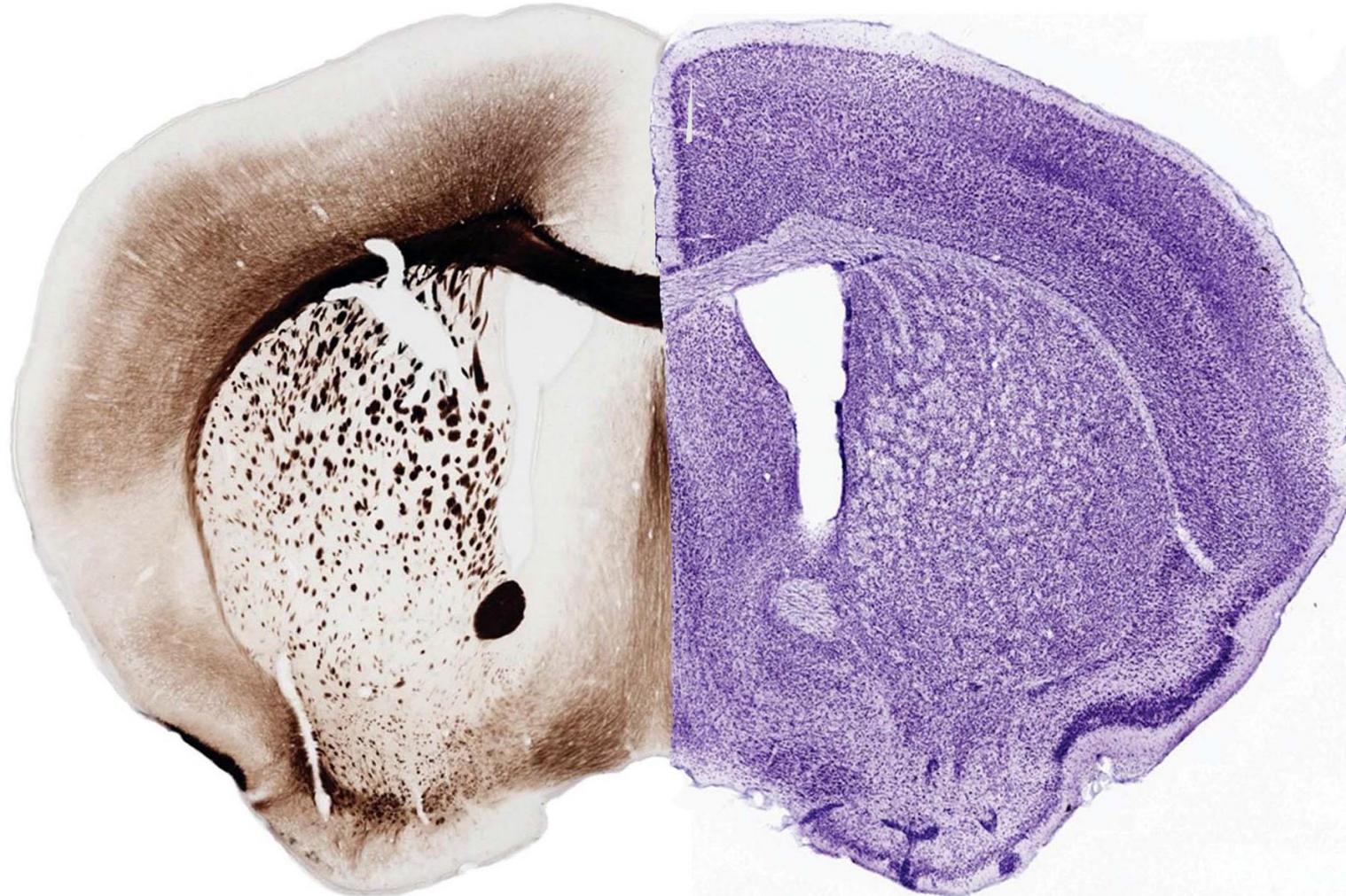
anterior commissure, anterior
limb (**aca**)

accumbens nucleus (**Acb**)
cingulum (**cg**)
lateral olfactory tract (**lo**)
corpus callosum (**cc**)

caudate putamen (**CPu**)
external capsule (**ec**)
lateral ventricle (**LV**)
cingulate cortex (**Cg**)

motor cortex (**M1**)
somatosensory cortex (**S1**)
insular cortex (**Ins**)
piriform (olfactory) cortex (**Pir**)

olfactory tubercle (**Tu**)
diagonal band region (**DB**)
medial forebrain bundle (**mfb**)
septum (**Se**)



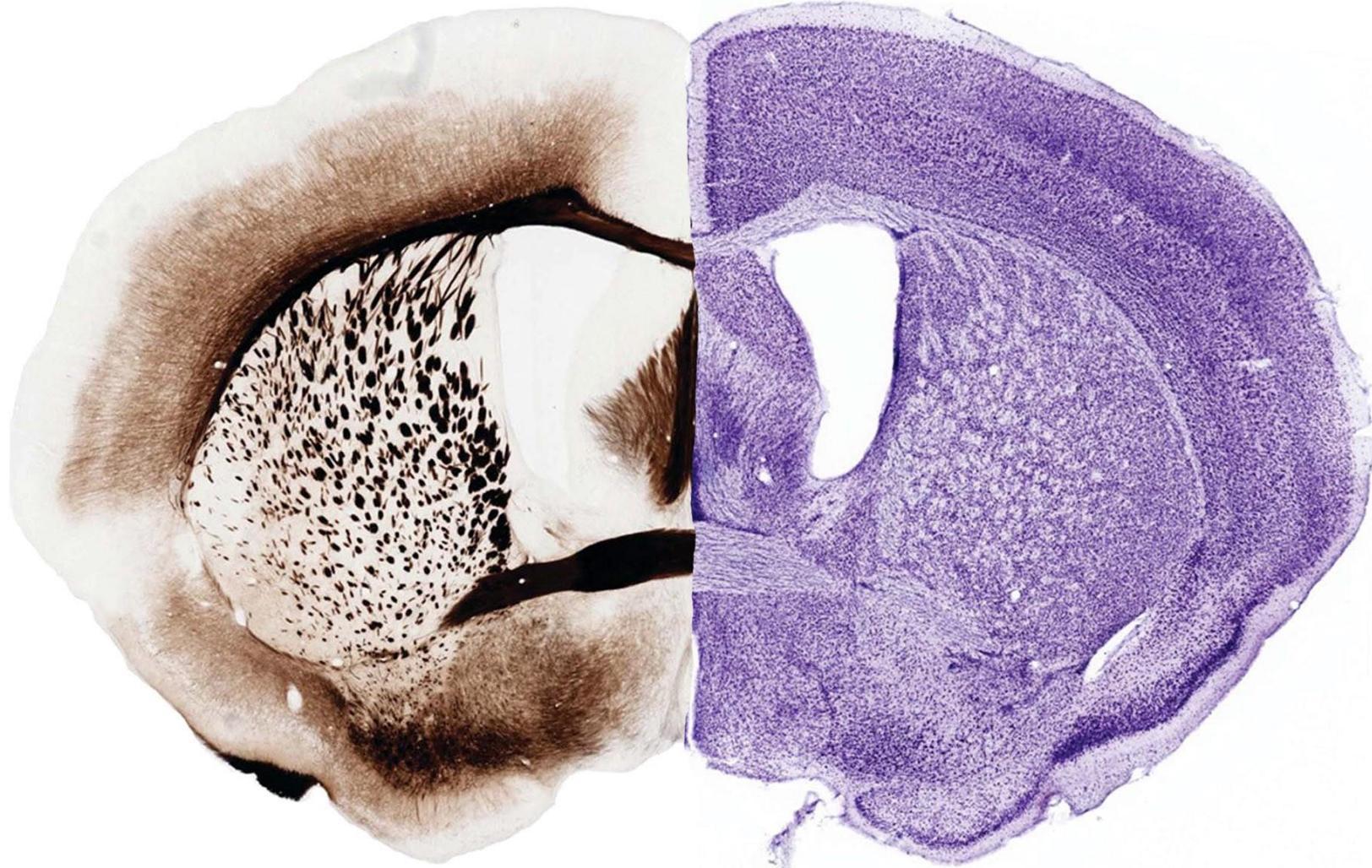
MOUSE Figure 6
anterior commissure, anterior
limb (aca)
accumbens nucleus (**Acb**)

cingulum (**cg**)
lateral olfactory tract (**Io**)
corpus callosum (**cc**)
caudate putamen (**CPu**)

external capsule (**ec**)
lateral ventricle (**LV**)
cingulate cortex (**Cg**)
motor cortex (**M1**)

somatosensory cortex (**S1**)
insular cortex (**Ins**)
piriform (olfactory) cortex (**Pir**)
olfactory tubercle (**Tu**)

diagonal band region (**DB**)
medial forebrain bundle (**mfb**)
septum (**Se**)



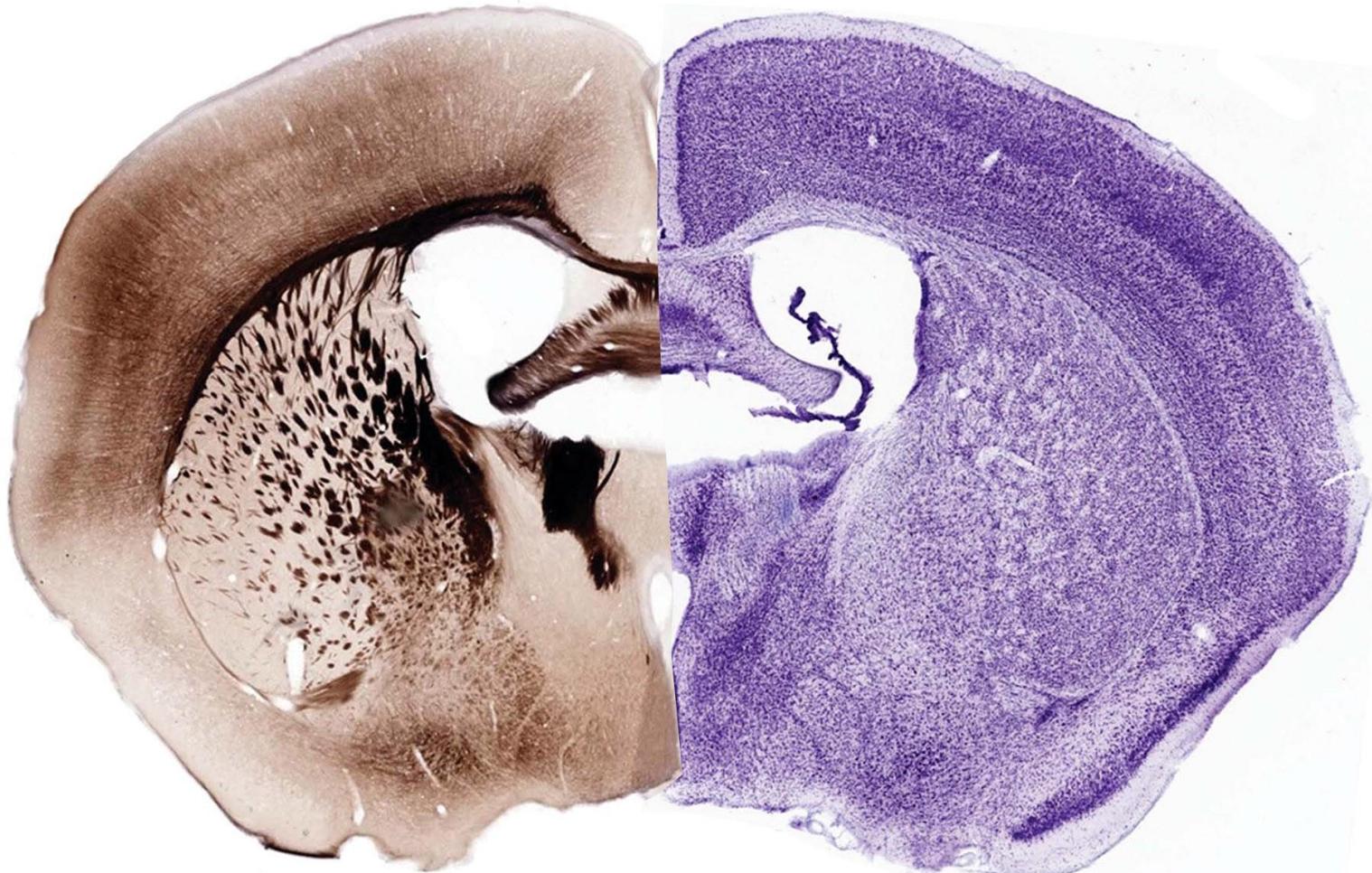
MOUSE Figure 7
anterior commissure (**ac**)
cingulum (**cg**)
corpus callosum (**cc**)

caudate putamen (**CPu**)
external capsule (**ec**)
internal capsule (**ic**)
lateral ventricle (**LV**)

cingulate cortex (**Cg**)
motor cortex (**M1**)
somatosensory cortex (**S1**)
insular cortex (**Ins**)

piriform (olfactory) cortex (**Pir**)
medial forebrain bundle (**mfib**)
septum (**Se**)
fornix (**f**)

internal capsule (**ic**)
preoptic area (**PO**)
bed nucleus of stria
terminalis (**ST**)



MOUSE Figure 8

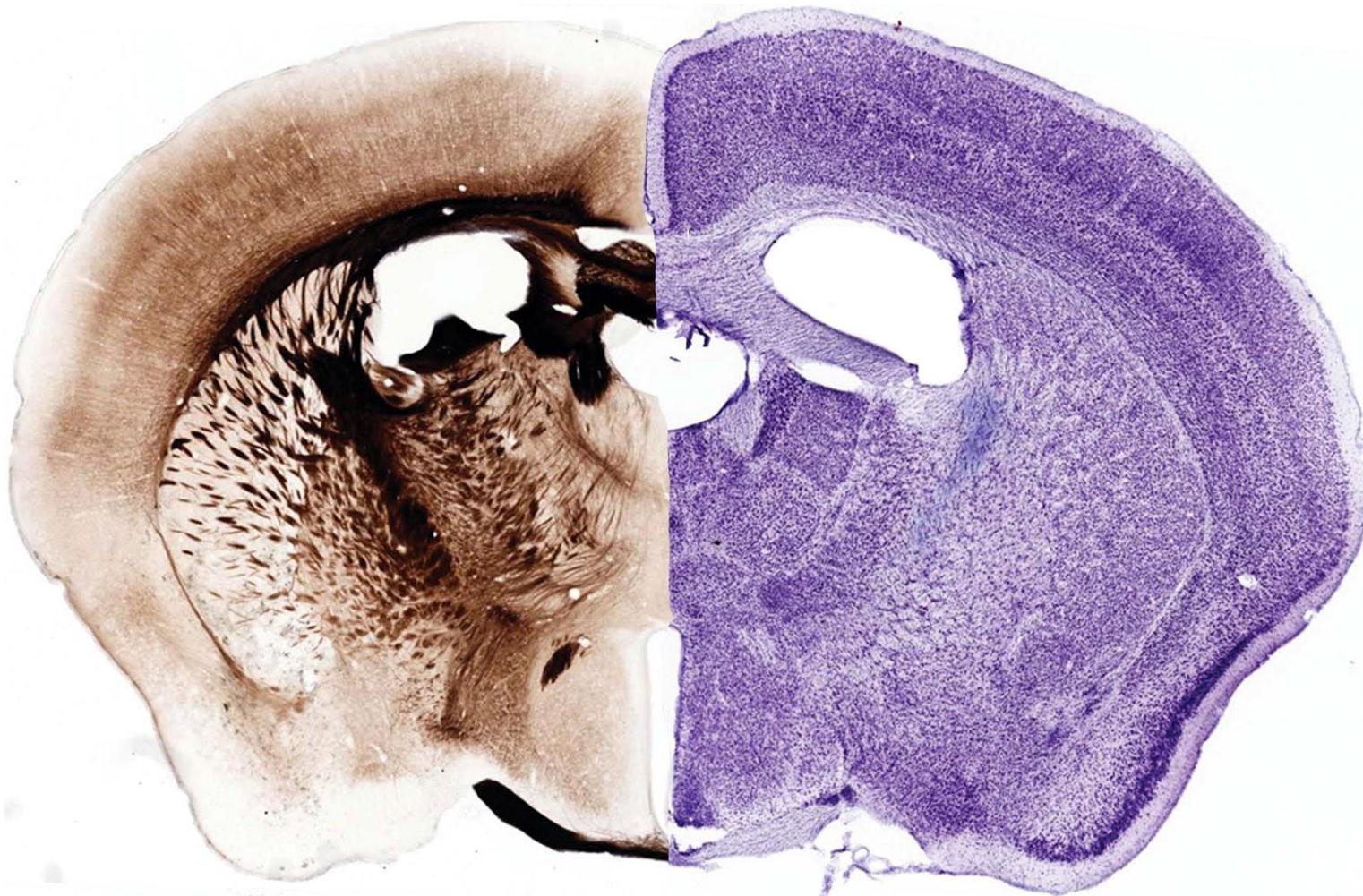
cingulum (**cg**)
corpus callosum (**cc**)
caudate putamen (**CPu**)
external capsule (**ec**)
internal capsule (**ic**)

lateral ventricle (**LV**)
third ventricle (**3V**)
anterior commissure, posterior
limb (**acp**)
amygdala (**Amyg**)
fornix (**f**)

fimbria of fornix (**fi**)
hippocampal commissure (**hc**)
globus pallidus (**GP**)
lateral olfactory tract (**lo**)
medial forebrain bundle (**mfb**)
cingulate cortex (**Cg**)

motor cortex (**M1**)
somatosensory cortex (**S1**)
insular cortex (**Ins**)
piriform cortex (**Pir**)
preoptic area (**PO**)

stria medullaris of the
thalamus (**sm**)
thalamus (**Th**)
bed nucleus of the stria
terminalis (**ST**)



MOUSE Figure 9

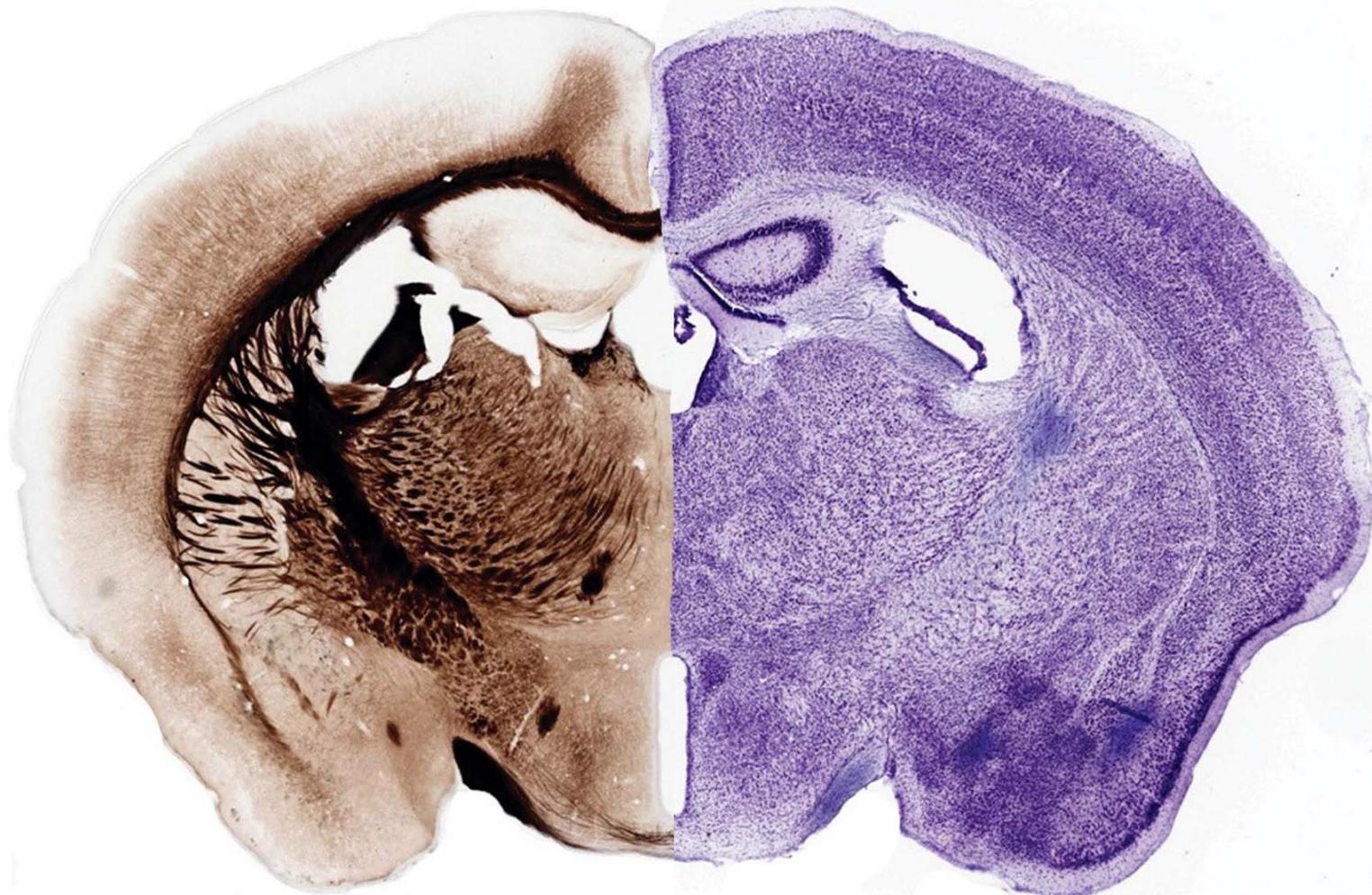
cingulum (**cg**)
corpus callosum (**cc**)
caudate putamen (**CPu**)

external capsule (**ec**)
lateral ventricle (**LV**)
third ventricle (**3V**)
fornix (**f**)

fimbria of fornix (**fi**)
globus pallidus (**GP**)
internal capsule (**ic**)
hypothalamus (**HyTh**)
optic chiasm (**och**)

optic tract (**opt**)
cingulate cortex (**Cg**)
motor cortex (**M1**)
somatosensory cortex (**S1**)
insular cortex (**Ins**)

piriform cortex (**Pir**)
stria medullaris of the
thalamus (**sm**)
thalamus (**Th**)



MOUSE Figure 10

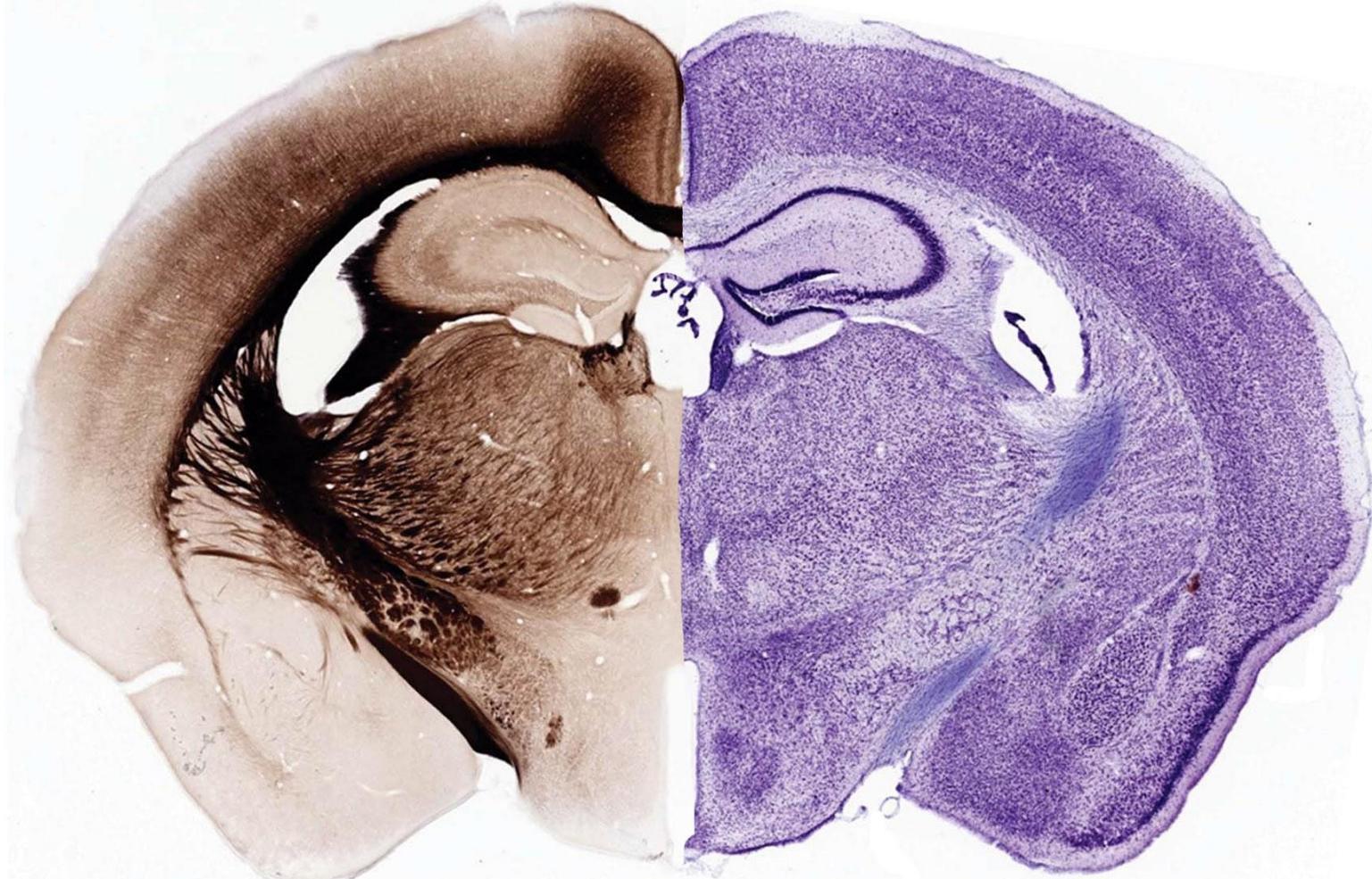
cingulum (**cg**)
corpus callosum (**cc**)
caudate putamen (**CPu**)

external capsule (**ec**)
lateral ventricle (**LV**)
third ventricle (**3V**)
fornix (**f**)
fimbria of fornix (**fi**)

globus pallidus (**GP**)
internal capsule (**ic**)
hippocampus (**Hip**)
hypothalamus (**HyTh**)
optic tract (**opt**)

mamillothalamic tract (**mt**)
cingulate cortex (**Cg**)
somatosensory cortex (**S1**)
insular cortex (**Ins**)
piriform cortex (**Pir**)

amygdala (**Amyg**)
stria medullaris of the
thalamus (**sm**)
habenula (**Hb**)
thalamus (**Th**)



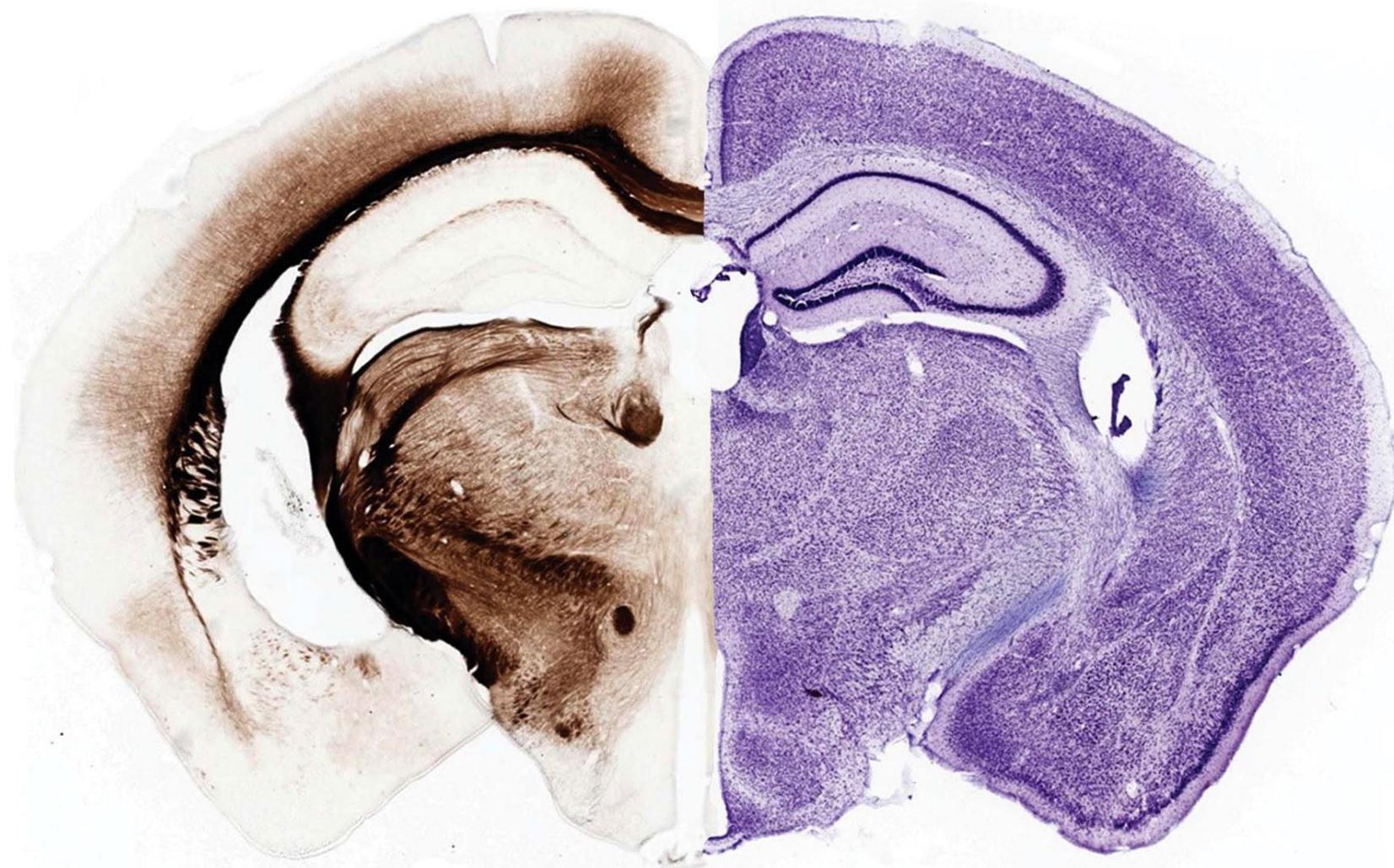
MOUSE Figure 11
cingulum (**cg**)
corpus callosum (**cc**)
caudate putamen (**CPu**)
external capsule (**ec**)

lateral ventricle (**LV**)
third ventricle (**3V**)
fornix (**f**)
fimbria of fornix (**fi**)
amygdala (**Amyg**)

habenula (**Hb**)
hippocampus (**Hip**)
hypothalamus (**HyTh**)
internal capsule (**ic**)
lateral olfactory tract (**lo**)

optic tract (**opt**)
mamillothalamic tract (**mt**)
cingulate cortex (**Cg**)
somatosensory cortex (**S1**)
insular cortex (**Ins**)

piriform cortex (**Pir**)
stria medullaris of the
thalamus (**sm**)
habenula (**Hb**)
thalamus (**Th**)



MOUSE Figure 12

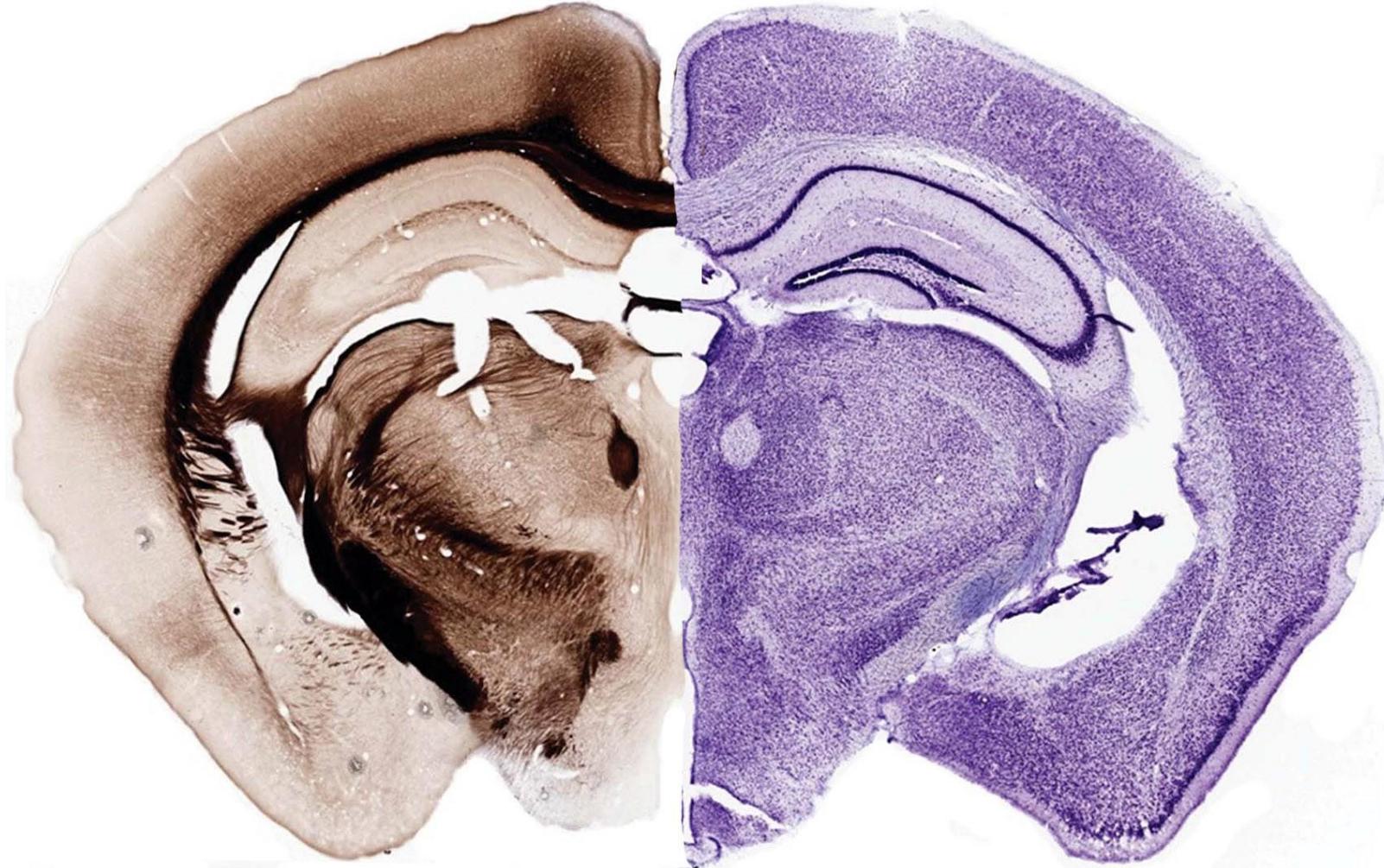
cingulum (**cg**)
corpus callosum (**cc**)
caudate putamen (**CPu**)

external capsule (**ec**)
lateral ventricle (**LV**)
third ventricle (**3V**)
fornix (**f**) / fimbria of fornix (**fi**)

habenula (**Hb**)
fasciculus retroflexus (**fr**)
amygdala (**Amyg**)
hippocampus (**Hip**)

hypothalamus (**HyTh: VMH**)
cerebral peduncle (**cp**)
optic tract (**opt**)
mamillothalamic tract (**mt**)

cingulate cortex (**Cg**)
somatosensory cortex (**S1**)
piriform cortex (**Pir**)
thalamus (**Th: VP here**)



MOUSE Figure 13

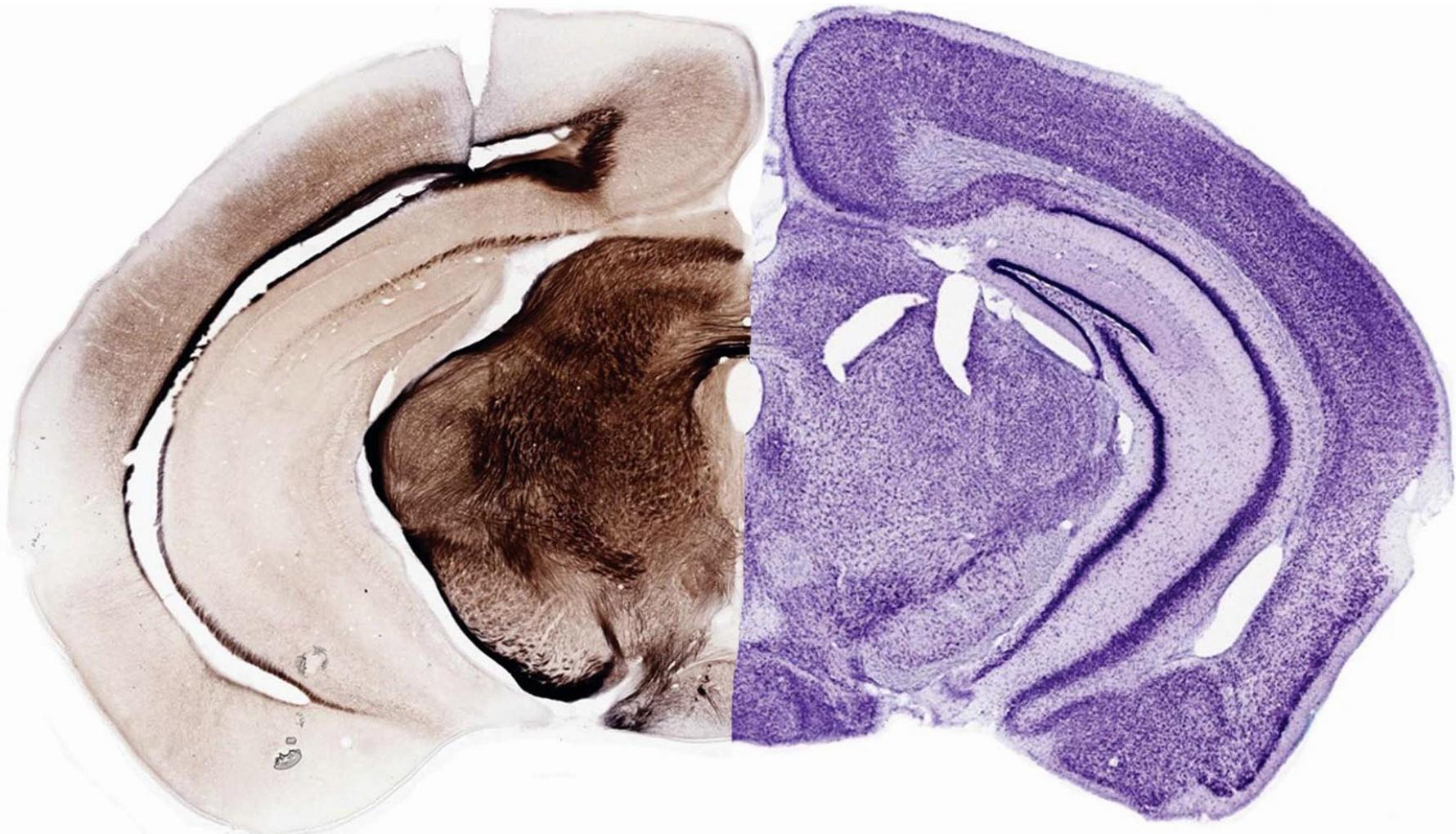
third ventricle (3V)
amygdala (Amyg)
cingulum (cg)

corpus callosum (cc)
caudate putamen (CPu)
external capsule (ec)
fornix (f)
fimbria of fornix (fi)

fasciculus retroflexus (fr)
hippocampus (Hip)
hypothalamus (HyTh)
cerebral peduncle (cp)
lateral ventricle (LV)

optic tract (opt)
mamillothalamic tract (mt)
cingulate cortex (Cg)
visual cortex (V1)
auditory cortex (A1)

piriform cortex (Pir)
amygdala (Amyg)
thalamus (Th: VP, DLG)
subthalamic nucleus (STh)



MOUSE Figure 14

aqueduct of the midbrain (**Aq**)

external capsule (**ec**)
hippocampus (**Hip**)
lateral ventricle (**LV**)

cingulate cortex (**Cg**)
visual cortex (**V1**)
auditory cortex (**A1**)

medial geniculate (**MG**)
hypothalamus (**HyTh: MB**)
mamillothalamic tract (**mt**)

posterior commissure (**pc**)
superior colliculus (**SC**)
substantia nigra (**SN**)

THE FOREBRAIN OF THE MAMMOTH MONKEY

The following images of sections from the brains of marmoset monkeys (*Callithrix jacchus*) are from the collection of the late Professor Hironobu Tokuno of the Tokyo Institute of Medical Research. The complete sets of sections can usually be viewed on the website marmoset-brain.org but are currently unavailable.

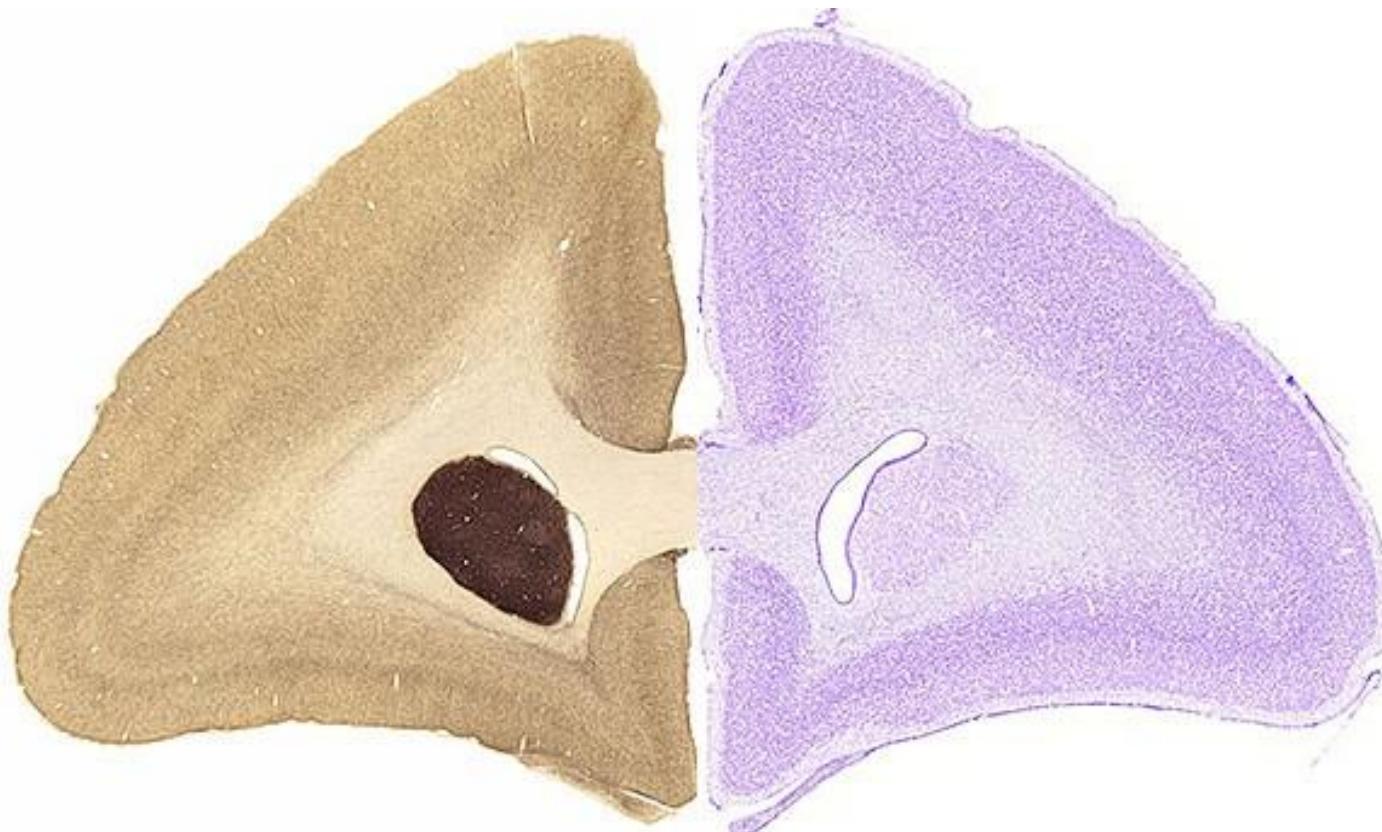
The coronal sections shown here are from Marmoset #8 from the Tokuno collection. The images are taken from adjacent Nissl and acetylcholinesterase sections. The Nissl stained sagittal section is taken from Marmoset #5 from the Tokuno collection.

There is a list of structures to identify in each section. Use the abbreviations provided to label the structures. The abbreviations are from the Paxinos and Watson atlas of the rat brain, which has been cited over 60,000 times. Each abbreviation is unique and the construction of abbreviations has consistently followed a number of rules:

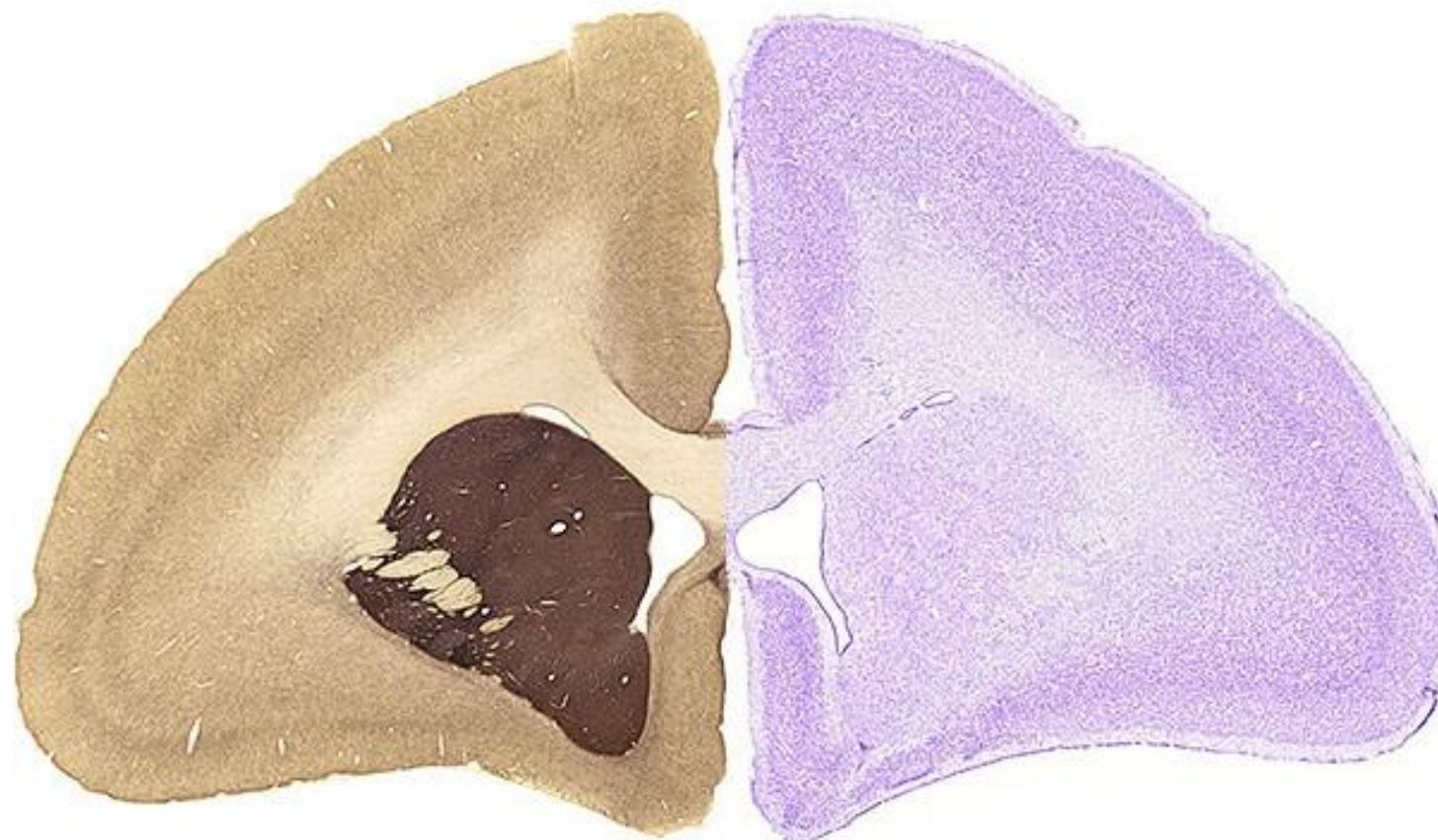
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2. All fibre bundles (tracts and nerves) begin with a lower case letter
3. All parts of the ventricular system begin with a capital letter



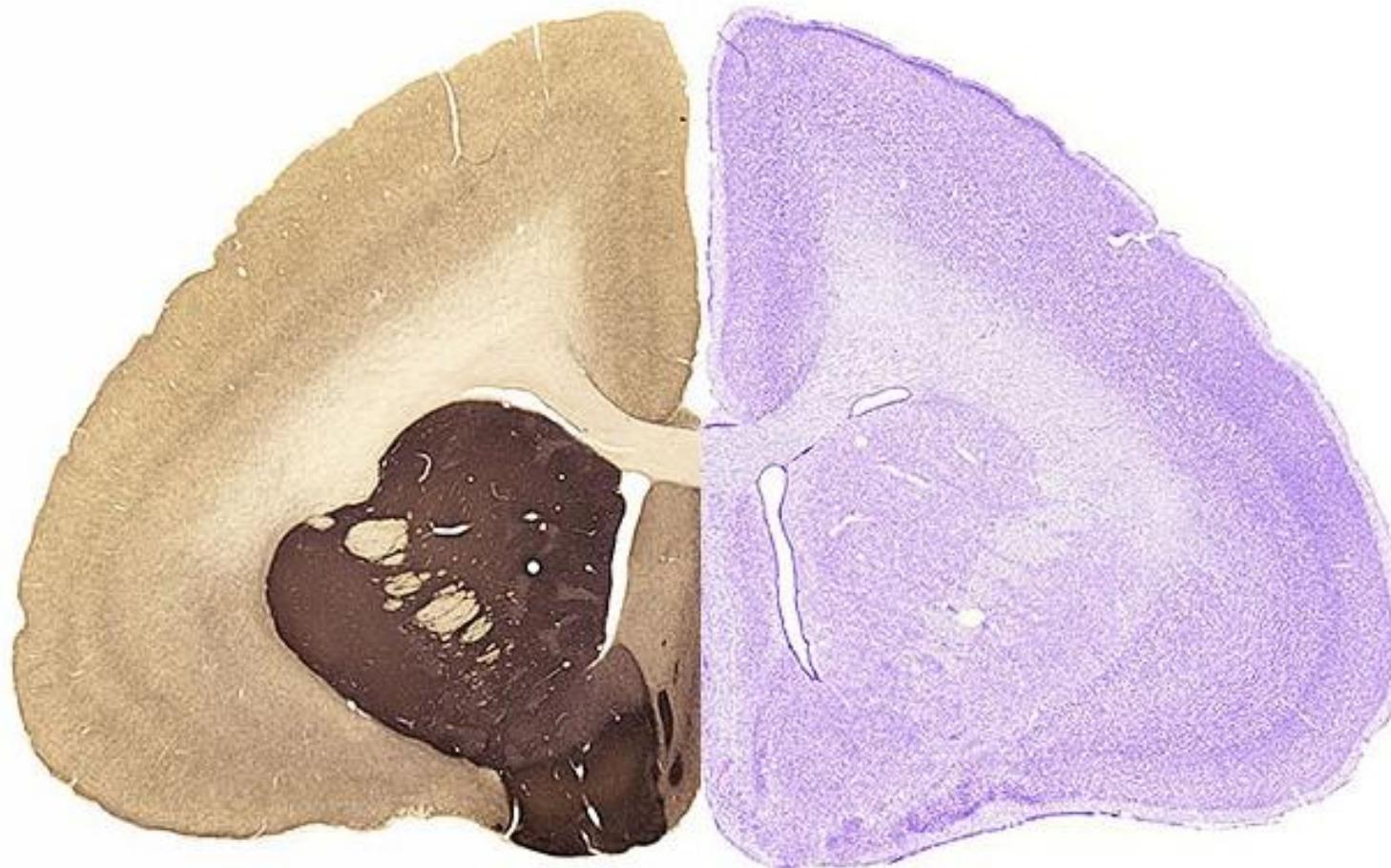
MARMOSET Figure 1:
Frontal pole rostral to the genu
of the corpus callosum
deep cerebral white matter (**dcw**)
rostral tip of caudate nucleus (**Cd**)



MARMOSET Figure 2:
Frontal pole at the genu of
the corpus callosum
corpus callosum (genu) (**gcc**)
caudate nucleus (**Cd**)
deep cerebral white matter
(**dcw**)
anterior horn of lateral
ventricle (**LV**)
induseum griseum
(hippocampal remnant) (**IG**)



MARMOSET Figure 3:
Frontal pole at the
rostral end of the
internal capsule
corpus callosum (**cc**)
caudate nucleus (**Cd**)
internal capsule (**ic**)
putamen (**Pu**)
caudate nucleus (**Cd**)
deep cerebral white
matter (**dcw**)
accumbens nucleus
(**Acb**)
anterior horn of lateral
ventricle (**LV**)
cingulate cortex (**Cg**)

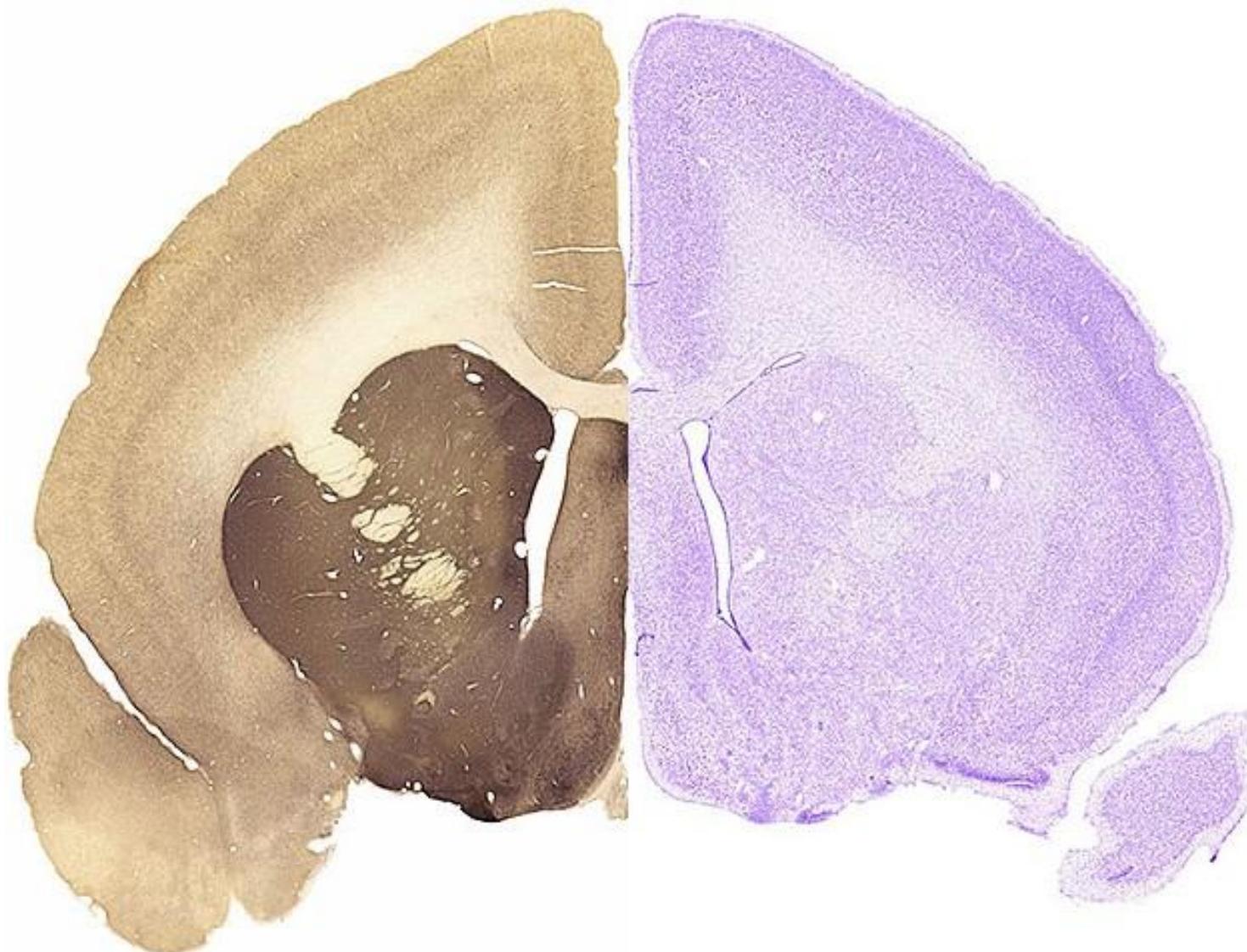


MARMOSET Figure 4:
Frontal lobe at the
rostral end of the
piriform cortex and
septum

corpus callosum (**cc**)
caudate nucleus (**Cd**)
internal capsule (**ic**)
putamen (**Pu**)
caudate nucleus (**Cd**)
deep cerebral white
matter (**dcw**)
septum (**Se**)
diagonal domain (**Dg**)
olfactory tubercle (**Tu**)
accumbens nucleus
(**Acb**)
island of Calleja (**ICj**)
anterior horn of lateral
ventricle (**LV**)
cingulate cortex (**Cg**)
induseum griseum
(hippocampal
remnant) (**IG**)
piriform cortex (**Pir**)

MARMOSET Figure 5:
Tip of the temporal lobe

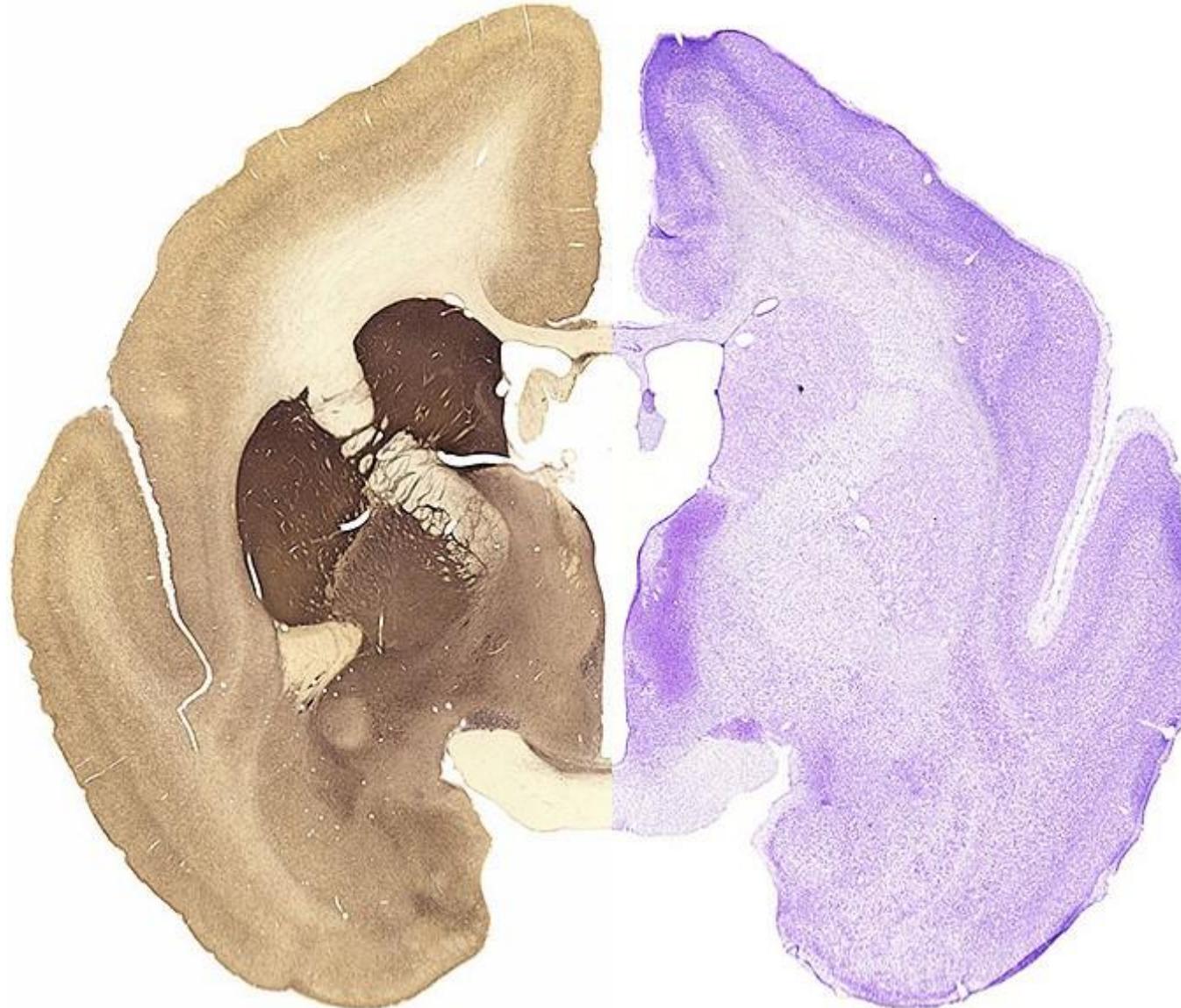
corpus callosum (**cc**)
caudate nucleus (**Cd**)
internal capsule (**ic**)
putamen (**Pu**)
claustrum (**Cl**)
deep cerebral white matter (**dcw**)
septum (**Se**)
diagonal domain (**Dg**)
olfactory tubercle (**Tu**)
accumbens nucleus (**Acb**)
anterior horn of lateral ventricle (**LV**)
induseum griseum (hippocampal remnant) (**IG**)
piriform cortex (**Pir**)
motor cortex (**M1**)
cingulate cortex (**Cg**)





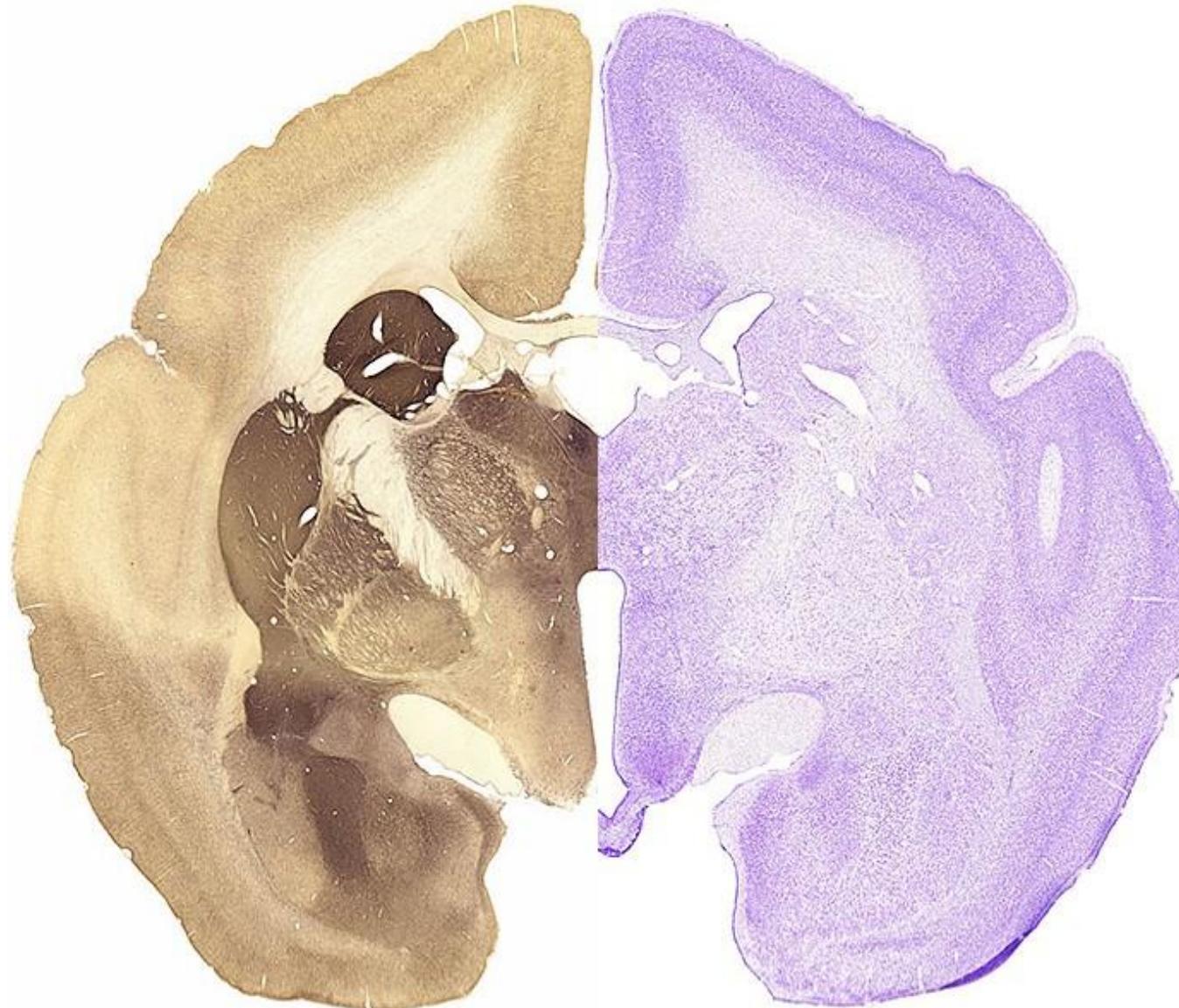
MARMOSET Figure 6:
Anterior commissure and
optic chiasm

corpus callosum (**cc**)
caudate nucleus (**Cd**)
internal capsule (**ic**)
putamen (**Pu**)
claustrum (**Cl**)
anterior commissure (**ac**)
deep cerebral white matter
(**dcw**)
septum (**Se**)
amygdala (**Amyg**)
preoptic area (**PO**)
optic chiasm (**och**)
third ventricle (**3V**)
bed nucleus of stria terminalis
(**ST**)
anterior horn of lateral ventricle
(**LV**)
induseum griseum
(hippocampal remnant) (**IG**)
piriform cortex (**Pir**)
motor cortex (**M1**)
somatosensory cortex (**S1**)
cingulate cortex (**Cg**)
insula (**Ins**)

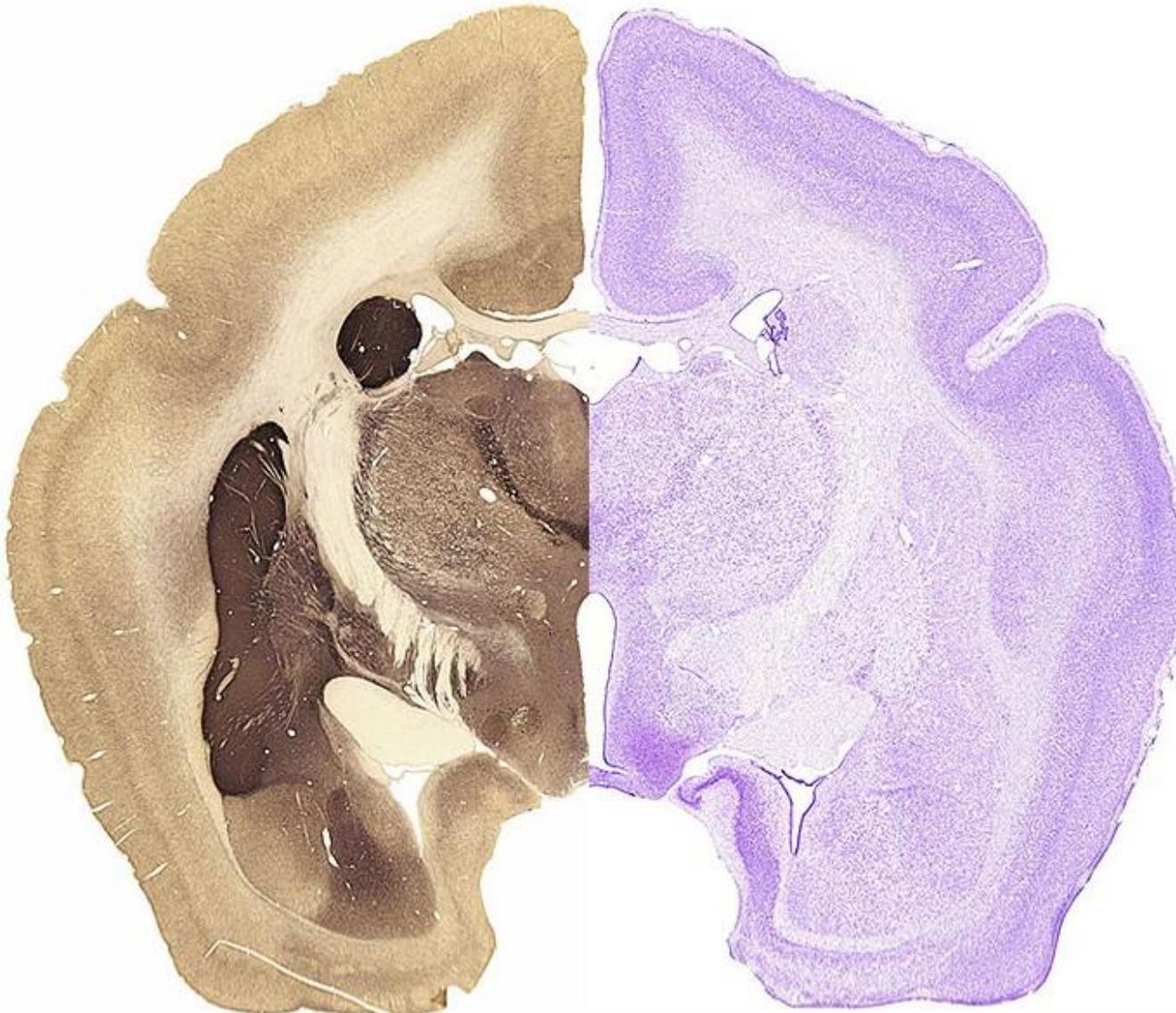


MARMOSET Figure 7:
Rostral pole of the thalamus

corpus callosum (**cc**)
caudate nucleus (**Cd**)
internal capsule (**ic**)
putamen (**Pu**)
globus pallidus (**GP**)
claustrum (**Cl**)
deep cerebral white matter (**dcw**)
posterior limb of anterior
commissure (**acp**)
fimbria of the fornix (**fi**)
amygdala (**Amyg**)
fornix (**f**)
stria medullaris (**sm**)
hypothalamus (**Hy**)
bed nucleus of stria terminalis
(**ST**)
third ventricle (**3V**)
optic chiasm (**och**)
supraoptic nucleus (**SO**)
interventricular foramen (**IVF**)
induseum griseum (hippocampal
remnant) (**IG**)
entorhinal cortex (**Ent**)
motor cortex (**M1**)
somatosensory cortex (**S1**)
cingulate cortex (**Cg**)
insula (**Ins**)

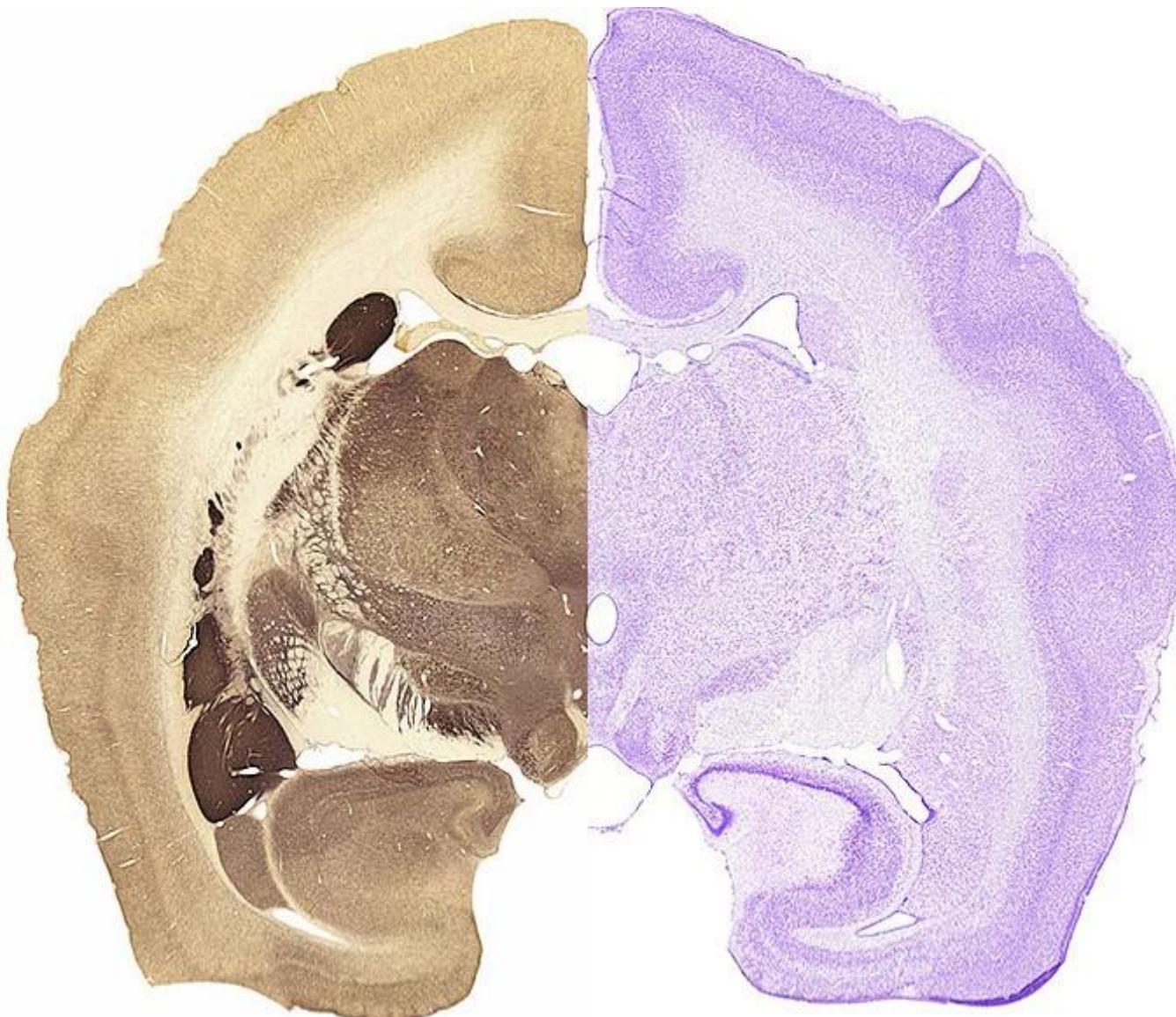


MARMOSET Figure 8:
Anterior thalamus
corpus callosum (**cc**)
caudate nucleus (**Cd**)
internal capsule (**ic**)
putamen (**Pu**)
globus pallidus (**GP**)
claustrum (**Cl**)
deep cerebral white matter (**dcw**)
fimbria of the fornix and
hippocampal commissure (**fi**)
fornix (**f**)
stria medullaris (**sm**)
reticular nucleus of the
prethalamus (**Rt**)
hypothalamus (**Hy**)
third ventricle (**3V**)
optic tract (**opt**)
body of lateral ventricle (**LV**)
inferior horn of lateral ventricle (**LV**)
induseum griseum (hippocampal
remnant) (**IG**)
somatosensory cortex (**S1**)
insula (**Ins**)
cingulate cortex (**Cg**)



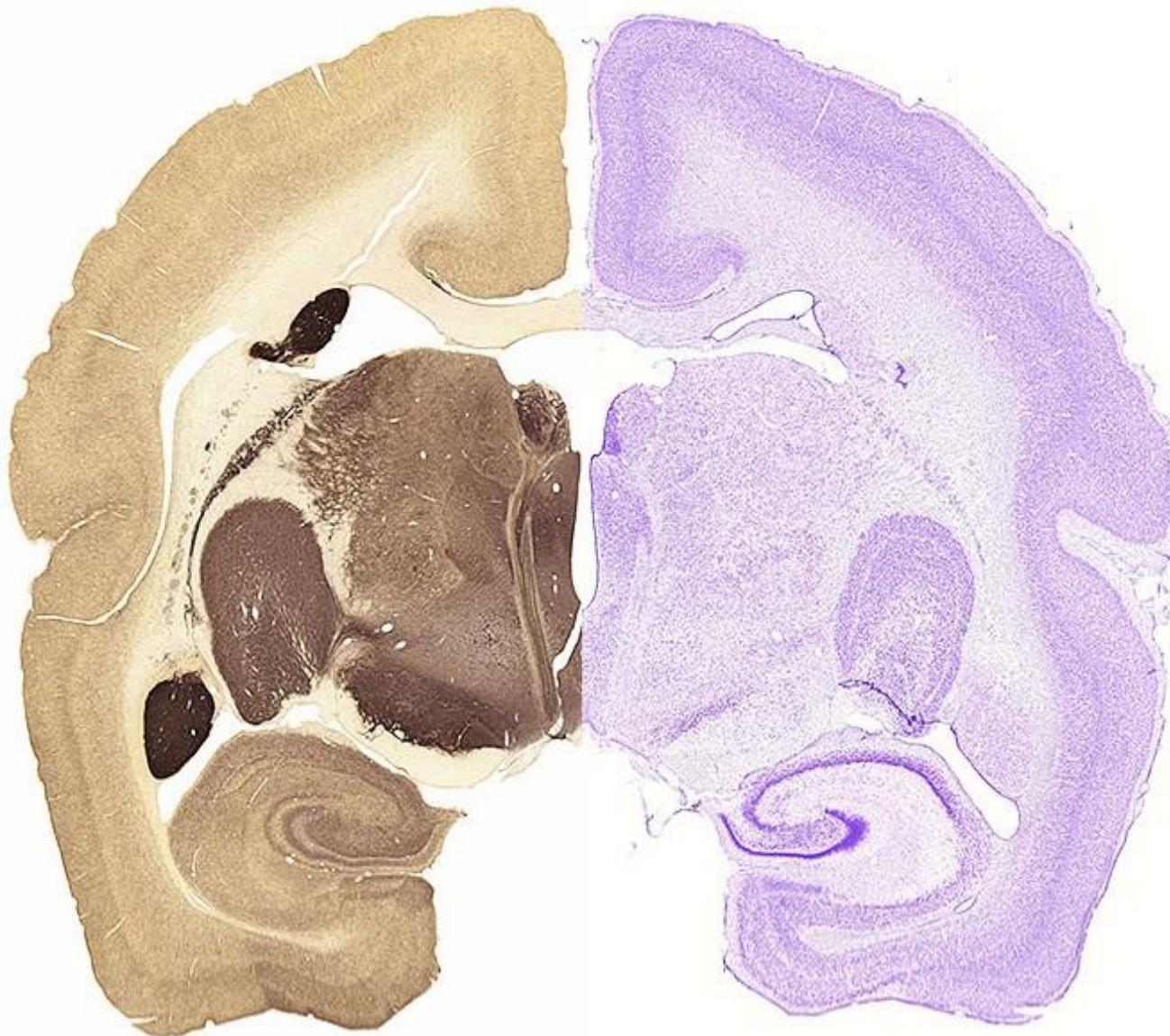
MARMOSET Figure 9:
Middle of thalamus

corpus callosum (**cc**)
caudate nucleus (**Cd**)
internal capsule (**ic**)
putamen (**Pu**)
globus pallidus (**GP**)
claustrum (**Cl**)
deep cerebral white matter (**dcw**)
fimbria of the fornix (**fi**)
fornix (**f**)
stria medullaris (**sm**)
mammillothalamic tract (**mt**)
reticular nucleus of the prethalamus
(**Rt**)
hypothalamus (**Hy**)
third ventricle (**3V**)
optic tract (**opt**)
body of lateral ventricle (**LV**)
inferior horn of lateral ventricle (**LV**)
induseum griseum (hippocampal
remnant) (**IG**)
hippocampus (CA areas) (**Hi**)
subiculum (**S**)
entorhinal cortex (**Ent**)
somatosensory cortex (**S1**)
auditory cortex (**Au1**)
cingulate cortex (**Cg**)



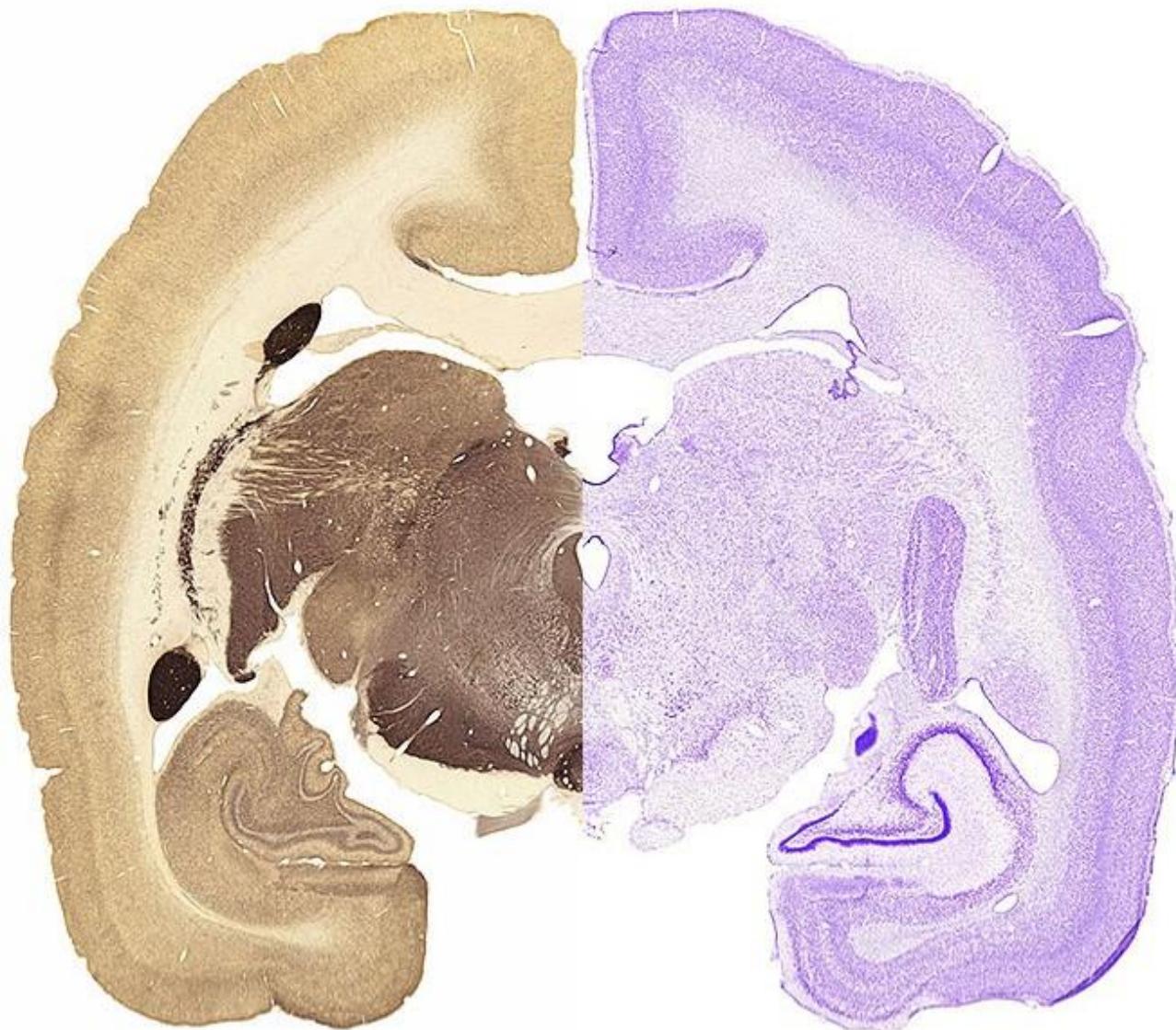
MARMOSET Figure 10:
Middle of thalamus and
subthalamic nucleus

corpus callosum (**cc**)
caudate nucleus (**Cd**)
internal capsule (**ic**)
cerebral peduncle (**cp**)
putamen (**Pu**)
claustrum (**Cl**)
deep cerebral white matter (**dcw**)
fimbria of the fornix (**fi**)
fornix (**f**)
stria medullaris (**sm**)
hypothalamus (**Hy**)
mammillary body (**MB**)
mammillary peduncle and
mammillothalamic tract (**mt**)
subthalamic nucleus (**STh**)
third ventricle (**3V**)
dorsal recess of third ventricle
(**D3V**)
optic tract (**opt**)
body of lateral ventricle (**LV**)
inferior horn of lateral ventricle
(**LV**)
tail of caudate nucleus (**Cd**)
induseum griseum (hippocampal
remnant) (**IG**)
hippocampus (CA areas) (**Hi**)
subiculum (**S**)
entorhinal cortex (**Ent**)
auditory cortex (**Au1**)
cingulate cortex (**Cg**)

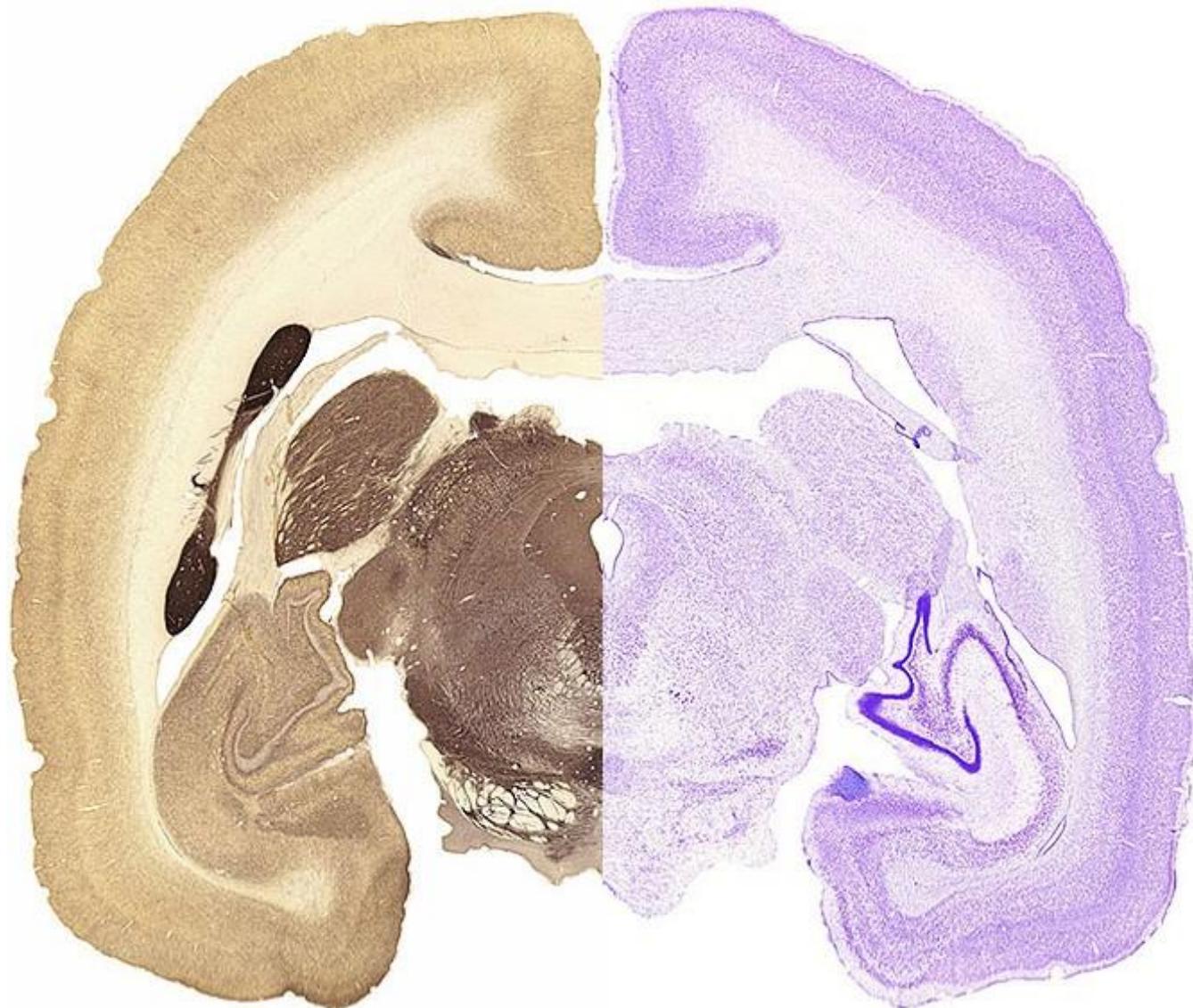


MARMOSET Figure 11:
Middle of the dorsal lateral geniculate nucleus and rostral substantia nigra

corpus callosum (**cc**)
caudate nucleus (**Cd**)
cerebral peduncle (**cp**)
substantia nigra (**SN**)
deep cerebral white matter (**dcw**)
fimbria of the fornix and hippocampal commissure (**fi**)
reticular nucleus of prethalamus (**Rt**)
habenula (**Hb**)
fasciculus retroflexus
(habenulopeduncular tract) (**fr**)
dorsal lateral geniculate (**DLG**)
ventral posterior thalamus (**VP**)
body of lateral ventricle (**LV**)
inferior horn of lateral ventricle (**LV**)
tail of caudate nucleus (**Cd**)
induseum griseum (hippocampal remnant) (**IG**)
hippocampus (CA areas) (**Hi**)
subiculum (**S**)
entorhinal cortex (**Ent**)
cingulate cortex (**Cg**)



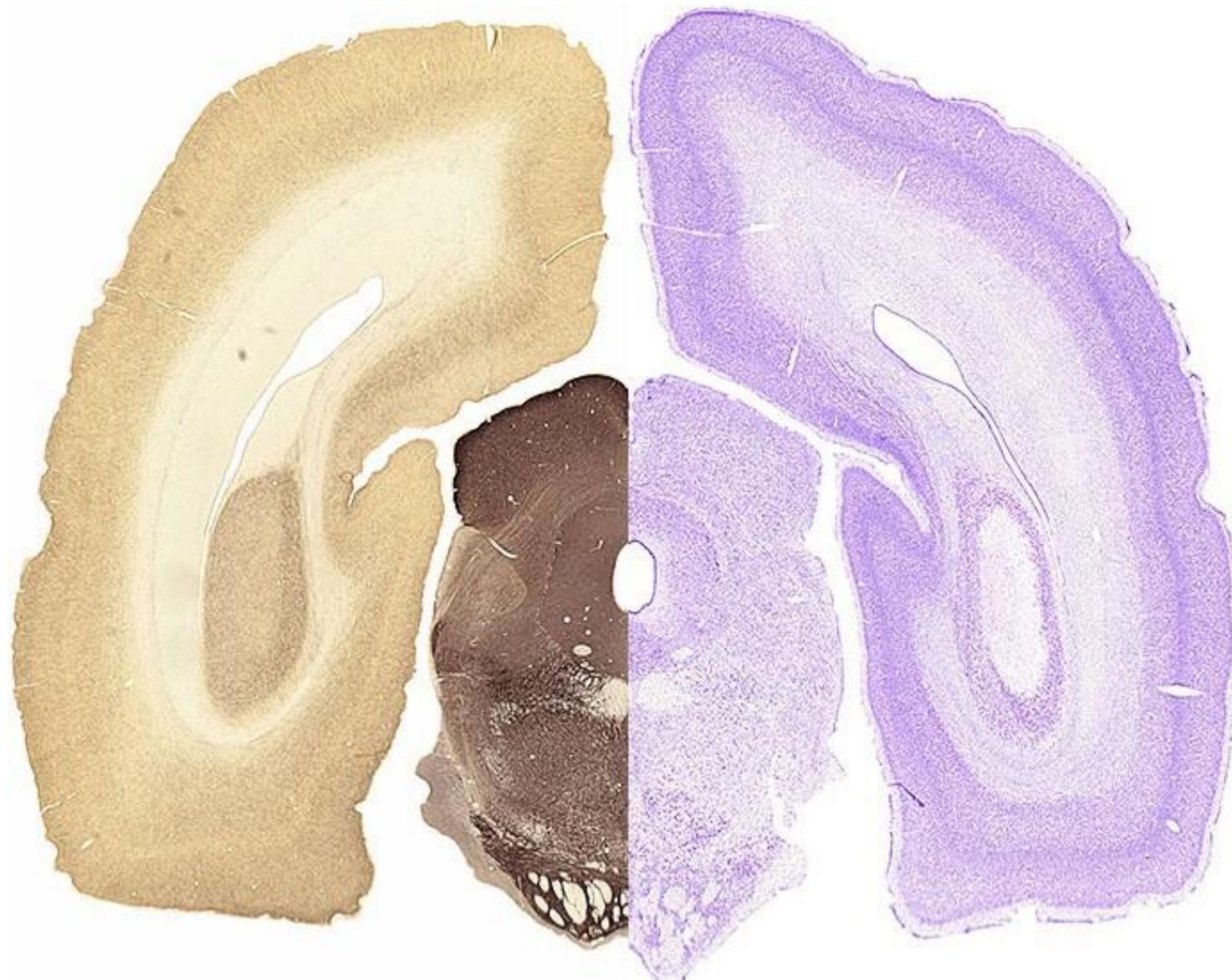
MARMOSET Figure 12:
Pulvinar and posterior commissure
corpus callosum (**cc**)
caudate nucleus (**Cd**)
cerebral peduncle (**cp**)
deep cerebral white matter (**dcw**)
fimbria of the fornix (**fi**)
posterior commissure (**pc**)
aqueduct (**Aq**)
dorsal lateral geniculate (**DLG**)
pulvinar (**Pul**)
medial geniculate (**MG**)
red nucleus (**R**)
oculomotor nerve (**3n**)
body of lateral ventricle (**LV**)
inferior horn of lateral ventricle (**LV**)
tail of caudate nucleus (**Cd**)
hippocampal remnant (induseum
griseum) (**IG**)
hippocampus (CA areas) (**Hi**)
subiculum (**S**)
entorhinal cortex (**Ent**)
cingulate cortex (**Cg**)



MARMOSET Figure 13:
Caudal pulvinar and splenium of
corpus callosum
corpus callosum (**cc**)
caudate nucleus (**Cd**)
pons (**Pn**)
deep cerebral white matter (**dcw**)
fimbria of the fornix (**fi**)
pulvinar (**Pul**)
periaqueductal grey (**PAG**)
superior colliculus (**SC**)
medial geniculate (**MG**)
body of lateral ventricle (**LV**)
inferior horn of lateral ventricle (**LV**)
aqueduct (**Aq**)
tail of caudate nucleus (**Cd**)
induseum griseum (hippocampal
remnant) (**IG**)
hippocampus (CA areas) (**Hi**)
subiculum (**S**)
cingulate cortex (**Cg**)



MARMOSET Figure 14:
Caudal end of
hippocampus
pons (Pn)
deep cerebral white matter
(dcw)
fimbria of the fornix (fi)
pulvinar (Pul)
periaqueductal grey (PAG)
superior colliculus (SC)
aqueduct (Aq)
hippocampus (CA areas)
(Hi)
subiculum (S)
cingulate cortex (Cg)
posterior horn of lateral
ventricle (LV)
deep cerebral white matter
(dcw)



MARMOSET Figure
15:
Occipital lobe rostral
to visual cortex
deep cerebral white
matter (**dcw**)
periaqueductal grey
(**PAG**)
superior colliculus (**SC**)
aqueduct (**Aq**)
hippocampus (CA
areas) (**Hi**)
cingulate cortex (**Cg**)
posterior horn of lateral
ventricle (**LV**)
pons (**Pn**)



MARMOSET Figure 16:
Occipital lobe in the
rostral visual cortex
primary visual cortex (**V1**)
deep cerebral white matter
(**dcw**)
posterior horn of lateral
ventricle (**LV**)
periaqueductal grey (**PAG**)
inferior colliculus (**IC**)
aqueduct (**Aq**)
pyramid (**py**)