

PSYCH 260/BBH 203

Neuroanatomy I

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2022-01-20 08:10:34

Prelude (3:24)

Parts of the Brain Song



[\(Neural Academy, 2020\)](#)

Prelude (2:01)

Human Body for Kids/Brain Song/Human Body Systems



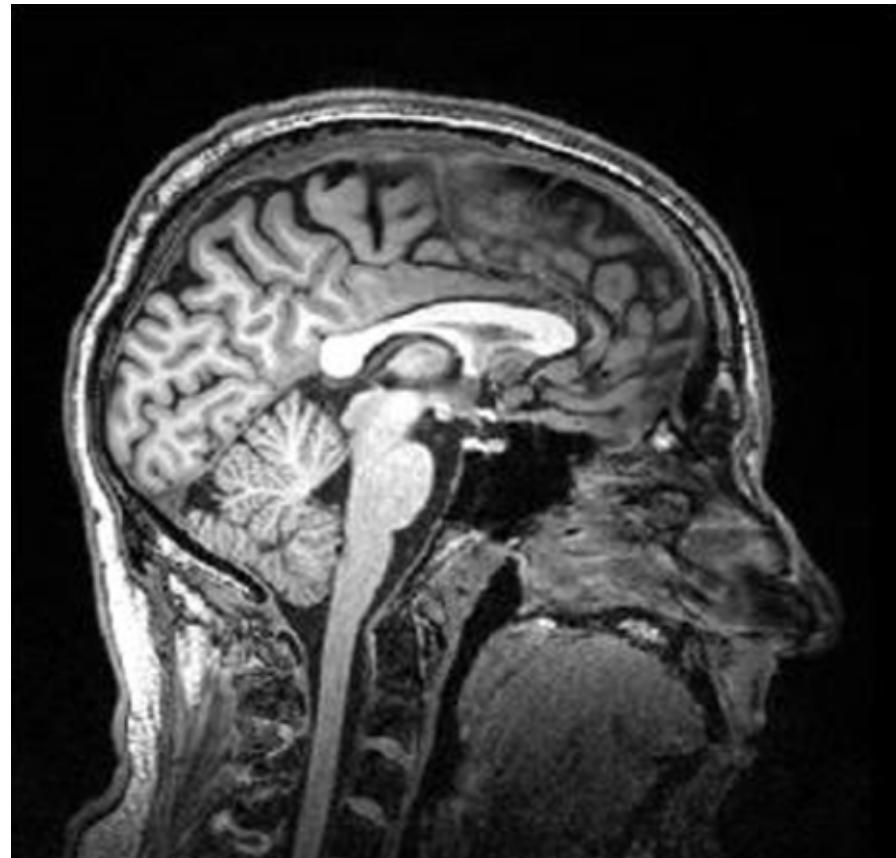
[\(Kids Learning Tube, 2015\)](#)

Today's topics

- Announcement: Quiz 1 next Thursday (online via Canvas)
- Warm-up
- Wrap up on functional methods
- Neuroanatomy
 - Through song and dance

Warm-up

What kind of brain imaging technique does this image represent?



What kind of structural brain imaging technique does this image represent?

- A. Magnetic Resonance Imaging (MRI)
- B. Positron Emission Tomography
- C. Event-related potentials (ERP)

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Which of the following functional methods has *temporal* resolution on the order of seconds?

- A. functional MRI
- B. EEG
- C. MEG
- D. single-unit recording

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- A. functional MRI
- B. EEG
- C. MEG
- D. ~~single-unit recording~~

Which of the following methods has high/fine *spatial* resolution?

- A. functional MRI
- B. PET
- C. EEG
- D. single-unit recording

Which of the following methods has high/fine *spatial* resolution?

- A. ~~functional MRI~~
- B. ~~PET~~
- C. ~~EEG~~
- D. single-unit recording

Which measure(s) would you use to map connections between brain areas?

- A. retrograde/anterograde cell tracers
- B. diffusion tensor imaging (DTI)
- C. PET neuroimaging
- E. both A & B.

Which measure(s) would you use to measure connections between brain areas?

- A. retrograde/anterograde cell tracers
- B. diffusion tensor imaging (DTI)
- C. ~~PET neuroimaging~~
- E. both A & B.

Wrap-up on functional methods

- Link to lecture on functional methods

Neuroanatomy

Brain anatomy through dance

0:00 / 1:28

Finding our way around

Anterior/Posterior

Medial/Lateral

Superior/Inferior

Dorsal/Ventral

Rostral/Caudal

Finding our way around

Anterior/Posterior -> front/back

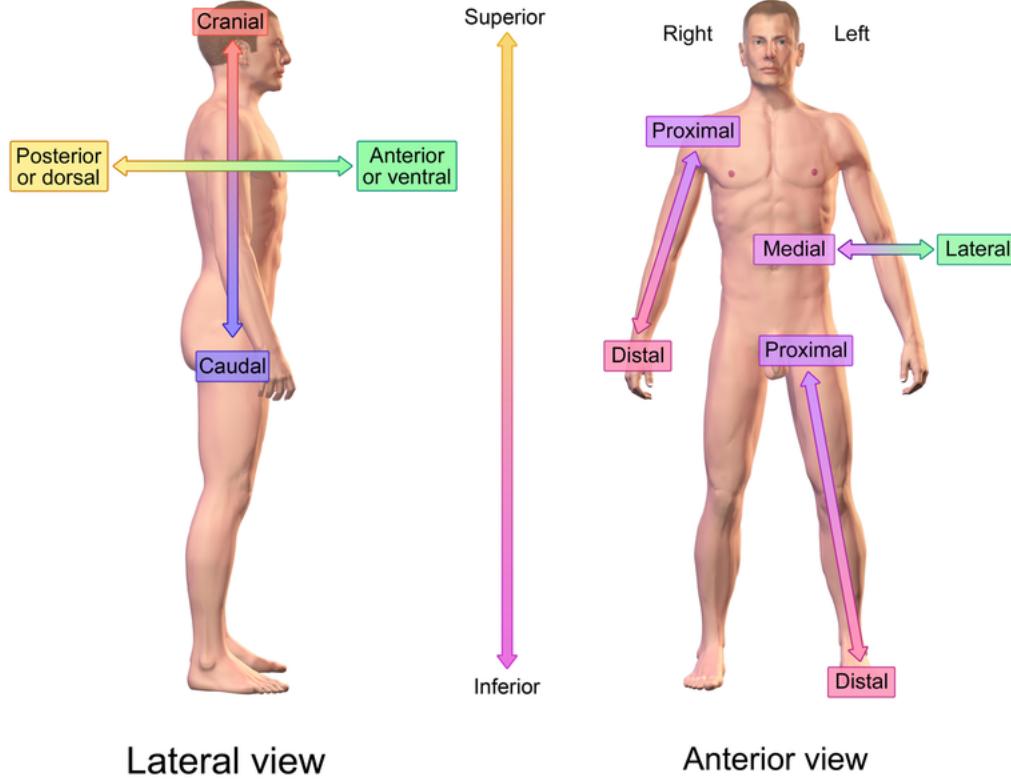
Medial/Lateral -> inside/outside

Superior/Inferior -> upward/downward

Dorsal/Ventral -> back-ward/belly-ward

Rostral/Caudal -> head-ward/tail-ward

Directional image



Lateral view

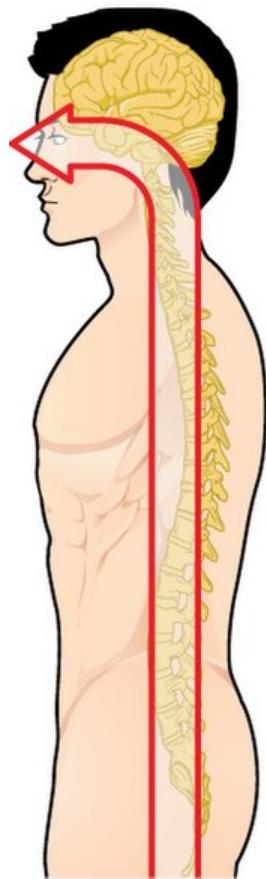
Anterior view

Directional References

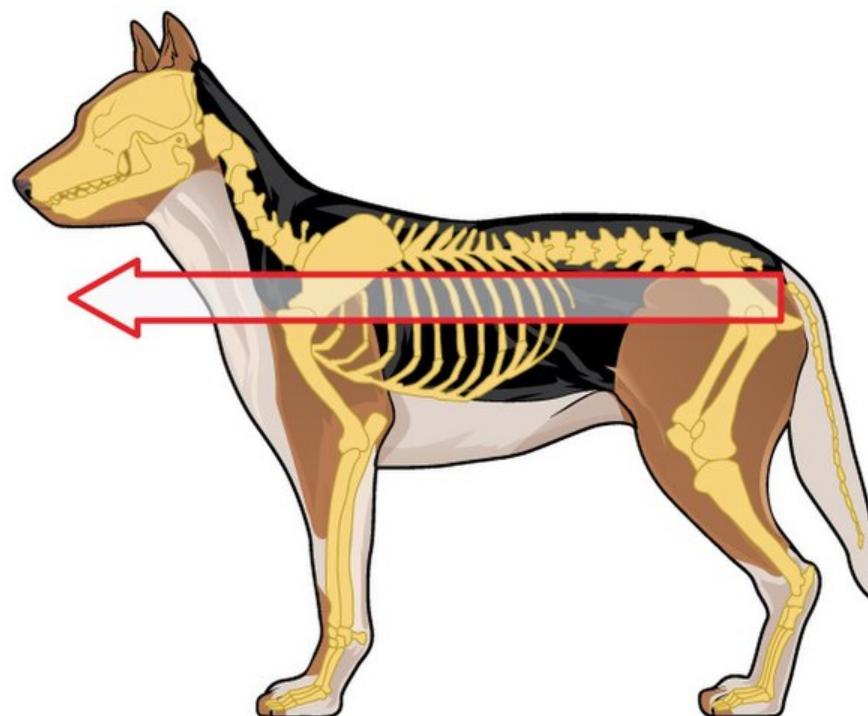
Wikipedia

Bipeds vs. quadripeds

Human (bipedal)



Dog (quadrupedal)



Wikipedia

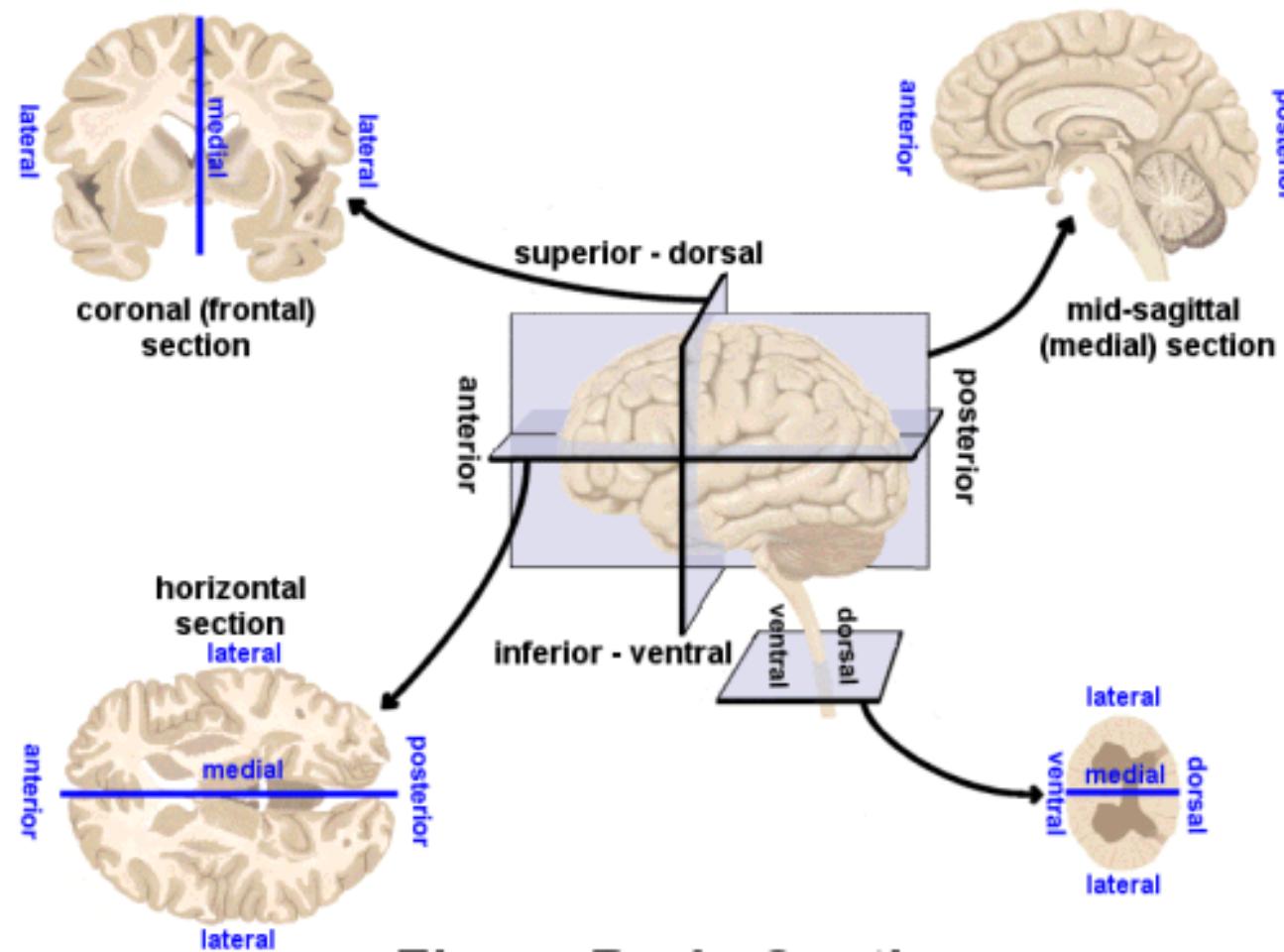
No matter how you slice it

Horizontal/Axial

Coronal/Transverse/Frontal

Sagittal (from the side)

Slice diagram



http://www.scienteteacherprogram.org/biology/chillemistudentguide1-06/brain_directions_planes_sections_directions_-_small.gif

Supporting structures

Meninges

Ventricular system

Blood supply

Meninges

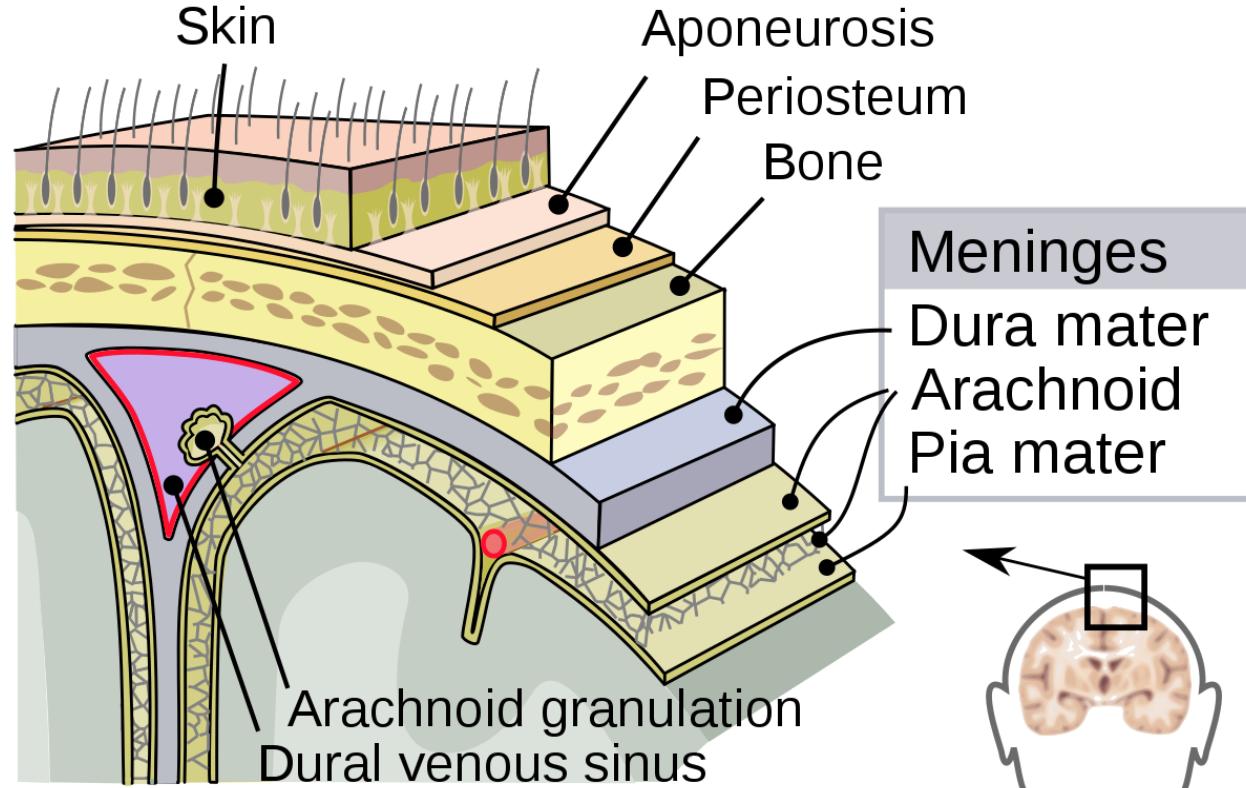
Dura mater

Arachnoid membrane

Subarachnoid space

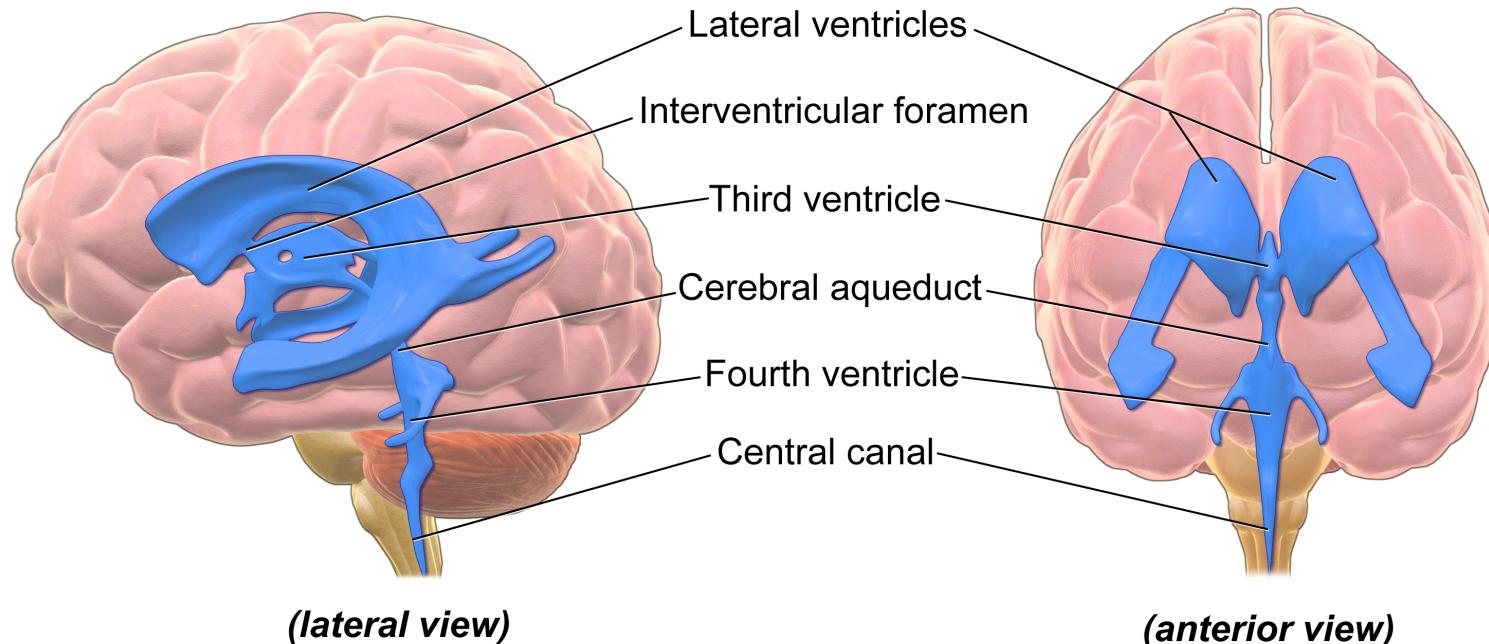
Pia mater

Meninges



<https://upload.wikimedia.org/wikipedia/commons/thumb/8/8e/Meninges-en.svg/1280px-Meninges-en.svg.png>

Ventricular system



https://upload.wikimedia.org/wikipedia/commons/d/d4/Blausen_0896_Ventricles_Brain.png

Ventricles

Lateral (1st & 2nd)

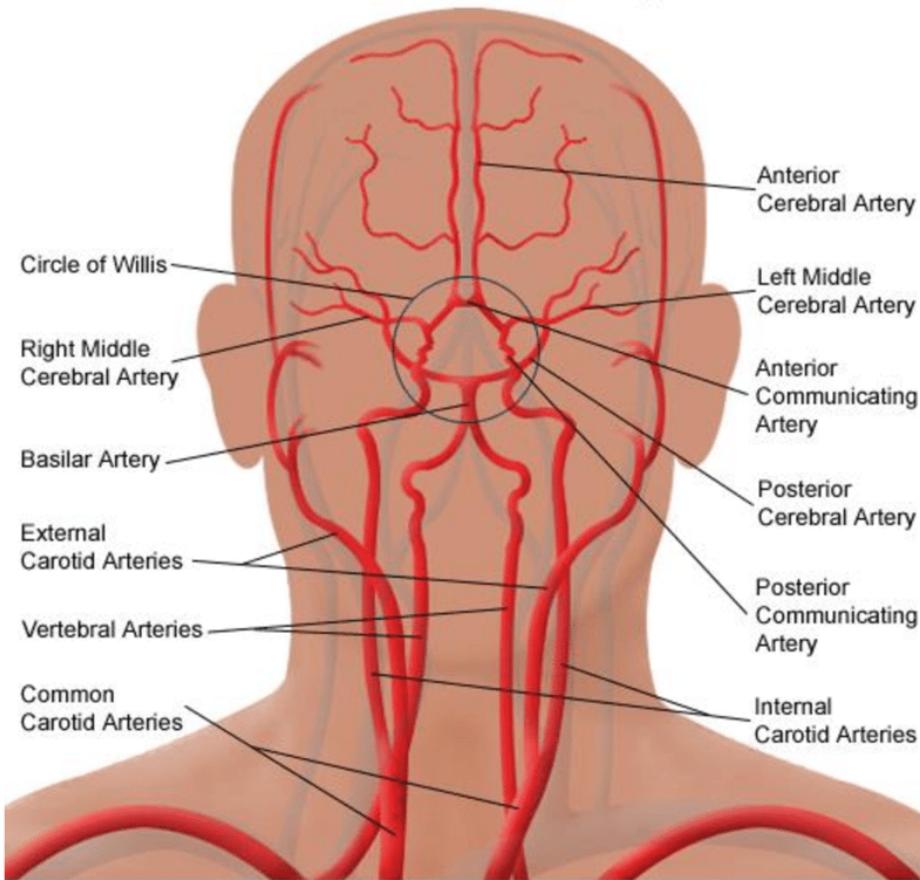
3rd

Cerebral aqueduct

4th

(are filled with) *Cerebrospinal fluid (CSF)*

Blood Supply



https://www.researchgate.net/profile/Yohannes_Mamo/publication/280830140/figure/fig1/AS:649635857174600/Organization-of-the-human-cerebral-circulation-The-brain-receives-its-blood-supply.png

Blood Supply

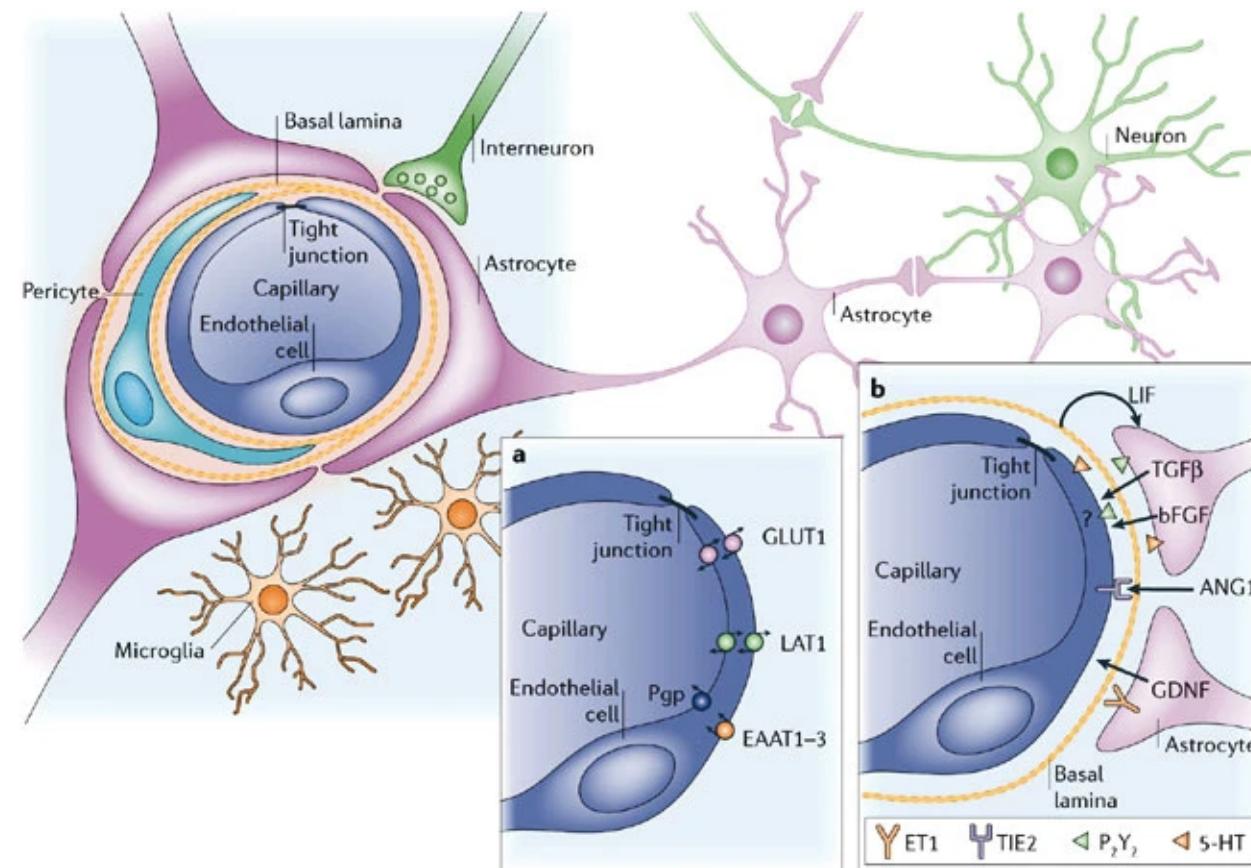
Arteries

- external & internal carotid; vertebral -> basilar
- *Circle of Willis*
- anterior, middle, & posterior cerebral

Blood/brain barrier

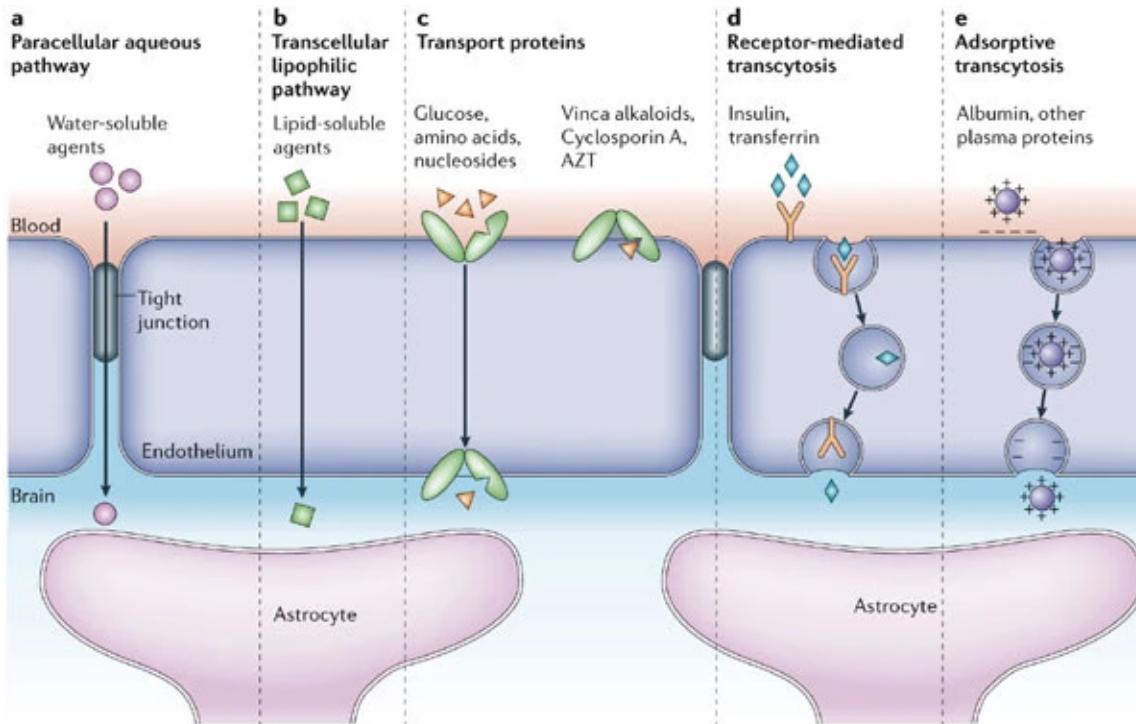
- Isolates CNS from blood stream
- Active transport of molecules typically required
- (endothelial) cells forming blood vessel walls are tightly packed

Blood/brain barrier



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(Abbott, Rönnbäck, & Hansson, 2006)



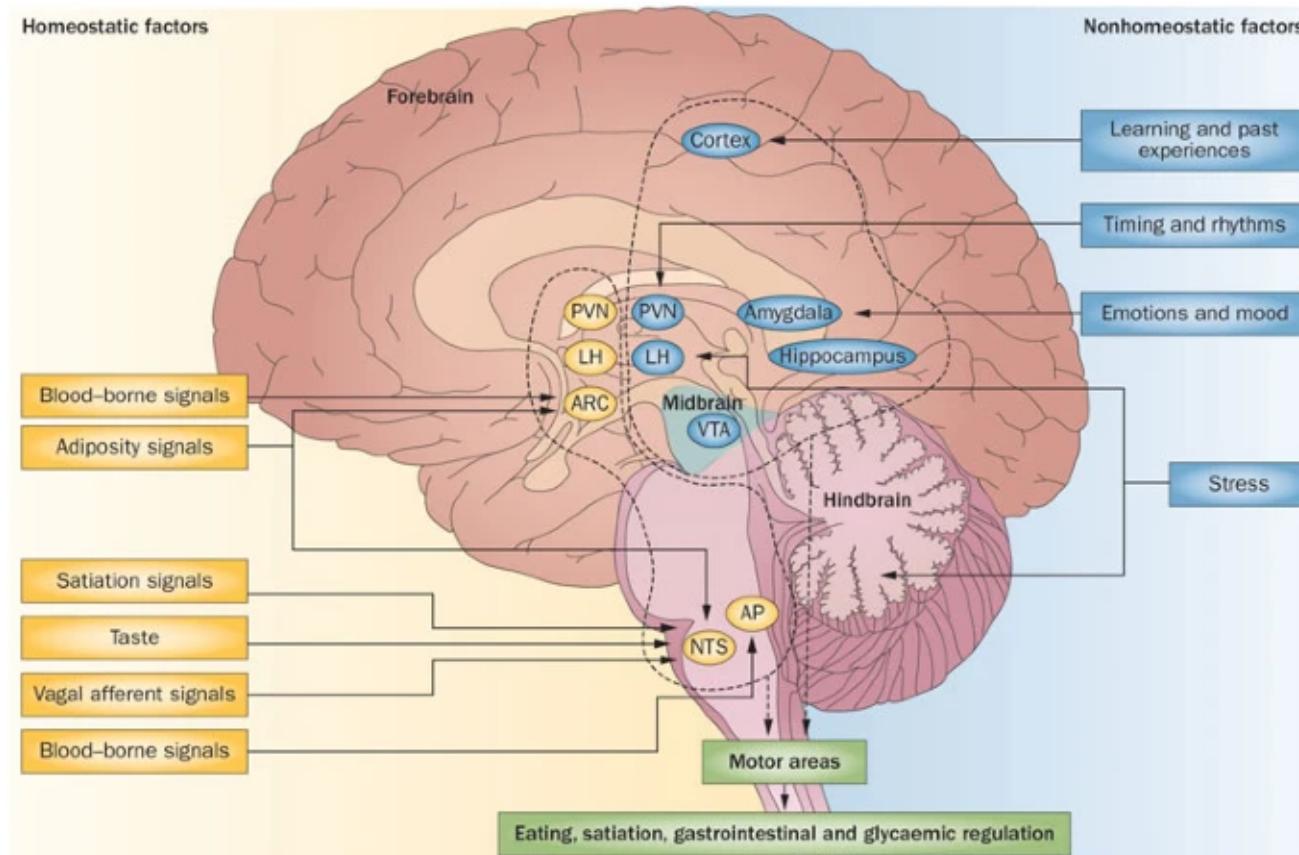
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(Abbott, Rönnbäck, & Hansson, 2006)

exception is *Area Postrema*

- In brainstem
- Blood-brain barrier thin
- Detects toxins, evokes vomiting

Area Postrema



(Begg & Woods, 2013)

Organization of the Nervous System

Central Nervous System (CNS)

- Brain
- Spinal Cord
- Everything encased in bone

Peripheral Nervous System (PNS)

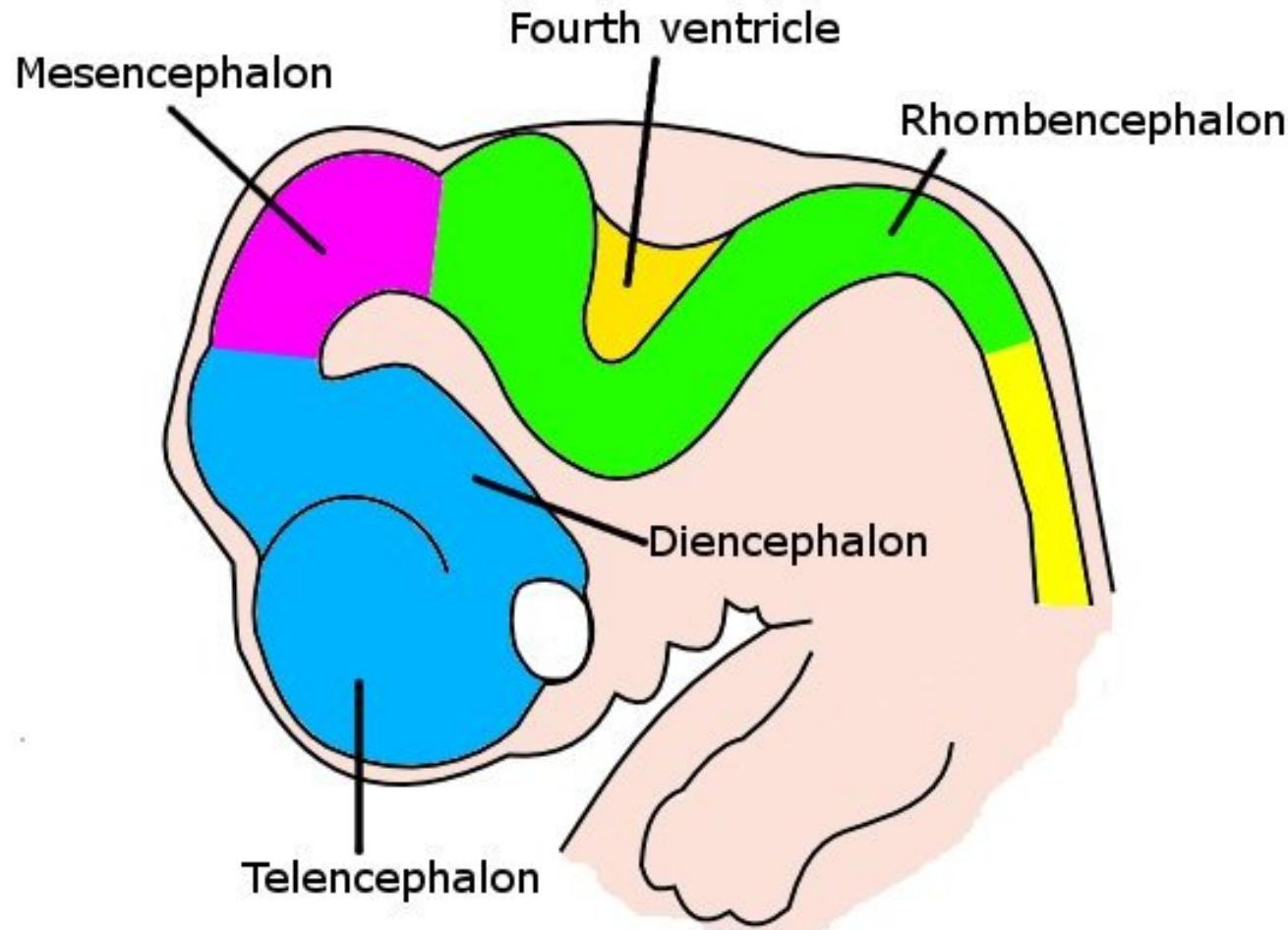
Organization of the brain

Major division	Ventricular Landmark	Embryonic Division	Structure
<i>Forebrain</i>	Lateral	Telencephalon	<i>Cerebral cortex</i>
			<i>Basal ganglia</i>
			<i>Hippocampus, amygdala</i>
<i>Midbrain</i>	Third	Diencephalon	<i>Thalamus</i>
			<i>Hypothalamus</i>
	Cerebral Aqueduct	Mesencephalon	<i>Tectum, Tegmentum</i>

Organization of the brain

Major division	Ventricular Landmark	Embryonic Division	Structure
<i>Hindbrain</i>	4th	Rhombencephalon	<i>Cerebellum, pons</i>
	-		<i>Medulla oblongata</i>

Embryonic brain (~6 weeks gestation)



https://upload.wikimedia.org/wikipedia/commons/c/c8/6_week_embryo_brain.jpg

Next time...

- More neuroanatomy...

References

- Abbott, N. J., Rönnbäck, L., & Hansson, E. (2006). Astrocyte-endothelial interactions at the blood-brain barrier. *Nature Reviews. Neuroscience*, 7(1), 41–53. <https://doi.org/10.1038/nrn1824>
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