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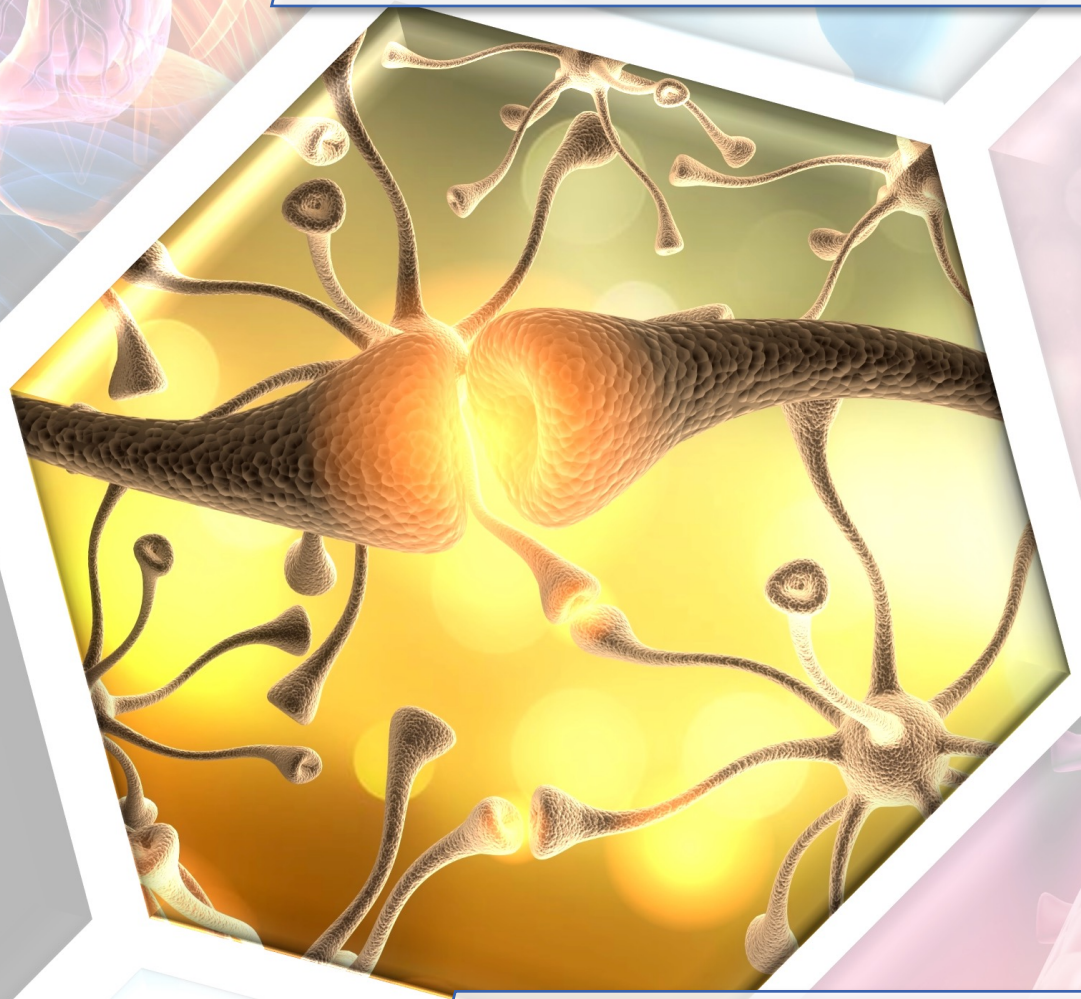
Neuroanatomy



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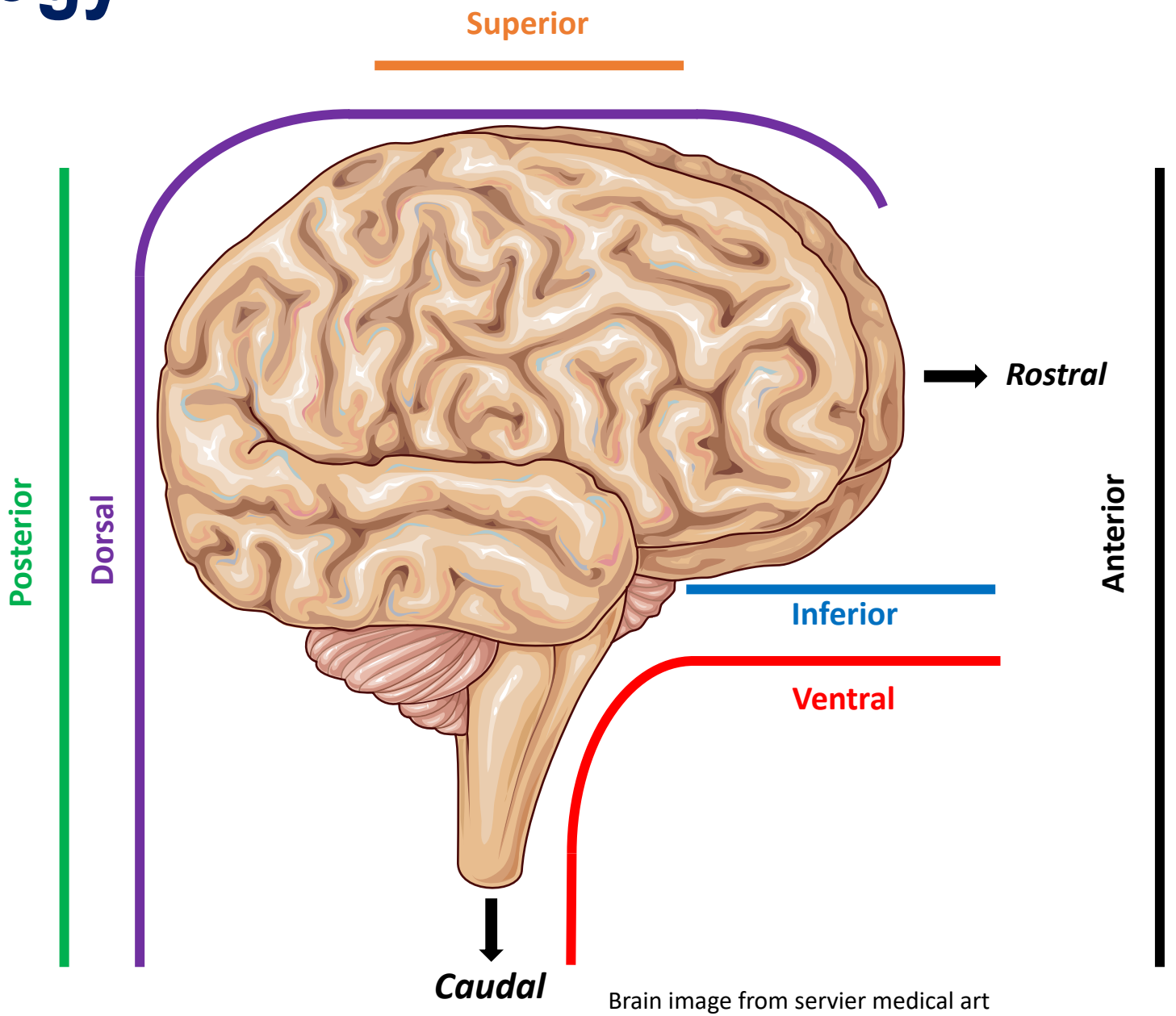
Terminology



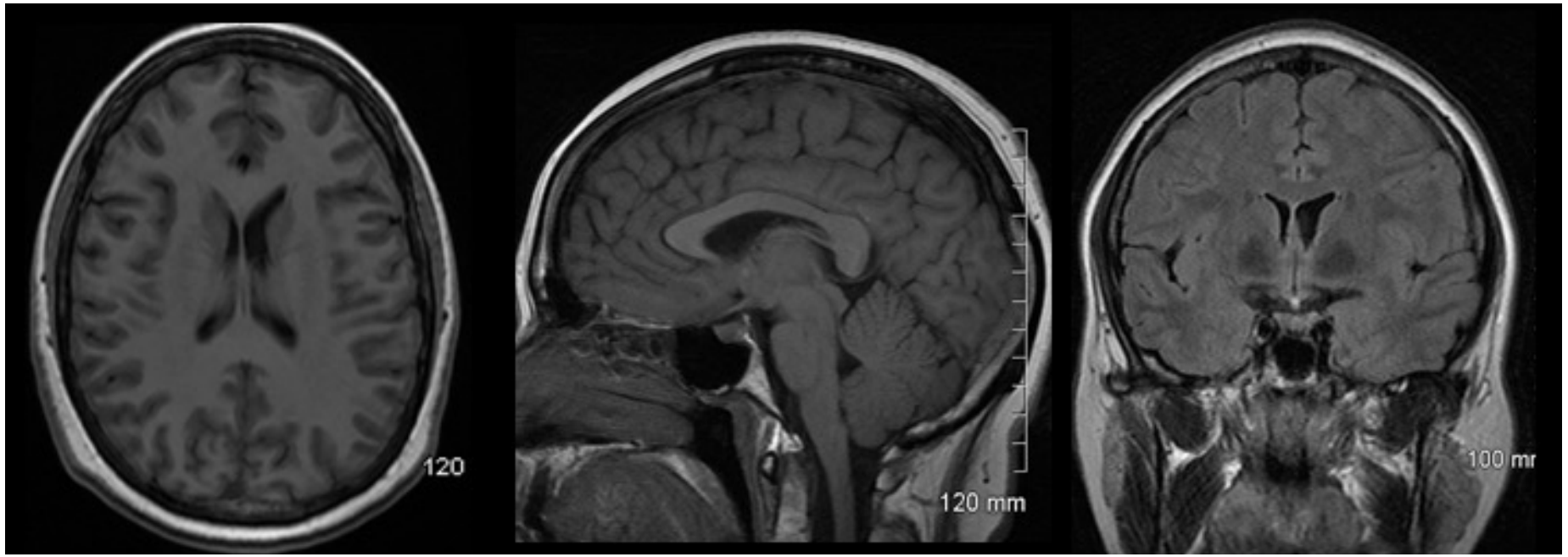
Brain image from servier medical art

Terminology – planes

Axial, horizontal, transverse

Sagittal

Coronal

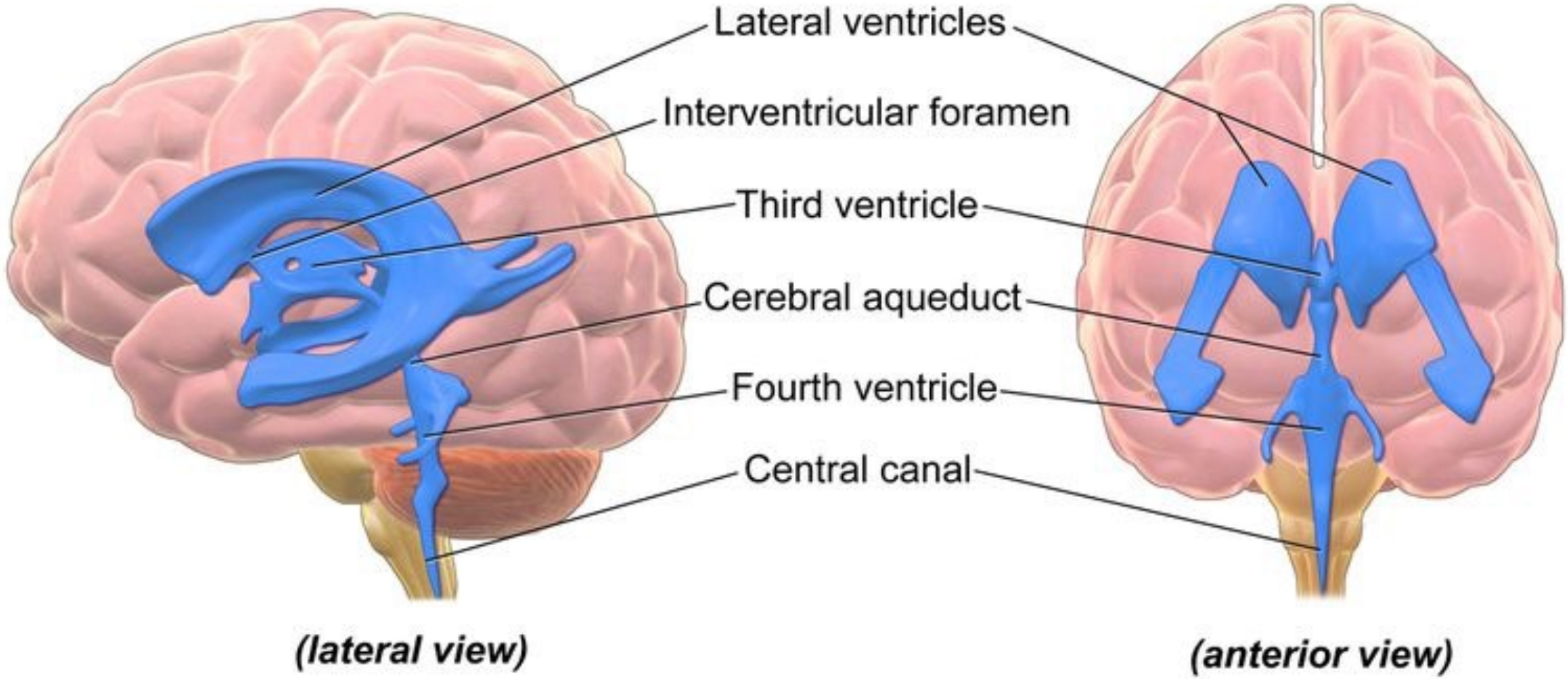


Cranial fossae

Which part of the brain:

Lies in the anterior cranial fossa	**Frontal lobe of cerebral hemisphere**
Lies in the middle cranial fossa	**Temporal lobe of cerebral hemisphere**
Lies in the posterior cranial fossa	**Cerebellum**
Lies directly above the body of the sphenoid bone	**Hypothalamus**
Passes through the foramen magnum	**Medulla**

Ventricular system

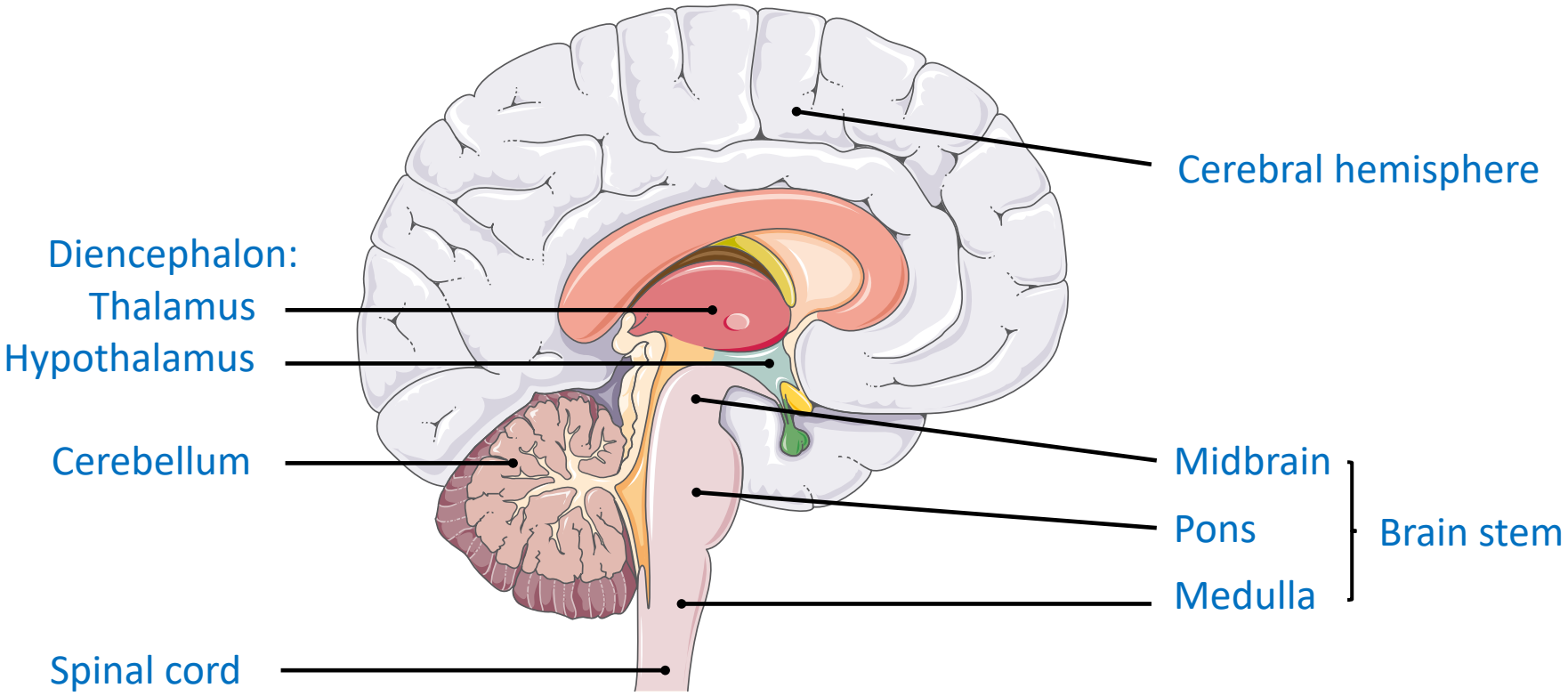


Ventricular system

Which part of the ventricular system relates to:

The cerebral hemisphere	**Lateral ventricle**
The diencephalon	**Third ventricle**
The midbrain	**Aqueduct**
The pons and medulla	**Fourth ventricle**

Brain



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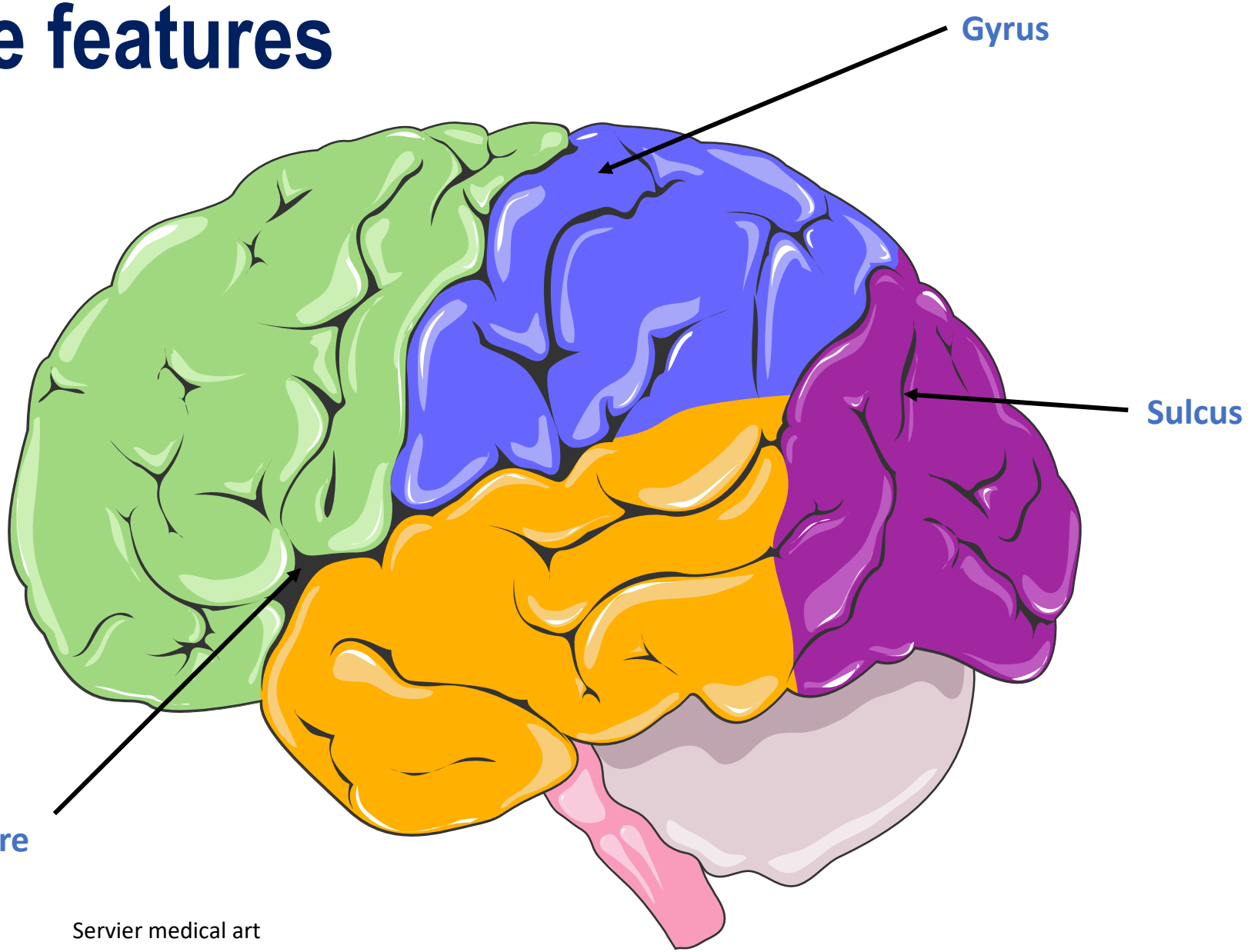
Surface features



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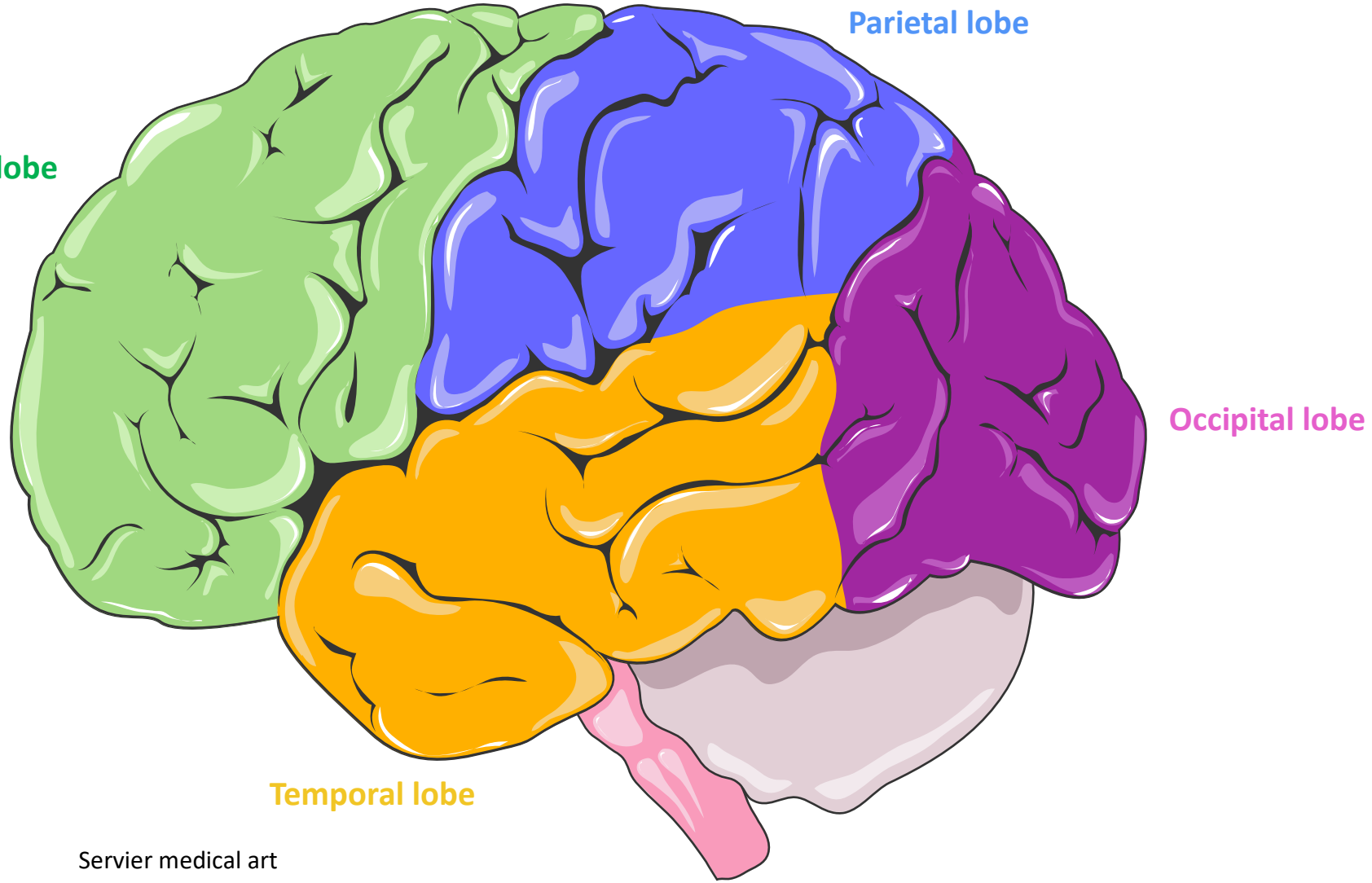
Lobes



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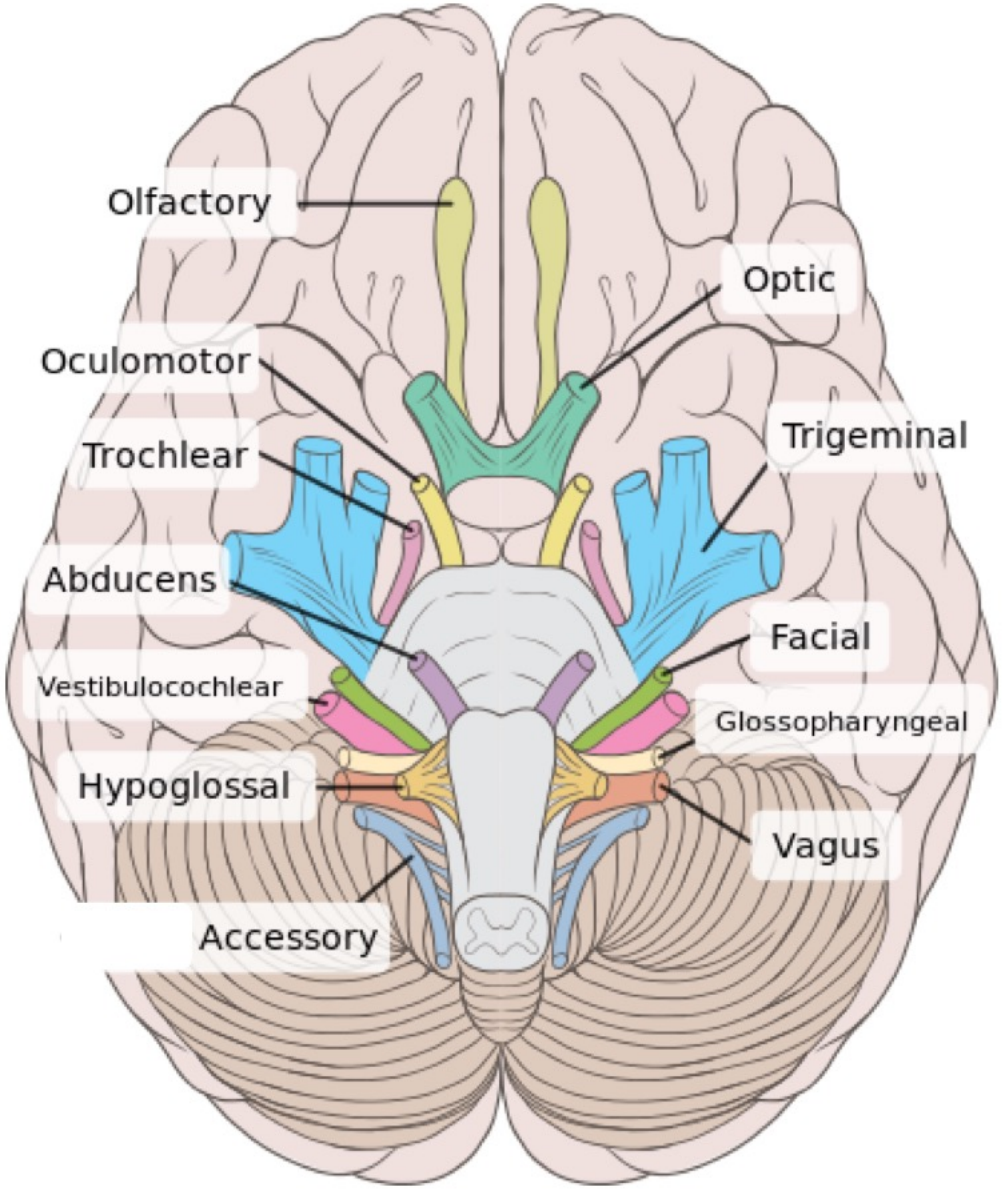
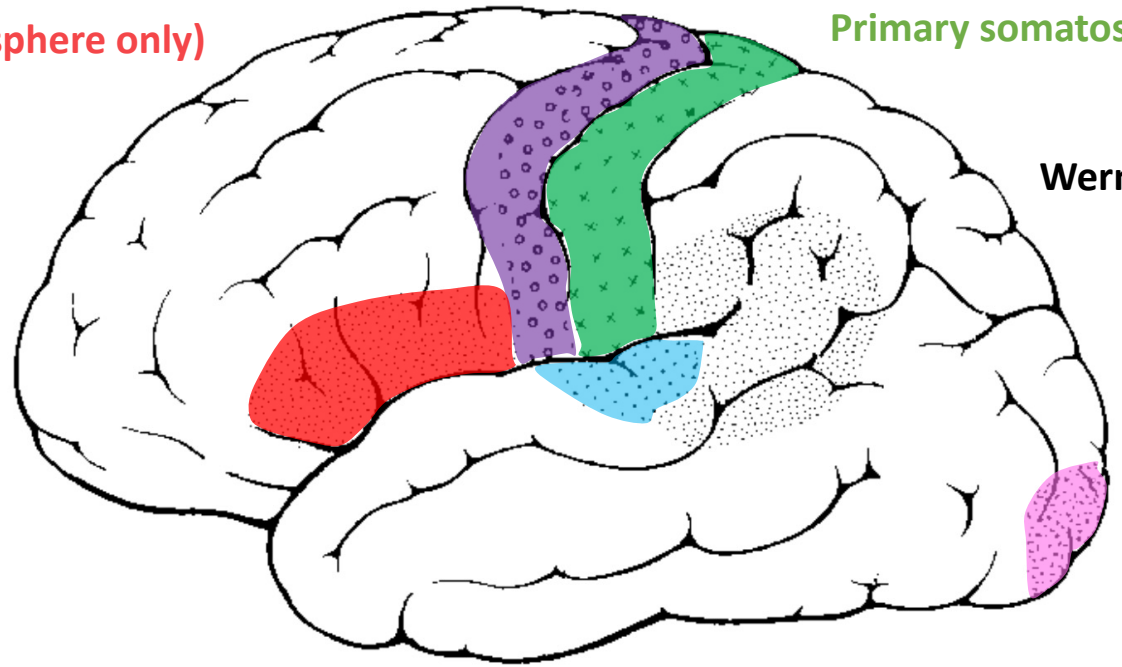
Cranial nerves



Cerebral cortex



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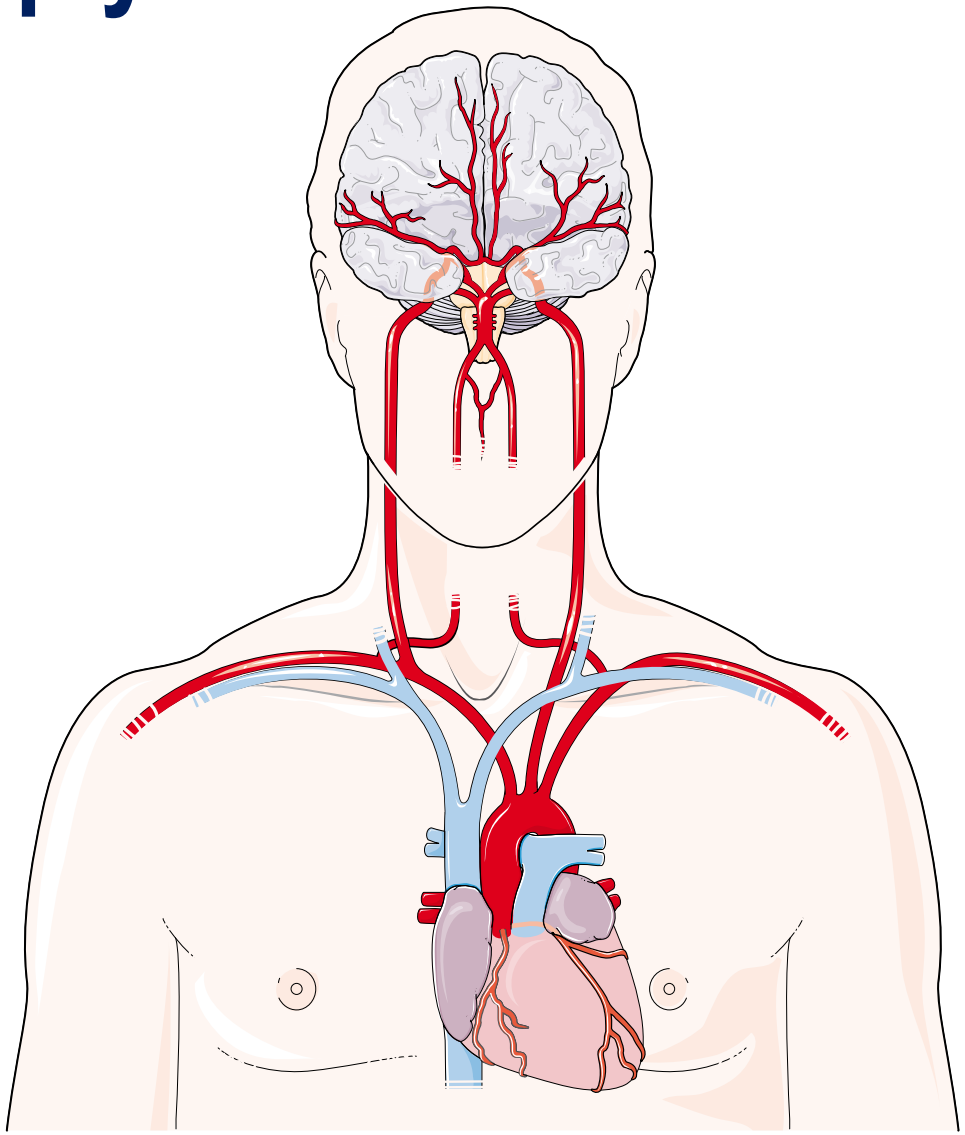
Arterial supply



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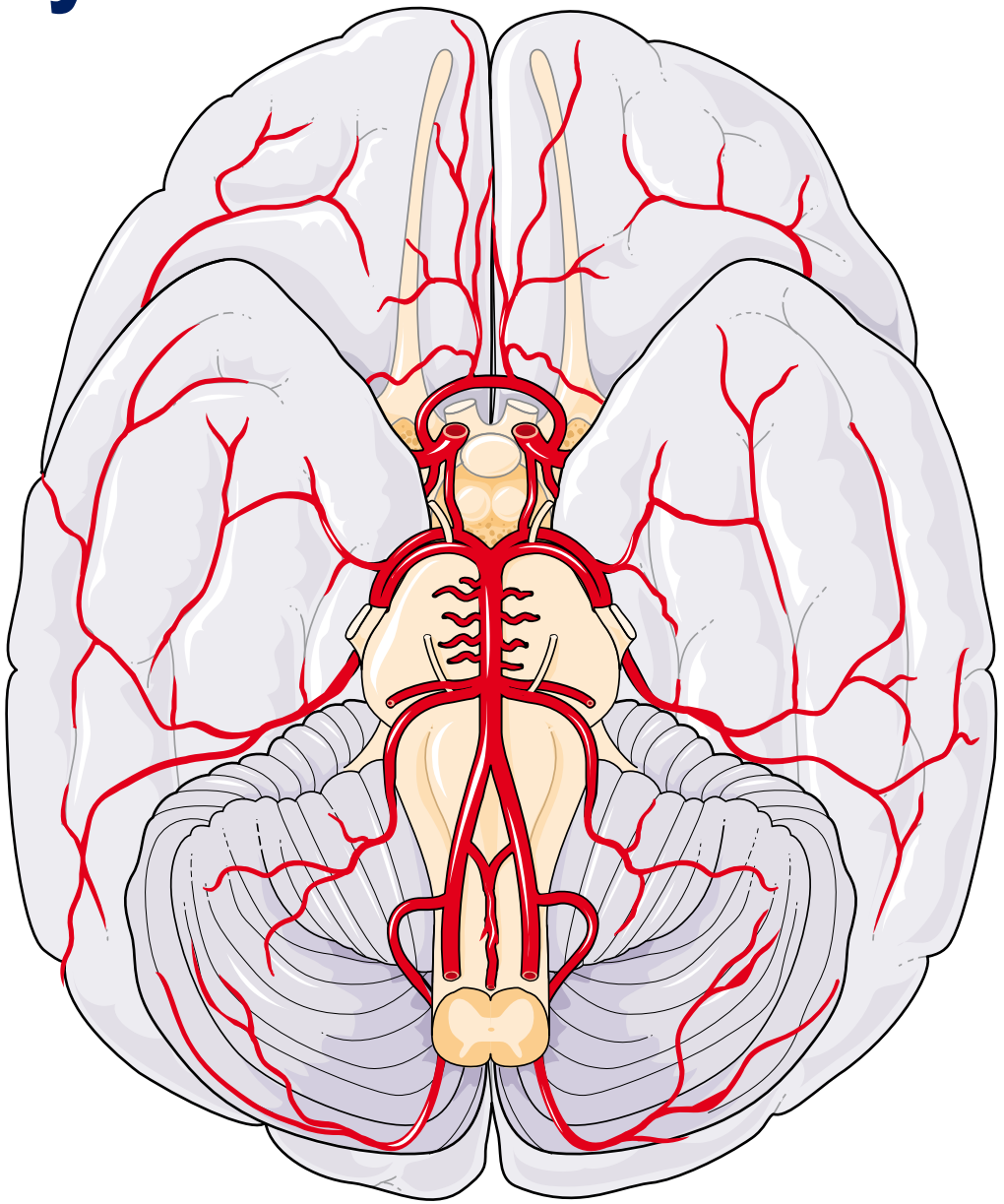
Arterial supply – the circle of Willis



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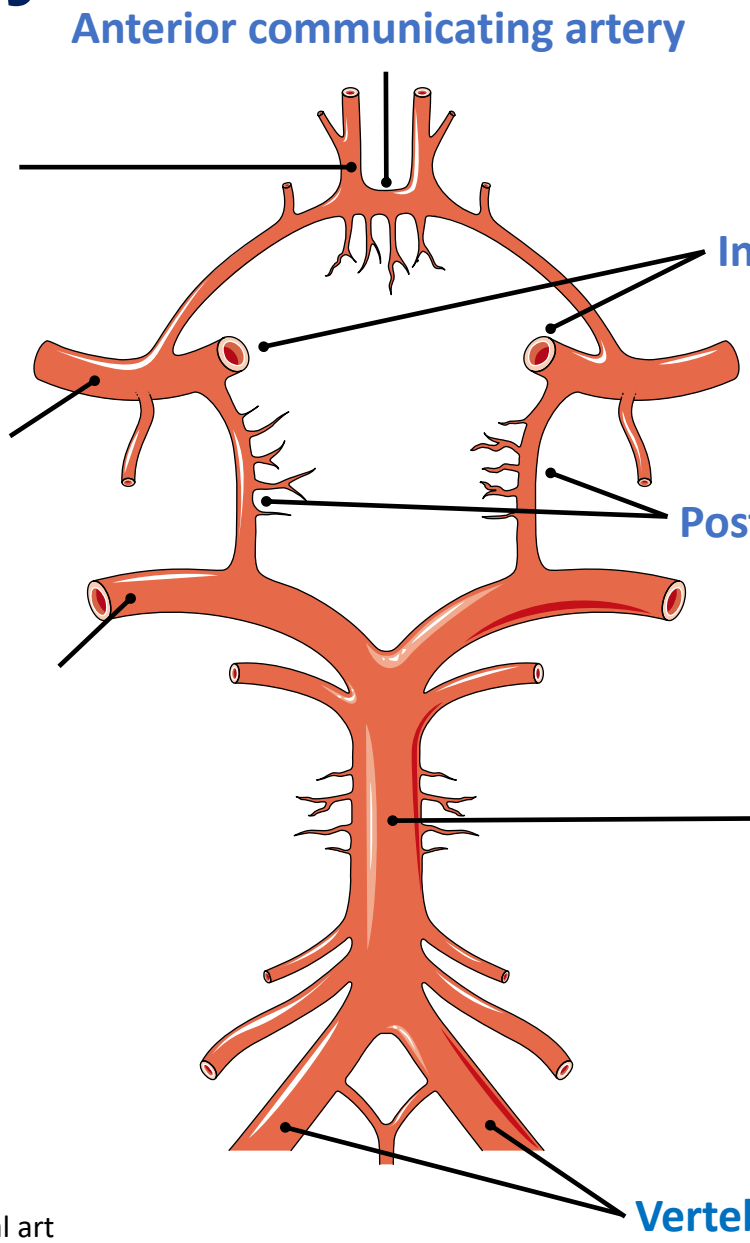
Arterial supply – the circle of Willis



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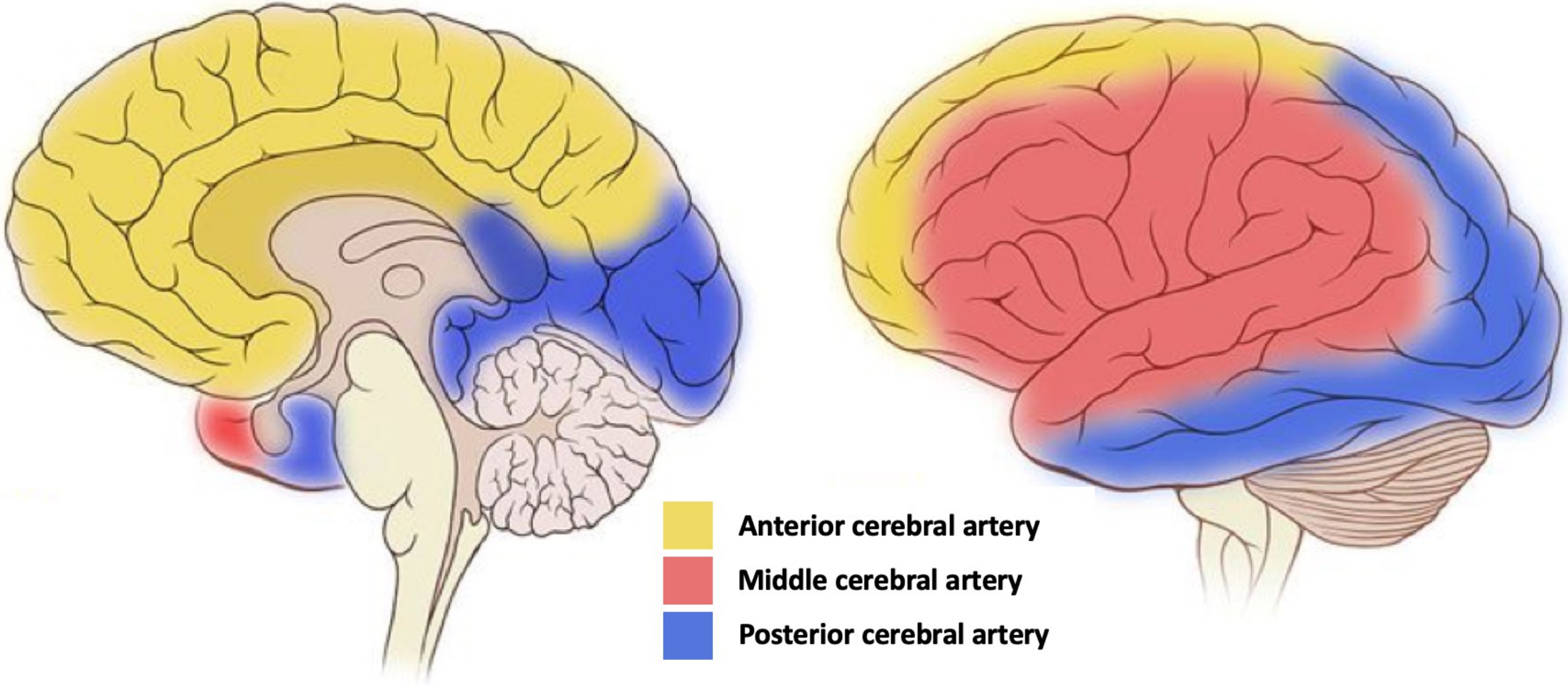
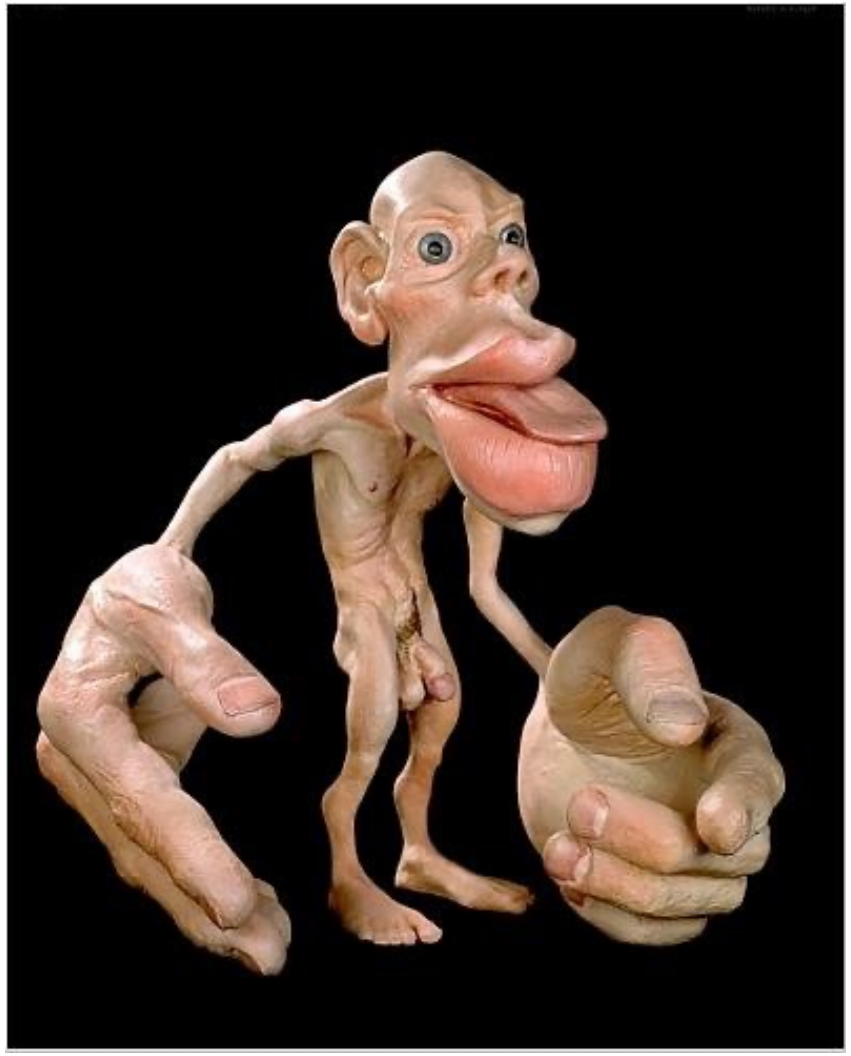
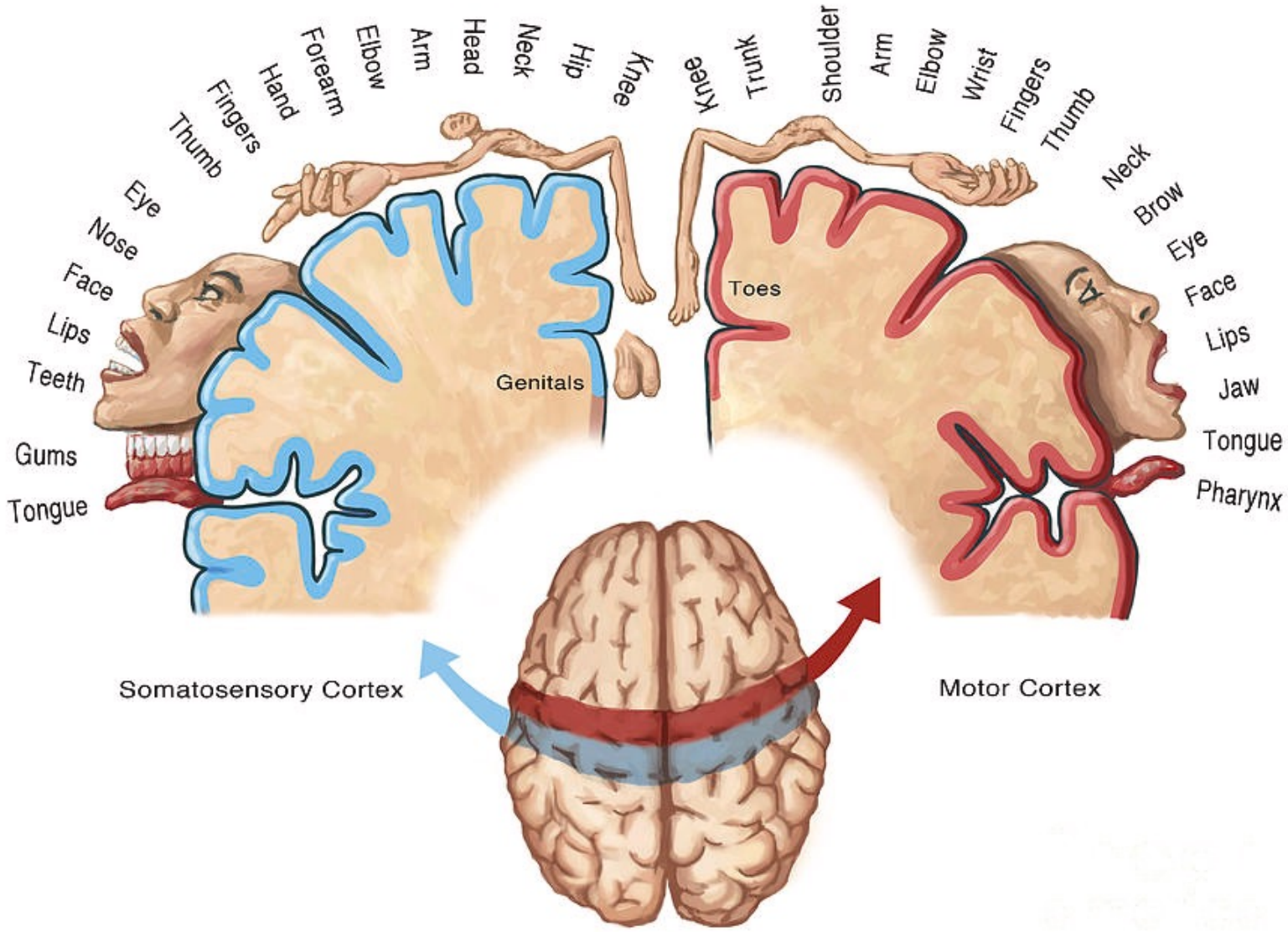
Cortical arterial supply



Homunculus and somatotopy





Cortical arterial supply

Cortical area	Blood supply
Primary motor cortex for face	**Middle cerebral artery**
Primary motor cortex for arm	**Middle cerebral artery**
Primary motor cortex for foot	**Anterior cerebral artery**
Primary somatosensory cortex for arm	**Middle cerebral artery**
Primary visual cortex	**Posterior cerebral artery**
Primary auditory cortex	**Middle cerebral artery**
Broca’s area	**Middle cerebral artery**
Wernicke’s area	**Middle cerebral artery**

The brain in different planes

1. Lateral ventricle [may be cut through twice in horizontal or coronal plane]
2. Third ventricle [may look like a hole or a slit in coronal and horizontal plane, depending on angle of section]
3. Fourth ventricle
4. Aqueduct
5. Corpus callosum [may be cut through twice in horizontal plane]
6. Frontal lobe
7. Occipital lobe
8. Parietal lobe

The brain in different planes continued

9. Temporal lobe
10. Basal ganglia [may be more than one part]
11. Thalamus
12. Internal capsule [both anterior and posterior limbs seen in horizontal plane]
13. Optic chiasm
14. Midbrain
15. Pons
16. Medulla
17. Cerebellum

Cranial nerve functions

Information taken from Gray's Anatomy for Students

Terminology – cranial nerves

Cranial nerve functional components

Functional component	Abbreviation	General function	Cranial nerves containing component
General somatic afferent	GSA	Perception of touch, pain, temperature	Trigeminal nerve [V], facial nerve [VII], glossopharyngeal nerve [IX], vagus nerve [X]
General visceral afferent	GVA	Sensory input from viscera	Glossopharyngeal nerve [IX], vagus nerve [X]
Special afferent*	SA	Smell, taste, vision, hearing, and balance	Olfactory nerve [I], optic nerve [II], facial nerve [VII], vestibulocochlear nerve [VIII], glossopharyngeal nerve [IX], vagus nerve [X]
General somatic efferent	GSE	Motor innervation to skeletal (voluntary) muscles	Oculomotor nerve [III], trochlear nerve [IV], abducent nerve [VI], hypoglossal nerve [XII]
General visceral efferent	GVE	Motor innervation to smooth muscle, heart muscle, and glands	Oculomotor nerve [III], facial nerve [VII], glossopharyngeal nerve [IX], vagus nerve [X]
Branchial efferent†	BE	Motor innervation to skeletal muscles derived from pharyngeal-arch mesoderm	Trigeminal nerve [V]; facial nerve [VII], glossopharyngeal nerve [IX], vagus nerve [X], accessory nerve [XI]

Other terminology used in the description of functional components:
*Special sensory, or special visceral afferent (SVA) (smell, taste); special somatic afferent (SSA) (vision, hearing, balance);
† special visceral efferent (SVE) or branchial motor.

Cranial nerves I-IV

Olfactory nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Olfactory [I]	SA		Cribriform plate of the ethmoid bone	Smell

SA, special afferent.

- Carries special afferent fibers for the sense of smell
- Receptors are located in the roof and upper parts of the nasal cavity
- Nerve fibers enter the cranial cavity through the cribriform plate of the ethmoid bone

Optic nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Optic [II]	SA		Optic canal	Vision

SA, special afferent.

- Carries special afferent fibers for vision
- Receptors are photoreceptors in retina
- Optic nerves enter cranial cavity through optic canals

Oculomotor nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Oculomotor [III]		GSE, GVE	Superior orbital fissure	GSE — innervates levator palpebrae superioris, superior rectus, inferior rectus, medial rectus, and inferior oblique muscles; GVE — innervates the sphincter pupillae for pupillary constriction, ciliary muscles for accommodation of the lens for near vision

GSE, general somatic efferent;

GVE, general visceral efferent.

- Carries general somatic efferent fibers that innervate the extraocular muscles
- Carries general visceral efferent fibers for parasympathetic innervation of some structures in the orbit
- Exits the cranial cavity through the superior orbital fissure

Trochlear nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Trochlear nerve [IV]		GSE	Superior orbital fissure	Innervates the superior oblique muscle

GSE, general somatic efferent.

- Carries general somatic efferent fibers to innervate one extraocular muscle
- Exits the cranial cavity through the superior orbital fissure

Cranial nerves V-VII

Trigeminal nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Trigeminal nerve [V]	GSA	BE	Superior orbital fissure—ophthalmic division [V1] Foramen rotundum—maxillary nerve [V2] Foramen ovale—mandibular division [V3]	GSA—sensory from: ophthalmic division [V1]—eyes, conjunctiva, orbital contents, nasal cavity, frontal sinus, ethmoidal cells, upper eyelid, dorsum of nose, anterior part of scalp, dura in anterior cranial fossa, superior part of tentorium cerebelli; maxillary nerve; maxillary nerve [V2]—dura in middle cranial fossa, nasopharynx, palate, nasal cavity, upper teeth, maxillary sinus, skin covering the side of the nose, lower eyelid, cheek, upper lip; mandibular division [V3]—skin of lower face, cheek, lower lip, anterior part of external ear, part of external acoustic meatus, temporal fossa, anterior two-thirds of tongue, lower teeth, mastoid air cells, mucous membranes of cheek, mandible, dura in middle cranial fossa BE—innervates temporalis, masseter, medial and lateral pterygoids, tensor tympani, tensor veli palatini, anterior belly of digastric, and mylohyoid muscles

GSA, general somatic afferent; *BE*, branchial efferent.

- Carries general somatic afferent fibers for sensory input from most of the head
- Carries branchial efferent fibers to innervate muscles that mainly move the lower jaw

Divisions

- Ophthalmic nerve [V_1]: Exits the cranial cavity through the superior orbital fissure
- Maxillary nerve [V_2]: Exits the cranial cavity through the foramen rotundum
- Mandibular nerve [V_3]: Exits the cranial cavity through the foramen ovale

Abducent nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Abducent nerve [VI]		GSE	Superior orbital fissure	Innervates the lateral rectus muscle

GSE, general somatic efferent.

- Carries general somatic efferent fibers to innervate one extraocular muscle
- Exits the cranial cavity through the superior orbital fissure

Facial nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Facial nerve [VII]	GSA, SA	GVE, BE	Internal acoustic meatus	GSA—sensory from part of external acoustic meatus and deeper parts of auricle SA—taste from anterior two-thirds of tongue GVE—innervates lacrimal gland, submandibular and sublingual salivary glands, and mucous membranes of nasal cavity, hard and soft palates BE—innervates muscles of face (muscles of facial expression) and scalp derived from the second pharyngeal arch, and stapedius, posterior belly of digastric, stylohyoid muscles

GSA, general somatic afferent; *SA*, special afferent; *GVE*, general visceral efferent; *BE*, branchial efferent.

- Carries general somatic afferent fibers for sensory input from some of the ear and surrounding area
- Carries special afferent fibers from part of the tongue for taste
- Carries general visceral efferent fibers for parasympathetic innervation of structures in the head
- Carries branchial efferent fibers to innervate numerous muscles in the head
- Exits the cranial cavity through the internal acoustic meatus and the skull through the stylomastoid foramen
- Additional smaller branches leave by other pathways

Cranial nerves VIII & IX

Vestibulocochlear nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Vestibulocochlear nerve [VIII]	SA		Internal acoustic meatus	Vestibular division — balance Cochlear division — hearing

SA, special afferent.

- Carries special afferent fibers for hearing and balance
- Exits the cranial cavity through the internal acoustic meatus and enters the inner ear

Glossopharyngeal nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Glossopharyngeal nerve [IX]	GVA, GSA, SA	GVE, BE	Jugular foramen	GVA—sensory from carotid body and sinus GSA—posterior one-third of tongue, palatine tonsils, oropharynx, and mucosa of middle ear and pharyngotympanic tube SA—taste from posterior one-third of tongue GVE—innervates parotid salivary gland BE—innervates stylopharyngeus muscle

GVA, general visceral afferent; *SA*, special afferent; *GVE*, general visceral efferent; *BE*, branchial efferent.

- Carries general visceral afferent fibers for sensory input from areas of the head and neck
- Carries special afferent fibers from part of tongue for taste
- Carries general visceral efferent fibers for parasympathetic innervation of structures in the head
- Carries branchial efferent fibers to innervate one pharyngeal muscle
- Exits the cranial cavity through the jugular foramen

Cranial nerves X-XII

Vagus nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Vagus nerve [X]	GSA, GVA, SA	GVE, BE	Jugular foramen	GSA—sensory from larynx, laryngopharynx, deeper parts of auricle, part of external acoustic meatus, and dura in posterior cranial fossa GVA—sensory from aortic body chemoreceptors and aortic arch baroreceptors, esophagus, bronchi, lungs, heart, and abdominal viscera of the foregut and midgut SA—taste from the epiglottis and pharynx GVE—innervates smooth muscle and glands in the pharynx, larynx, thoracic viscera, and abdominal viscera of the foregut and midgut BE—innervates one tongue muscle (palatoglossus), muscles of soft palate (except tensor veli palatini), pharynx (except stylopharyngeus), and larynx

GVA, general visceral afferent; *SA*, special afferent; *GVE*, general visceral efferent; *BE*, branchial efferent.

- Carries general somatic afferent fibers for sensory input from some of the ear and surrounding area and the dura in the posterior cranial fossa
- Carries general visceral afferent fibers for sensory input from the pharynx, larynx, neck, and organs throughout the thorax, foregut, and midgut
- Carries special afferent fibers for taste around the epiglottis
- Carries general visceral efferent fibers for parasympathetic innervation of structures in the pharynx, larynx, thorax, foregut, and midgut
- Carries branchial efferent fibers to innervate muscles associated with the tongue, soft palate, pharynx, and larynx
- Exits the cranial cavity through the jugular foramen

Accessory nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Accessory nerve [XI]		BE	Jugular foramen	Innervates sternocleidomastoid and trapezius muscles

BE, branchial efferent.

- Carries branchial efferent fibers to innervate a muscle of the neck and a muscle of the upper back
- Roots arise from the upper five segments of the cervical spinal cord
- Fibers enter the cranial cavity through the foramen magnum
- Fibers exit the cranial cavity through the jugular foramen

Hypoglossal nerve

Nerve	Components		Exit from skull	Function
	Afferent	Efferent		
Hypoglossal nerve [XII]		GSE	Hypoglossal canal	Innervates hyoglossus, genioglossus, and styloglossus muscles and all intrinsic muscles of the tongue

GSE, general somatic efferent.

- Carries general somatic efferent fibers to innervate all intrinsic muscles of the tongue and all but one extrinsic muscle
- Exits the cranial cavity through the hypoglossal canal

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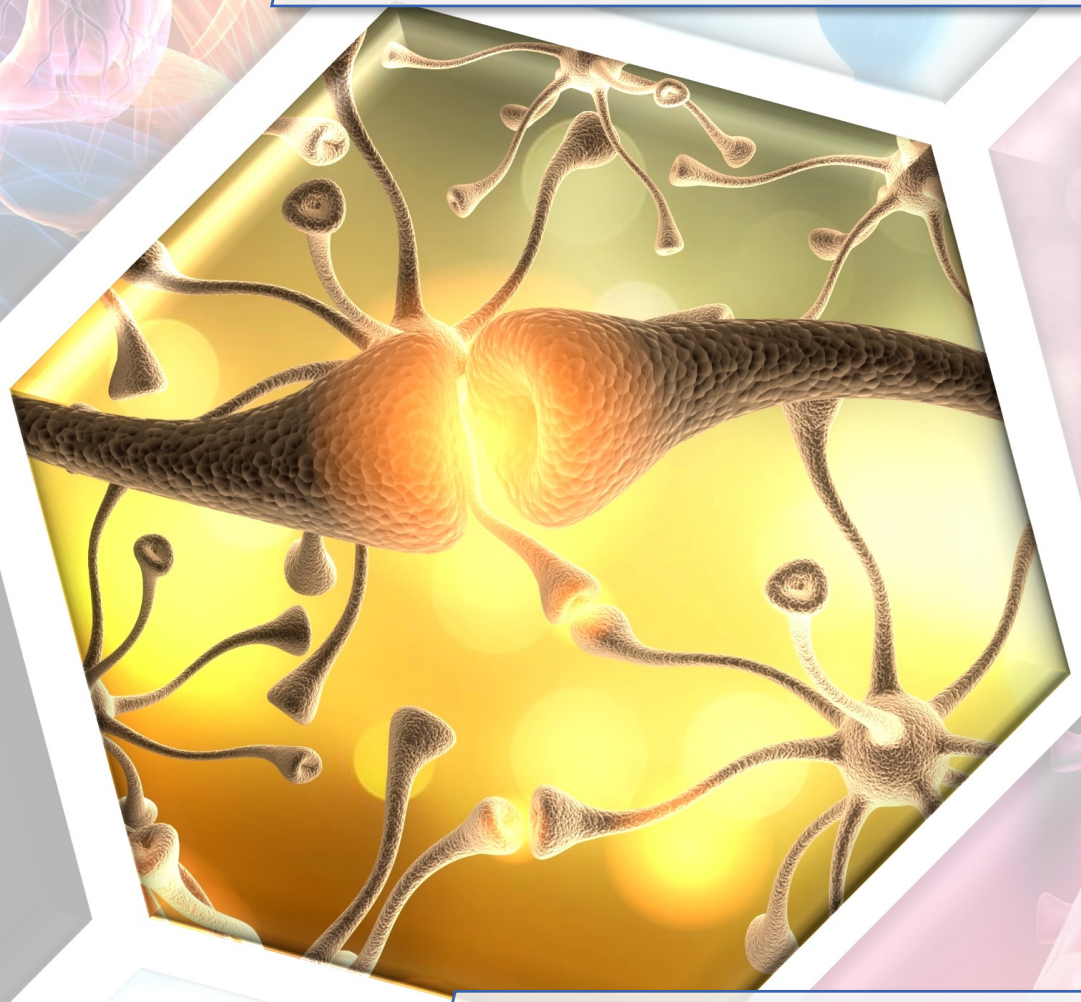
Any questions, please email..



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