

BASICS OF NEUROBIOLOGY

DIENCEPHALON

ZSOLT LIPOSITS

Basics of Neurobiology: Diencephalon

FEATURES OF THE DIENCEPHALON

THE DIENCEPHALON IS IN THE ROSTRAL CONTINUATION OF THE BRAIN STEM. WITH THE EXCEPTION OF ITS VENTRAL PART, IT IS COVERED BY TELENCEPHALIC STRUCTURES

IT DEVELOPS FROM THE PROSENCEPHALIC VESICLE, ITS CAVITY IS THE THIRD CEREBRAL VENTRICLE

THE MAJOR CONSTITUENTS OF THE DIENCEPHALON INCLUDE THE THALAMUS, HYPOTHALAMUS, METATHALAMUS, EPITHALAMUS AND SUBTHALAMUS

THE THALAMUS AND THE BASAL TELENCEPHALIC NUCLEAR COMPLEX FORM A CLINICALLY IMPORTANT PASSAGEWAY FOR PROJECTING FIBERS, THE INTERNAL CAPSULE

THALAMIC STRUCTURES ARE IN RECIPROCAL CONNECTION WITH THE CEREBRAL CORTEX, COMMUNICATE WITH MAJOR MOTOR AND SENSORY SYSTEMS AND THEY ARE LINKED WITH THE LIMBIC SYSTEM

THE HYPOTHALAMUS CONTROLS AUTONOMIC CENTERS AND VIA THE PITUITARY IT ORCHESTRATES THE PERFORMANCE OF THE ENDOCRINE SYSTEM. IT SECRETS A WIDE SCALE OF HORMONES INTO THE SYSTEMIC AND PORTAL CIRCULATIONS

DIENCEPHALON

THALAMUS

HYPOTHALAMUS

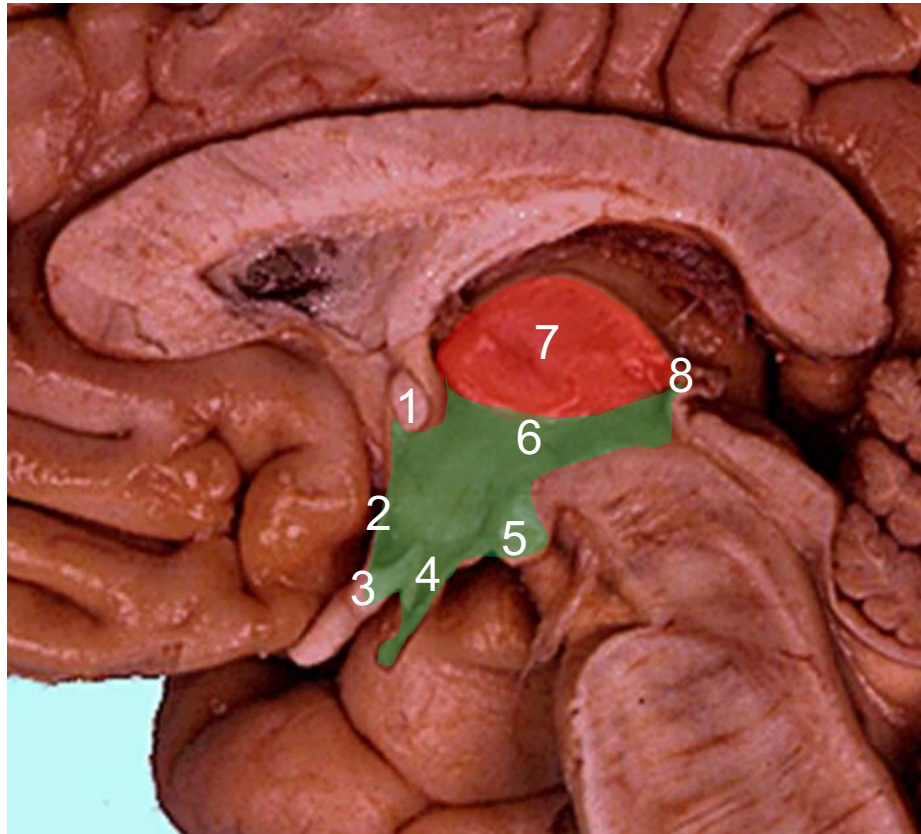
EPITHALAMUS

METATHALAMUS

SUBTHALAMUS

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PARCELLATION OF THE DIENCEPHALON

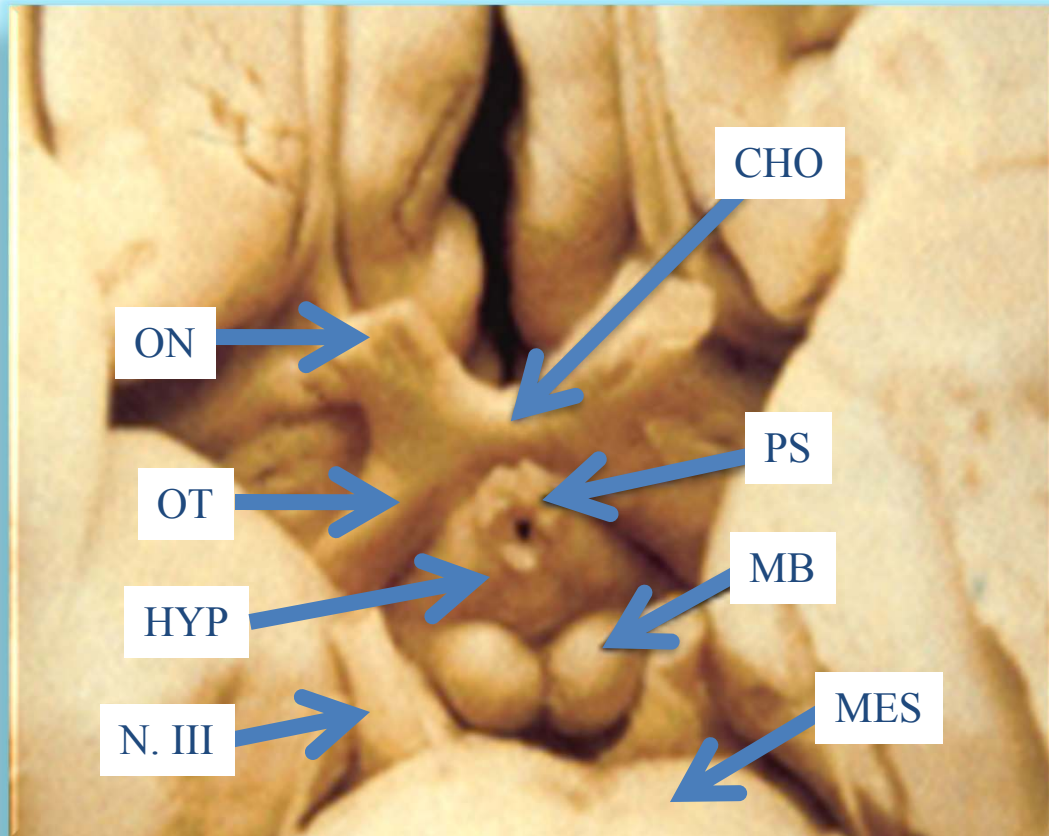


1. COMMISSURA ANTERIOR
2. LAMINA TERMINALIS
3. CHIASMA OPTICUM
4. INFUNDIBULUM
5. CORPUS MAMILLARE
6. SULCUS HYPOTHALAMICUS
7. THALAMUS
8. EPITHALAMUS

THE PICTURE DEPICTS THE DIENCEPHALON IN THE MID-SAGITTAL PLANE. THE THALAMUS IS HIGHLIGHTED IN RED, THE HYPOTHALAMUS IN GREEN COLOR

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VIEW OF THE DIENCEPHALON ON THE VENTRAL SURFACE OF THE BRAIN



CHO: OPTIC CHIASM

HYP: HYPOTHALAMUS

MES: MESENCEPHALON

MB: MAMILLARY BODY

N. III: OCULOMOTOR NERVE

ON: OPTIC NERVE

OT: OPTIC TRACT

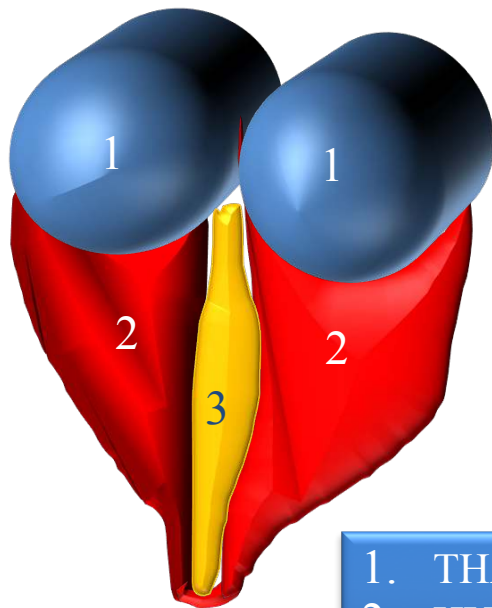
PS: PITUITARY STALK

FROM THE DIENCEPHALON ONLY THE HYPOTHALAMUS IS VISIBLE ON THE VENTRAL SURFACE OF THE BRAIN BEHIND THE OPTIC CHIASM

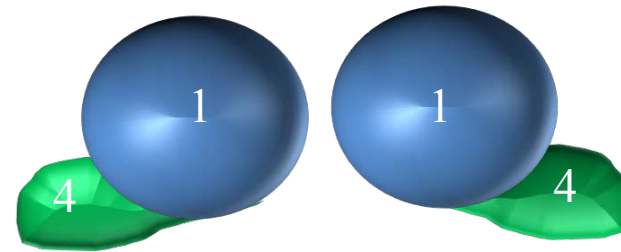
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SCHEMATIC DEMONSTRATION OF THE MAIN DIENCEPHALIC UNITS

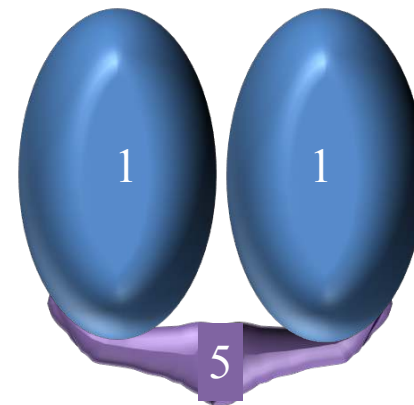
CORONAL SEGMENT



POSTERIOR VIEW



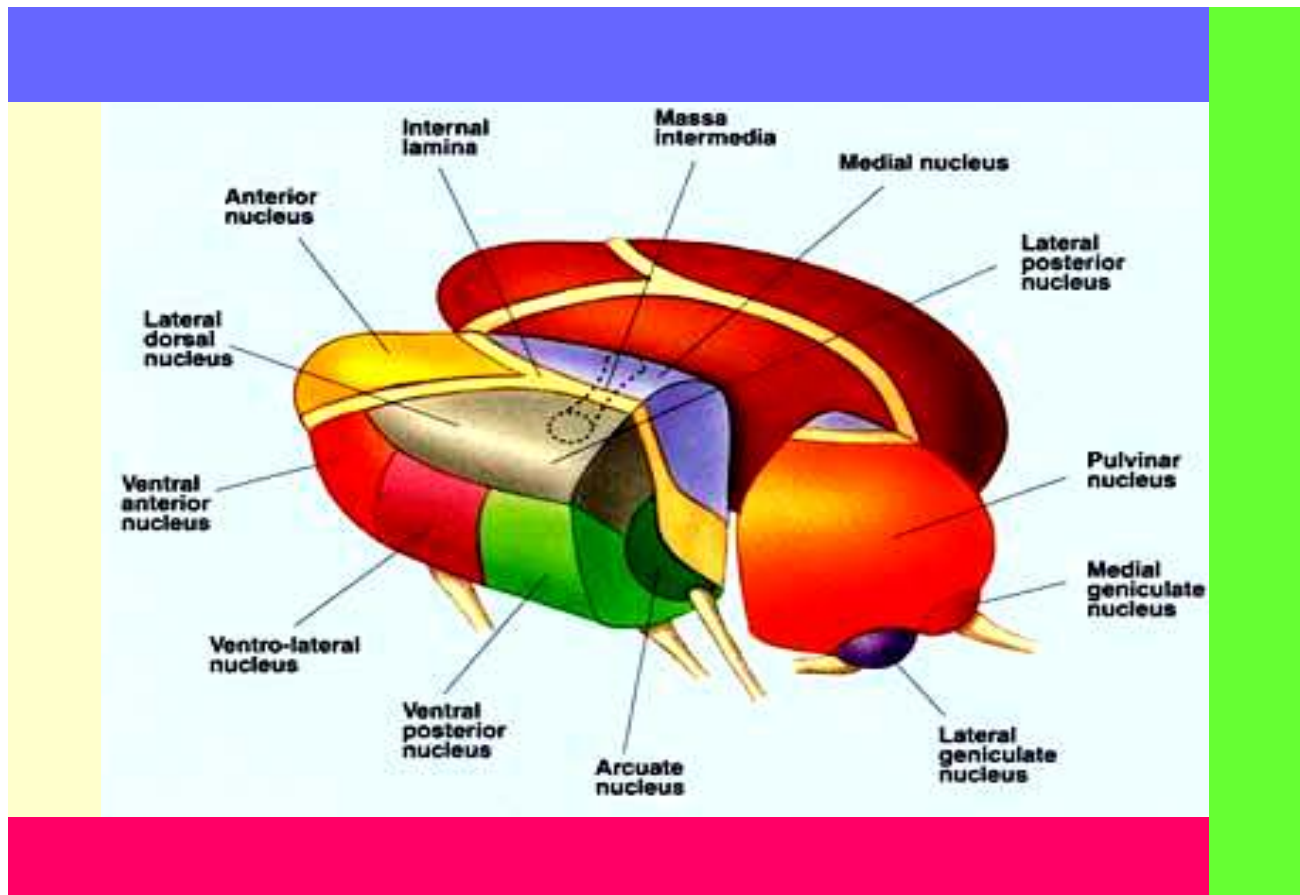
UPPER VIEW



1. THALAMUS
2. HYPOTHALAMUS
3. III. VENTRICLE
4. METATHALAMUS
5. EPITHALAMUS

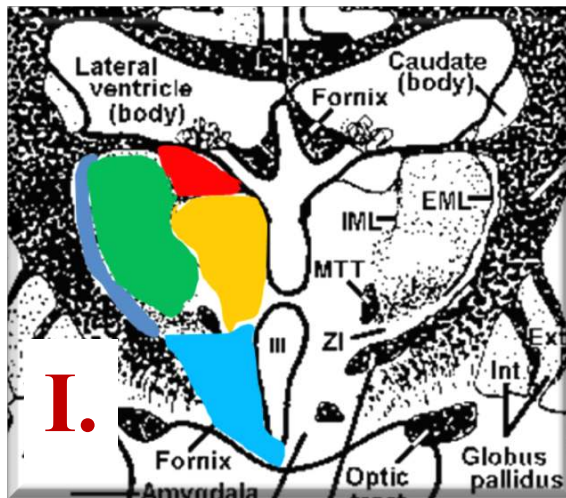
THALAMUS

THALAMIC NUCLEI

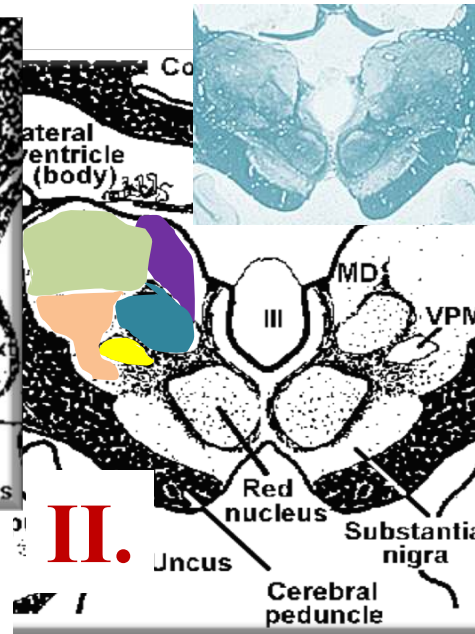


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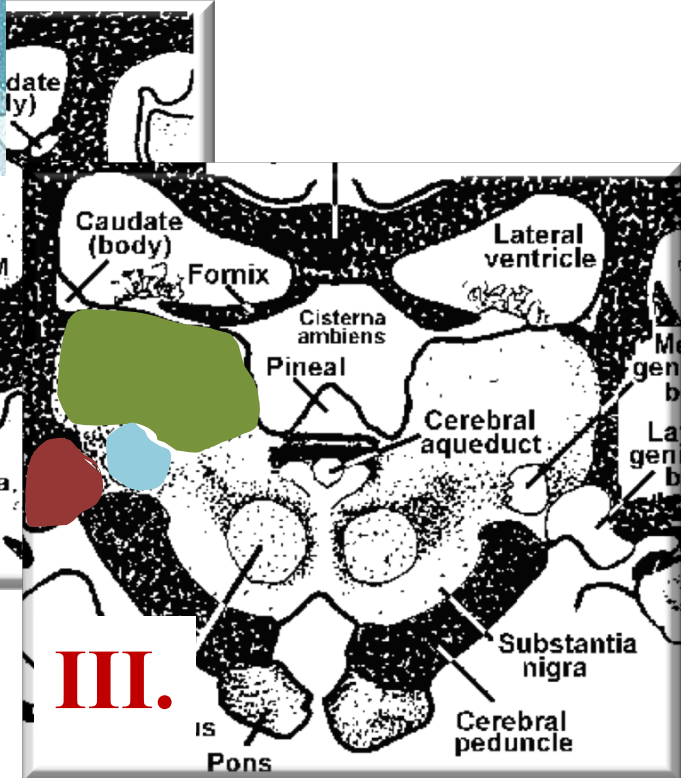
DEMONSTRATION OF THE DIENCEPHALON IN CROSS SECTIONS (I-III)



RETICULAR NUCLEUS
ANTERIOR NUCLEUS
VENTRALIS ANTERIOR NUC.
MEDIODORSAL NUCLEUS
HYPOTHALAMUS



LATERALIS POSTERIOR
VENTRALIS POSTEROLATERALIS
VENTRALIS POSTEROMEDIALIS
MEDIODORSAL NUCLEUS
CENTRUM MEDIANUM



PULVINAR
MEDIAL GENICULATE BODY
LATERAL GENICULATE BODY

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DIFFERENT CELL GROUPS OF THE THALAMUS

ANTERIOR NUCLEAR GROUP

anterodorsal nucleus
anteromedial nucleus
anteroventral nucleus

MIDLINE NUCLEAR GROUP

paratenial nucleus
paraventricular nucleus of thalamus
reuniens nucleus
rhomboidal nucleus
subfascicular nucleus

MEDIAL DORSAL NUCLEUS

paralaminar part of medial dorsal nucleus
magnocellular part of medial dorsal nucleus
parvicellular part of medial dorsal nucleus
densocellular part of medial dorsal nucleus

INTRALAMINAR NUCLEAR GROUP

ROSTRAL INTRALAMINAR NUCLEI

central dorsal nucleus
central lateral nucleus
central medial nucleus
paracentral nucleus
centromedian nucleus
parafascicular nucleus

LATERAL NUCLEAR GROUP

lateral dorsal nucleus
lateral posterior nucleus

PULVINAR

oral pulvinar nucleus
lateral pulvinar nucleus
medial pulvinar nucleus
inferior pulvinar nucleus

VENTRAL NUCLEAR GROUP

VENTRAL ANTERIOR NUCLEUS

parvicellular part of ventral anterior nucleus
magnocellular part of ventral anterior nucleus

VENTRAL LATERAL NUCLEUS

oral part of ventral lateral nucleus
caudal part of ventral lateral nucleus
medial part of ventral lateral nucleus
pars postrema of ventral lateral nucleus
area X

VENTRAL POSTERIOR NUCLEUS

VENTRAL POSTEROLATERAL NUCLEUS

oral part of ventral posterolateral nucleus
caudal part of ventral posterolateral nucleus

VENTRAL POSTEROMEDIAL NUCLEUS

principal part of ventral posteromedial nucleus
parvicellular part of ventral posteromedial nucleus
ventral posteroinferior nucleus

GENICULATE BODIES

LATERAL GENICULATE BODY

dorsal lateral geniculate nucleus
ventral lateral geniculate

MEDIAL GENICULATE BODY

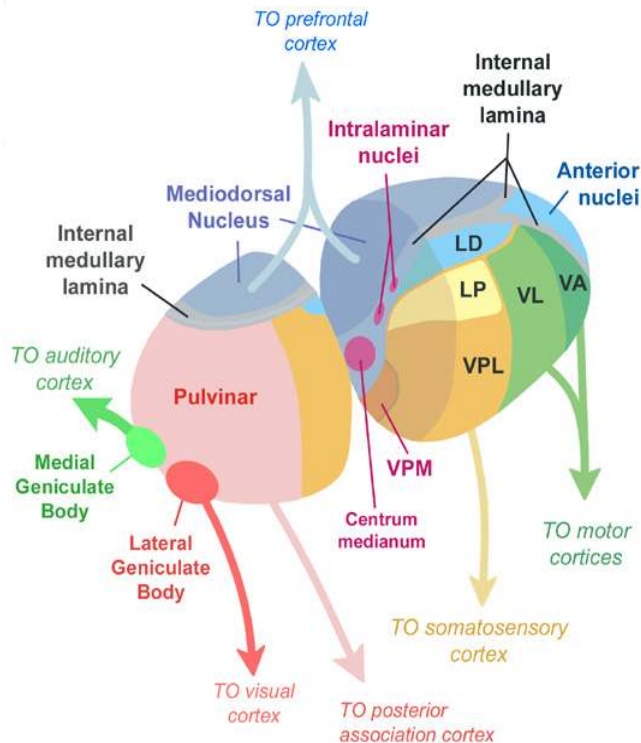
dorsal medial geniculate nucleus
ventral medial geniculate nucleus
magnocellular medial geniculate nucleus
capsule of medial geniculate nucleus

POSTERIOR NUCLEAR COMPLEX

limitans nucleus
posterior nucleus of thalamus
supragenulate nucleus
submedial nucleus
thalamic reticular nucleus

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CONNECTIONS OF THALAMIC NUCLEI

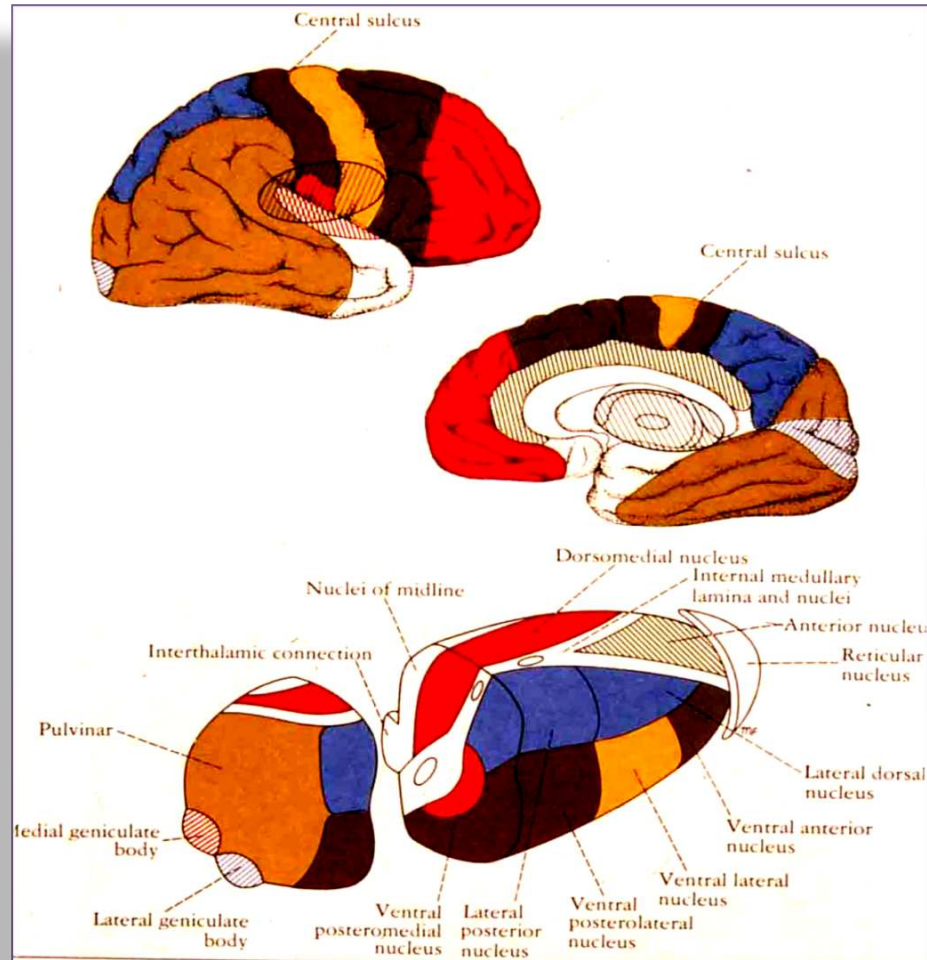


NUCLEUS	INPUT	OUTPUT
MEDIODORSAL	ENTORHINAL CORTEX, SPINOTHALAMIC TRACT	PREFRONTAL CORTEX
ANTERIOR	MAMILLARY BODY	CINGULATE CORTEX
VA, VL	DENTATE NUCLEUS GLOBUS PALLIDUS	PRECENTRAL GYRUS PREMOTOR AREA
VPL, VPM	SENSORY SYSTEMS (SPINAL, TRIGEMINAL)	PARIETAL LOBE, POSTCENTRAL GYRUS
CM	RETICULAR FORMATION	FRONTAL AND PARIETAL LOBES OF CEREBRAL CORTEX
LATERAL GENICULATE	SUPERIOR COLLICULUS	VISUAL CORTEX IN OCCIPITAL LOBE
MEDIAL GENICULATE	INFERIOR COLLICULUS	AUDITORY CORTEX IN TEMPORAL LOBE

THALAMIC FIBER TRACTS

external medullary lamina
internal medullary lamina
anterior thalamic peduncle
superior thalamic peduncle
inferior thalamic peduncle
posterior thalamic peduncle
mammillothalamic tract of thalamus
stratum zonale of thalamus

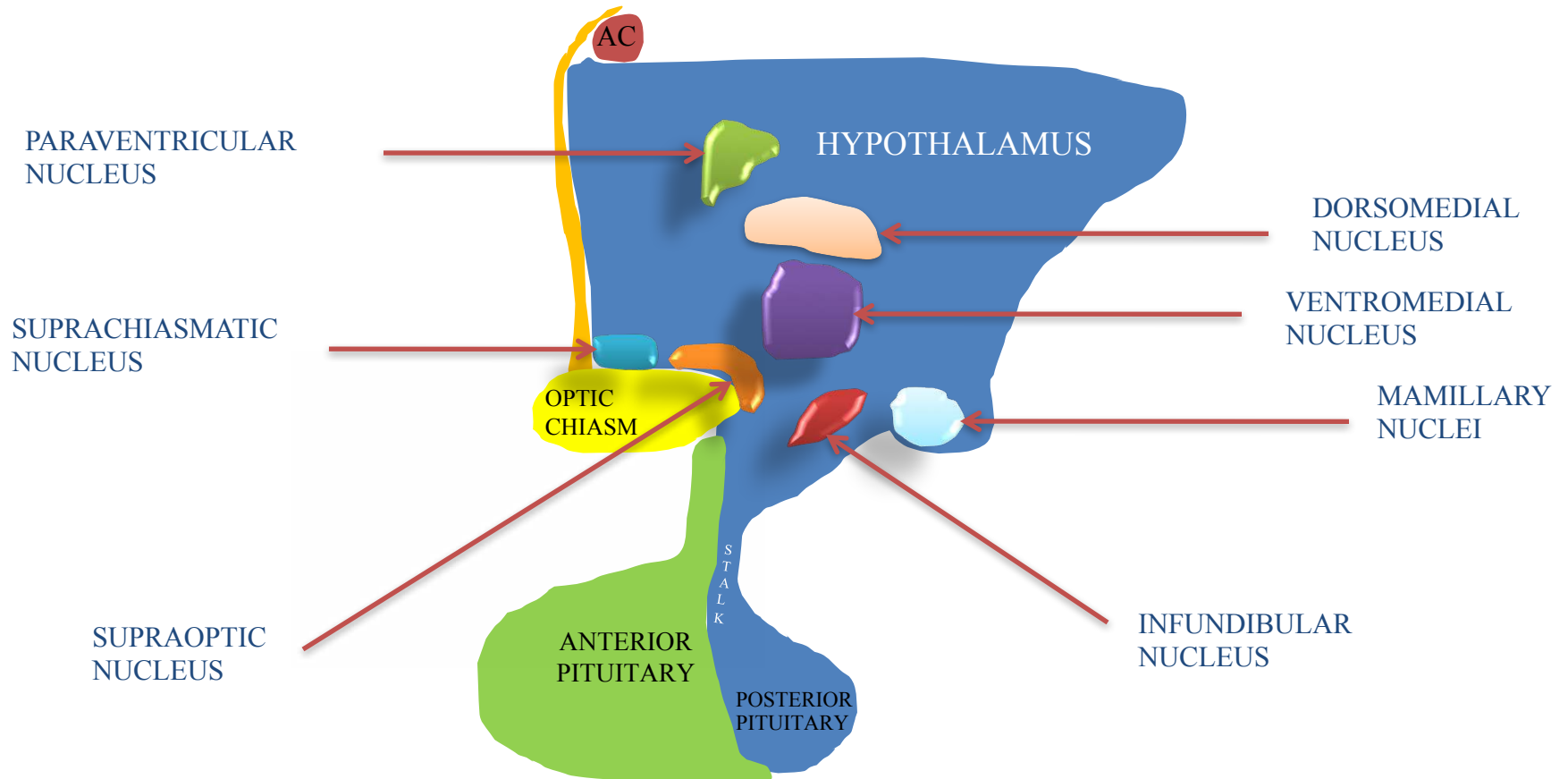
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HYPOTHALAMUS

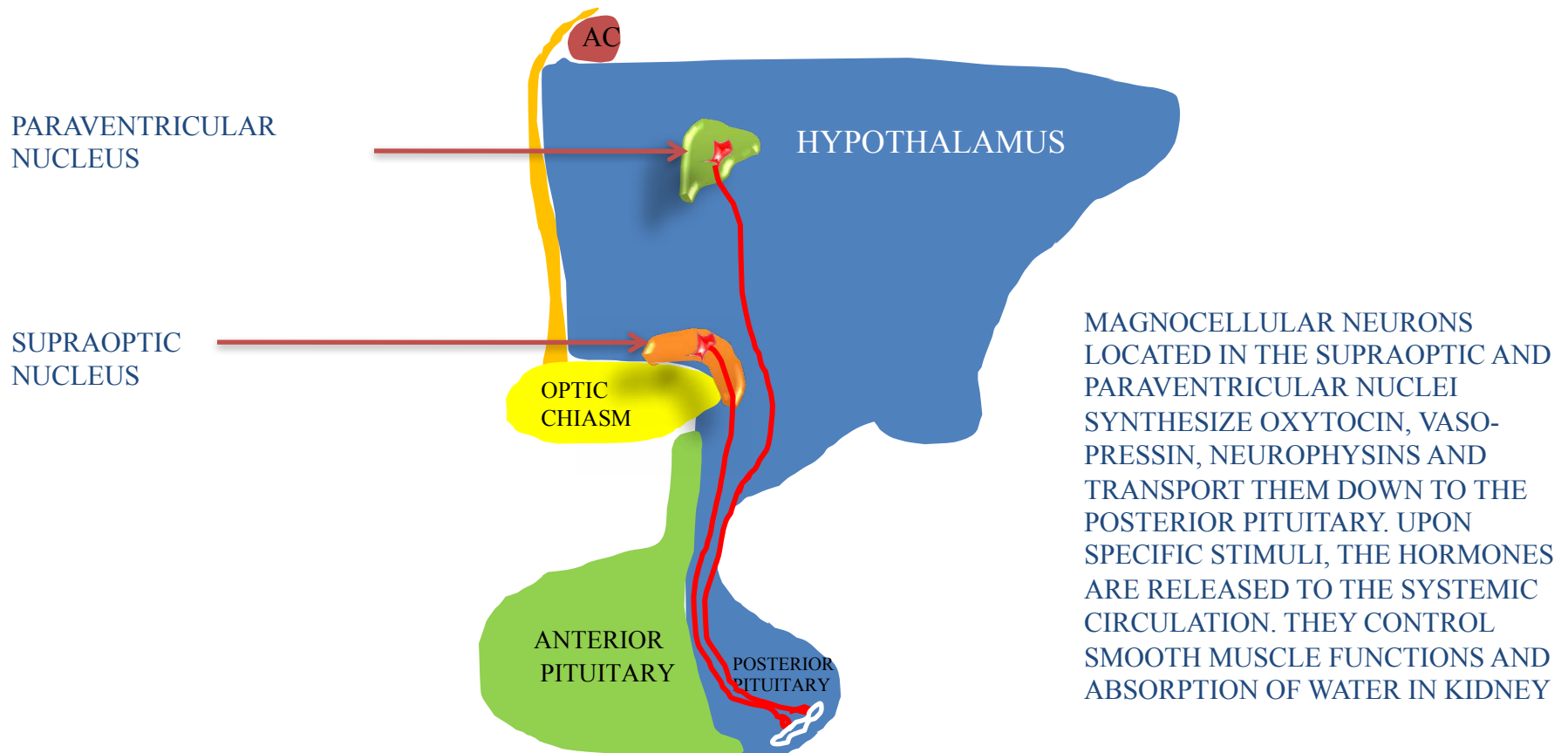
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SCHEME OF HYPOTHALAMIC NUCLEI IN MID-SAGITTAL SECTION



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DEMONSTRATION OF THE MAGNOCELLULAR NEUROSECRETORY SYSTEM



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ILLUSTRATION OF THE PARVICELLULAR NEUROSECRETORY SYSTEM

