

NEUROBIOLOGY OF SLEEP AND CONSCIOUSNESS

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SLEEP

Sleep is a dynamic process involving complex neural activation.

In 1929 the psychiatrist Hans Berger established that brain activity was different during wakefulness and sleep

Sleep Cycle



Purpose of Sleep

RESTORATIVE FUNCTIONS

GH - Tissue repair and
protein synthesis

ENERGY CONSERVATION

Decreased metabolism to
allocate limited energy
resources

IMMUNE FUNCTION REGULATION

Sleep enhances Immunity

ONTOGENETIC HYPOTHESIS

Brain maturation during
Infancy

MEMORY CONSOLIDATION

(Including naps)

SYNAPTIC HOMEOSTASIS

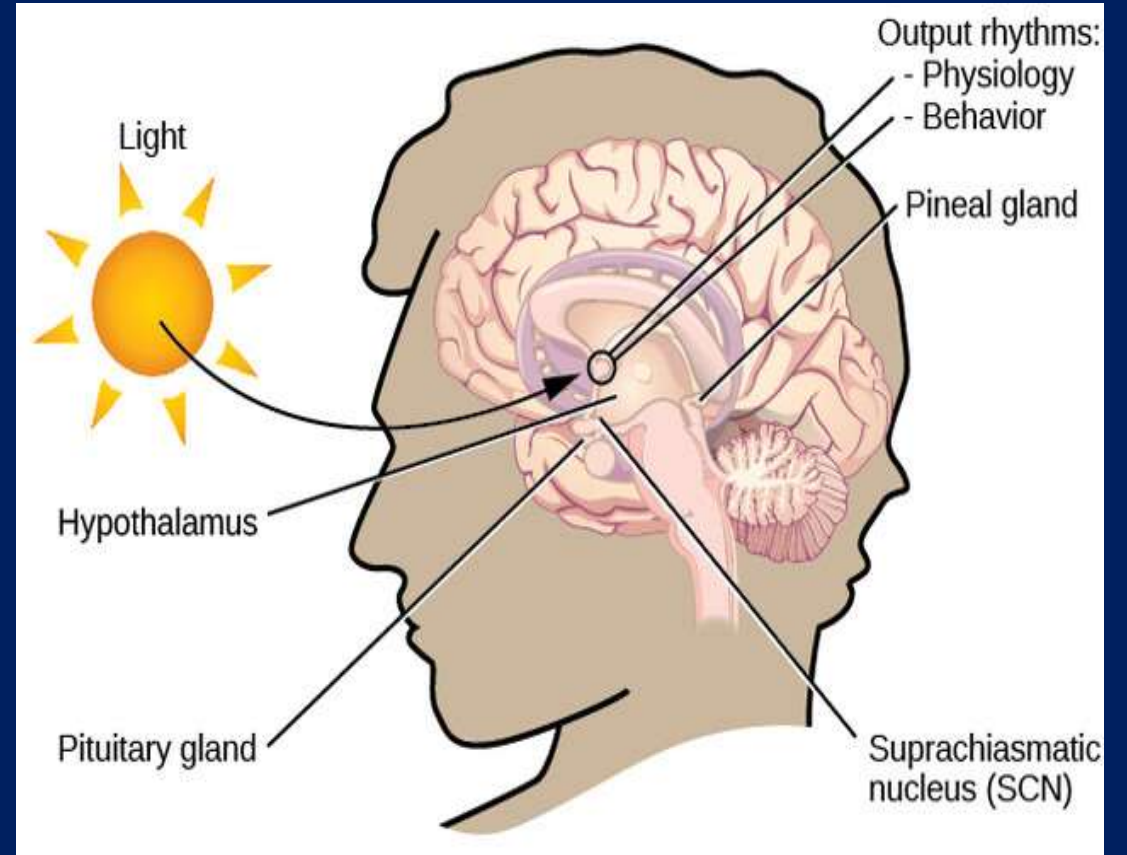
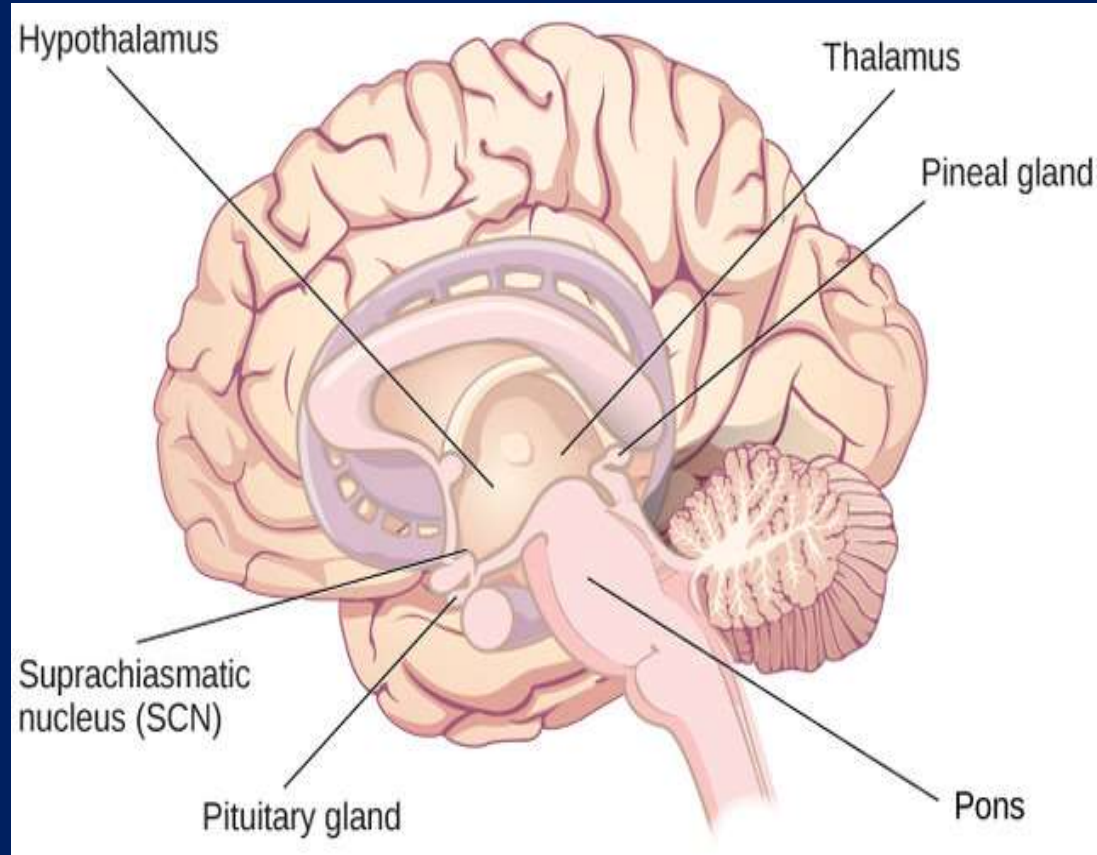
(Brain Plasticity)

GLYMPHATIC SLEEP SYSTEM

Neuro-anatomy of Sleep

- Hypothalamus
- Brain stem
- Thalamus
- Pineal gland
- Basal Forebrain
- Pineal gland

Neuro-anatomy of Sleep



Neuro- anatomy Sleep

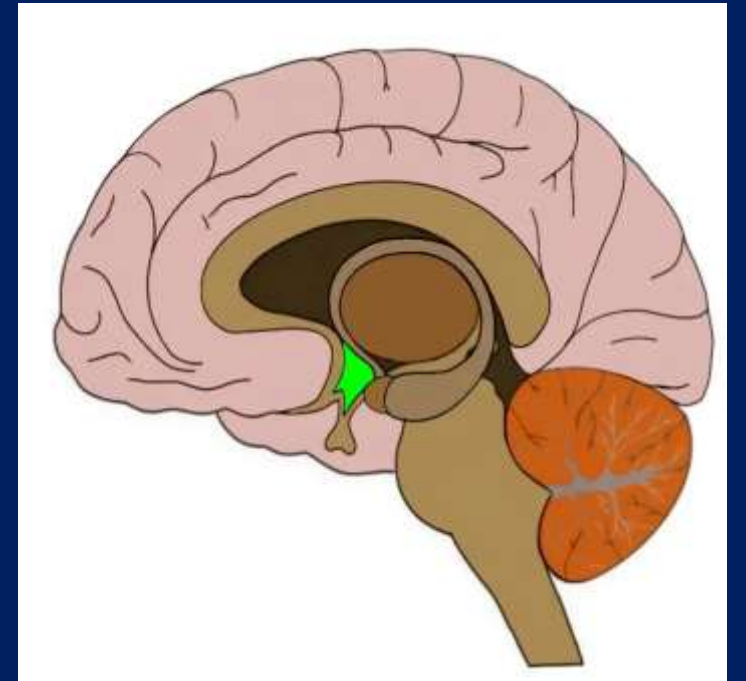
Hypothalamus

Control centers affecting sleep and arousal

Within the hypothalamus is the suprachiasmatic nucleus (SCN)

Brain Stem

The brain stem communicates with the hypothalamus to control the transitions between wake and sleep

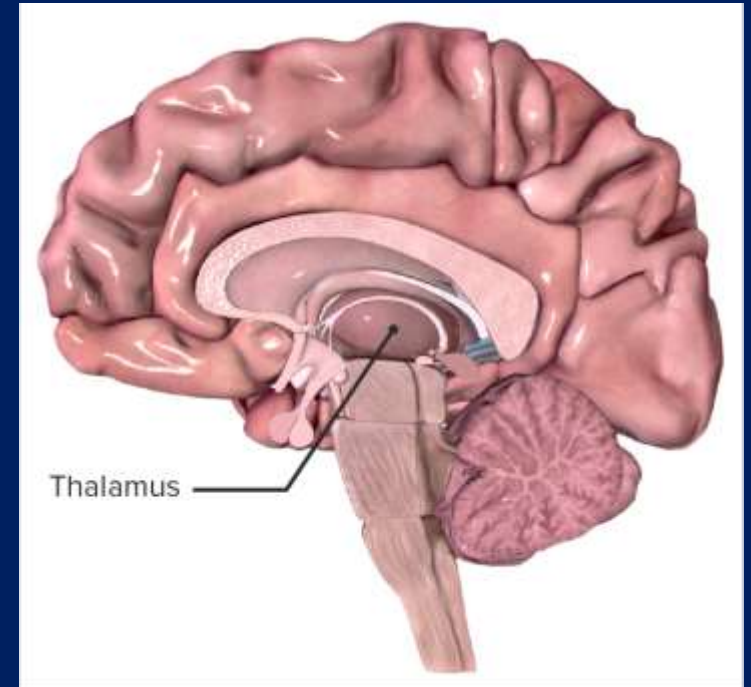


Neuro-anatomy

Thalamus

The thalamus becomes quiet, letting you tune out the external world.

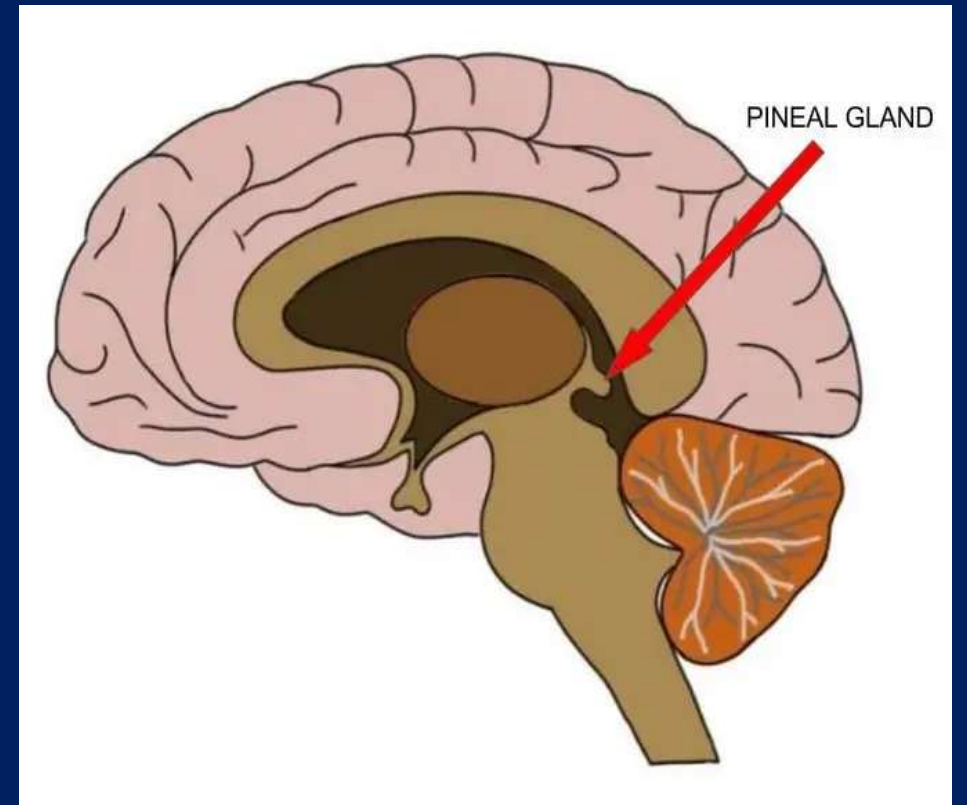
But during REM sleep, the thalamus is active, sending the cortex images, sounds, and other sensations that fill our dreams.



Neuro-anatomy

Pineal Gland

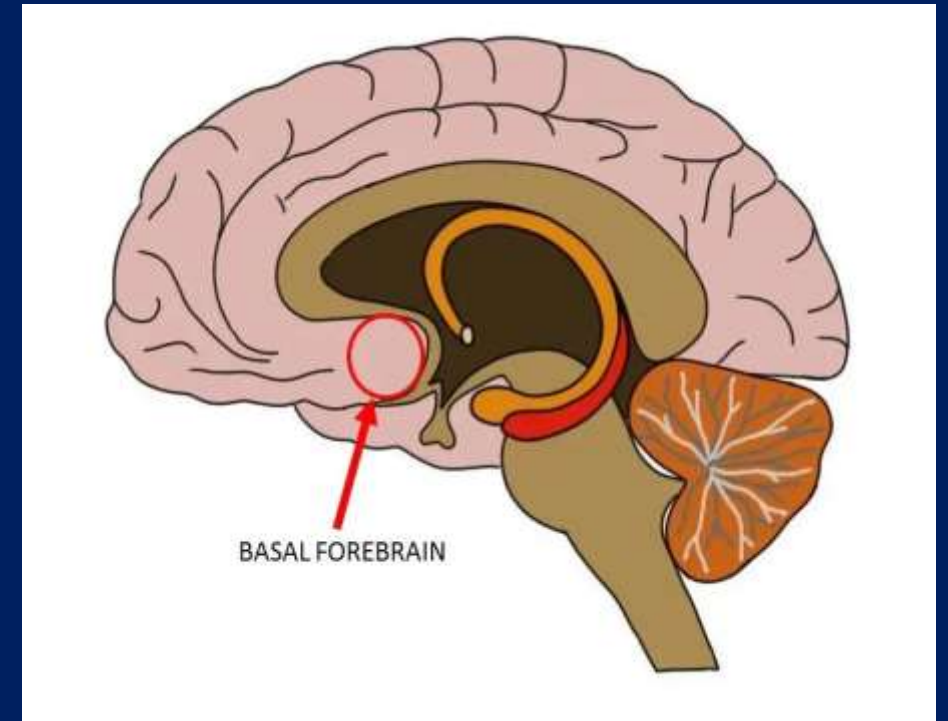
The pineal gland, located within the brain's two hemispheres, receives signals from the SCN and increases production of the Neuro-hormone



Neuro-anatomy

Basal-Forebrain

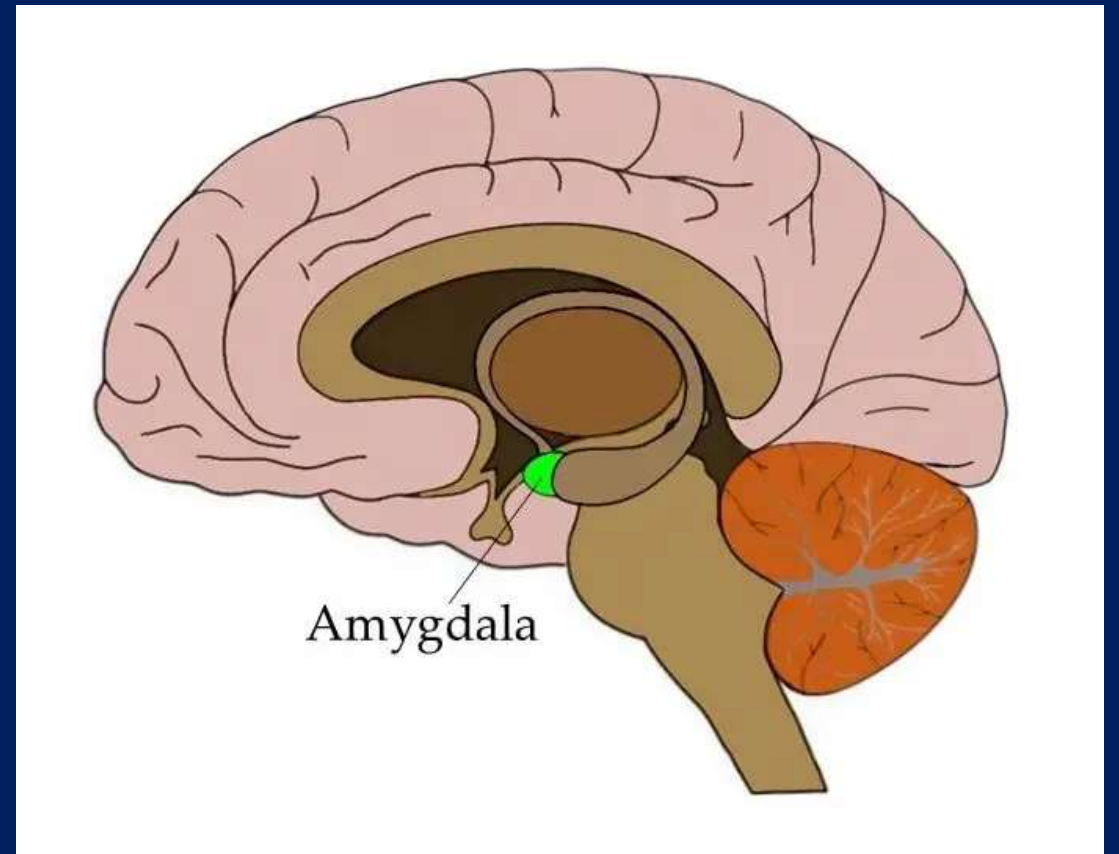
It promotes sleep and wakefulness, while part of the midbrain acts as an arousal system.



Neuro-anatomy

Amygdala

Active during Dream sleep



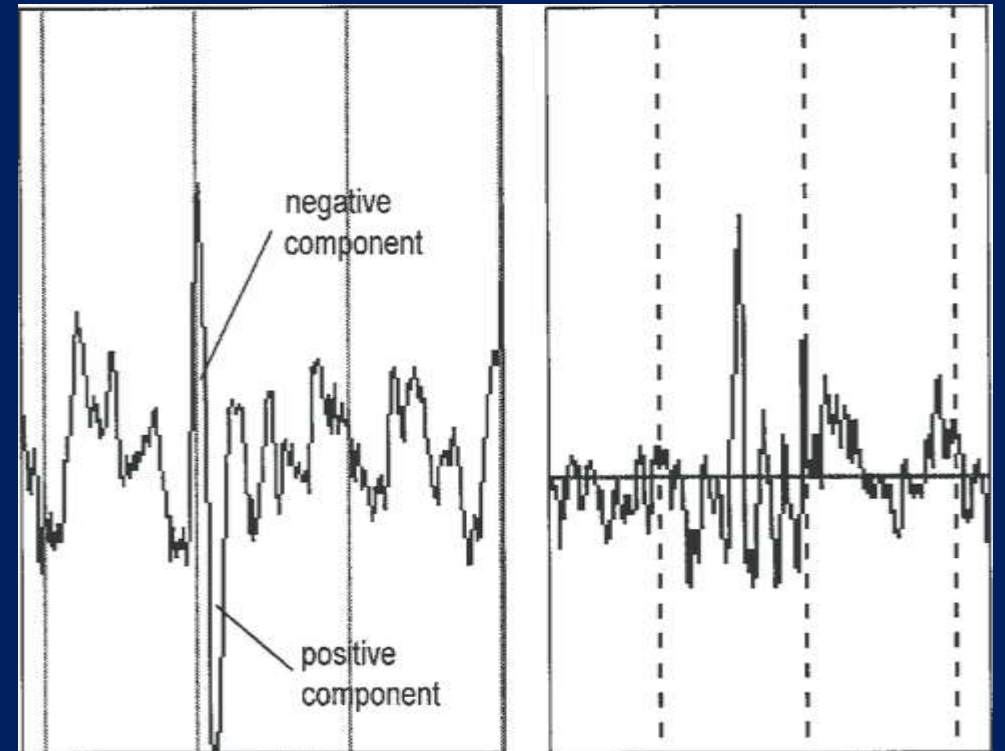
Neuro-physiology of Sleep

N1 sleep

Sharp vertex waves

Vertex waves, which are bilateral phase reversing discharges over the central regions.

They can come alone or in runs of varying amplitude and morphology



Neuro-physiology of Sleep

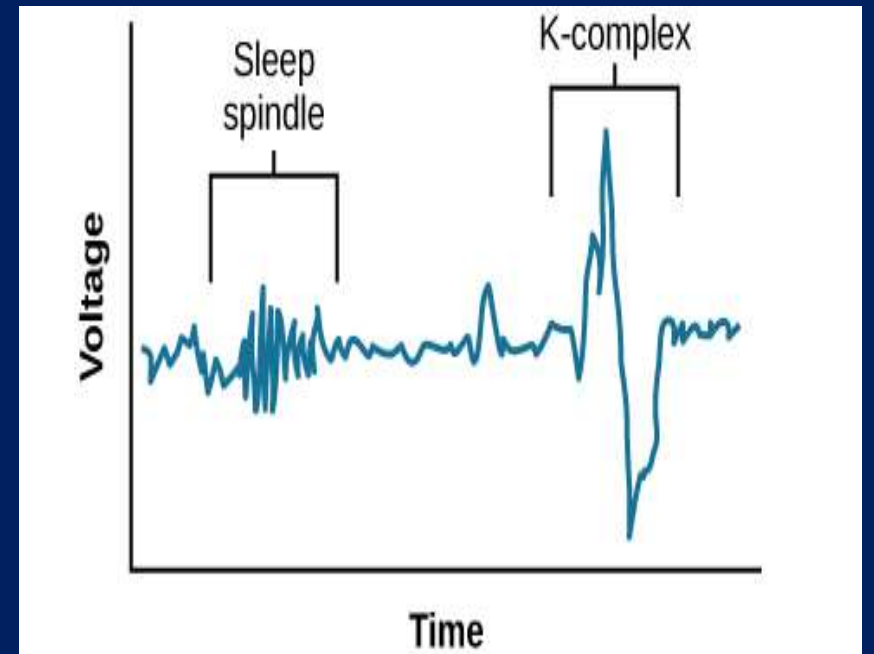
N2 sleep

Sleep spindles

Periodical oscillations of Thalamo-cortical Neurons

K-complexes

The K-complex (KC) is a sharp, well-delineated, high-voltage, biphasic wave that lasts for more than 0.5 seconds.



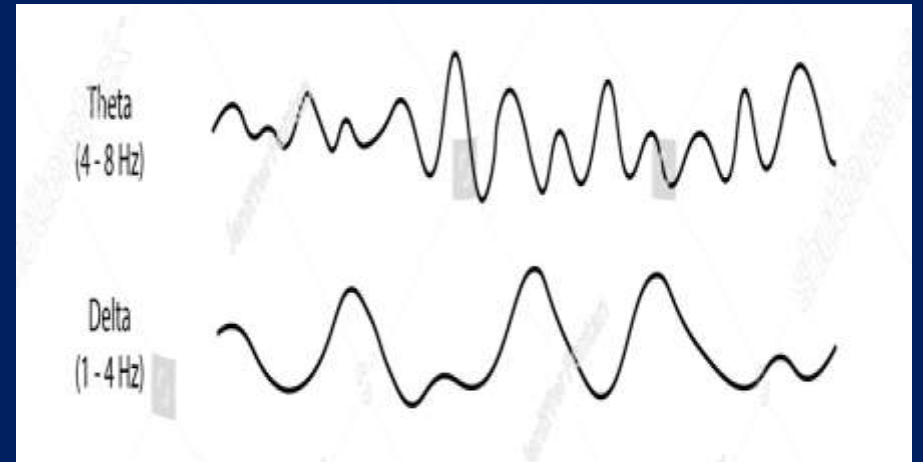
Neuro-physiology of Sleep

N3 sleep

Theta and Delta waves

Theta is believed to reflect activity from the limbic system and hippocampal regions.

Delta is an indicator of Low level of arousals and deeply relaxed states.



Neurochemistry of Sleep

Wake promoting Neuro-transmitters

NREM SLEEP

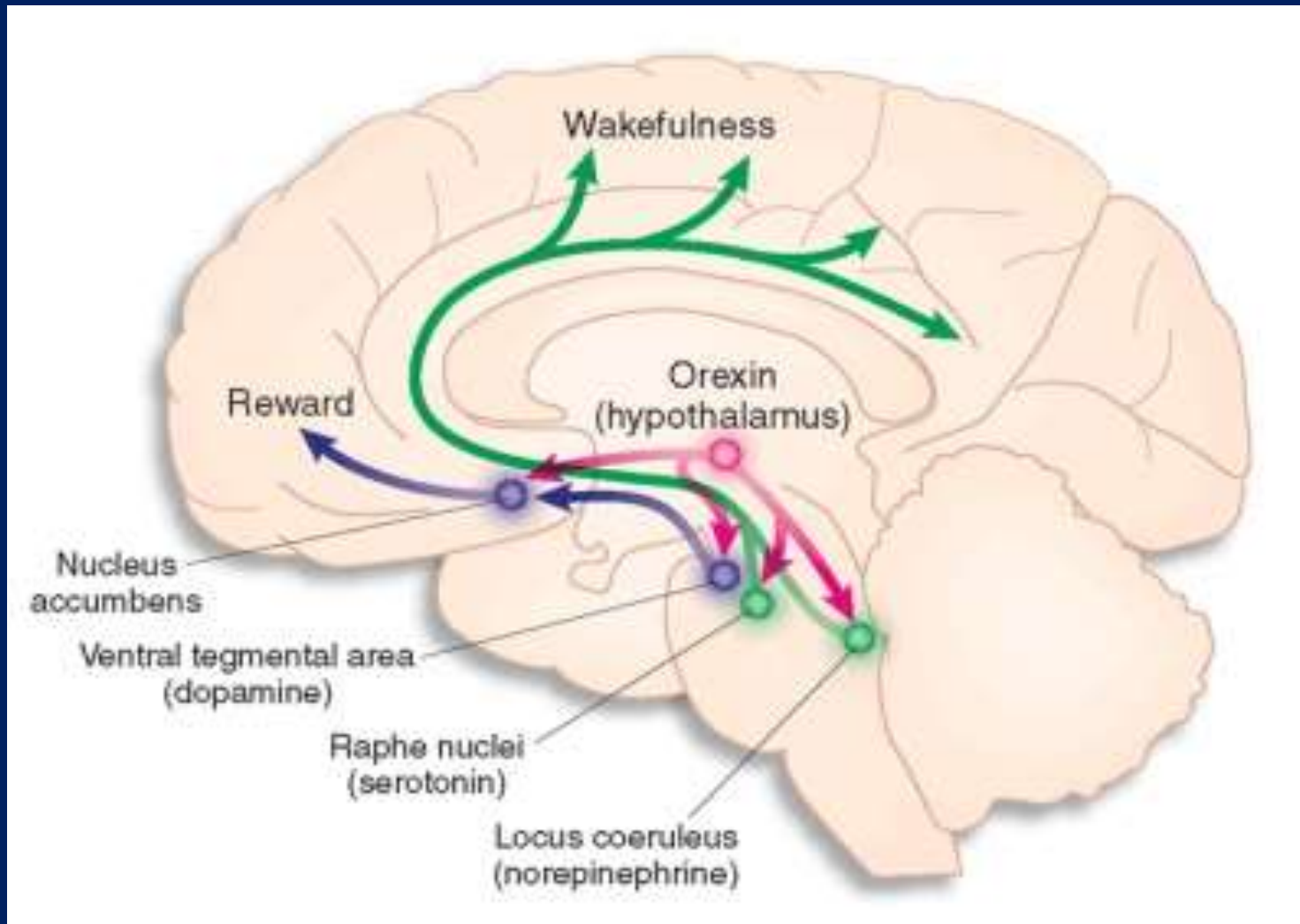
- GABA
- Galanin
- Adenosin
- Melatonin



REM SLEEP

- Acetylcholine
- Glutamate
- GABA
- Glycine

Neurochemistry of Sleep



Neurobiology of Consciousness

Consciousness

One capable of sensing and responding to its world (Armstrong, 1981)

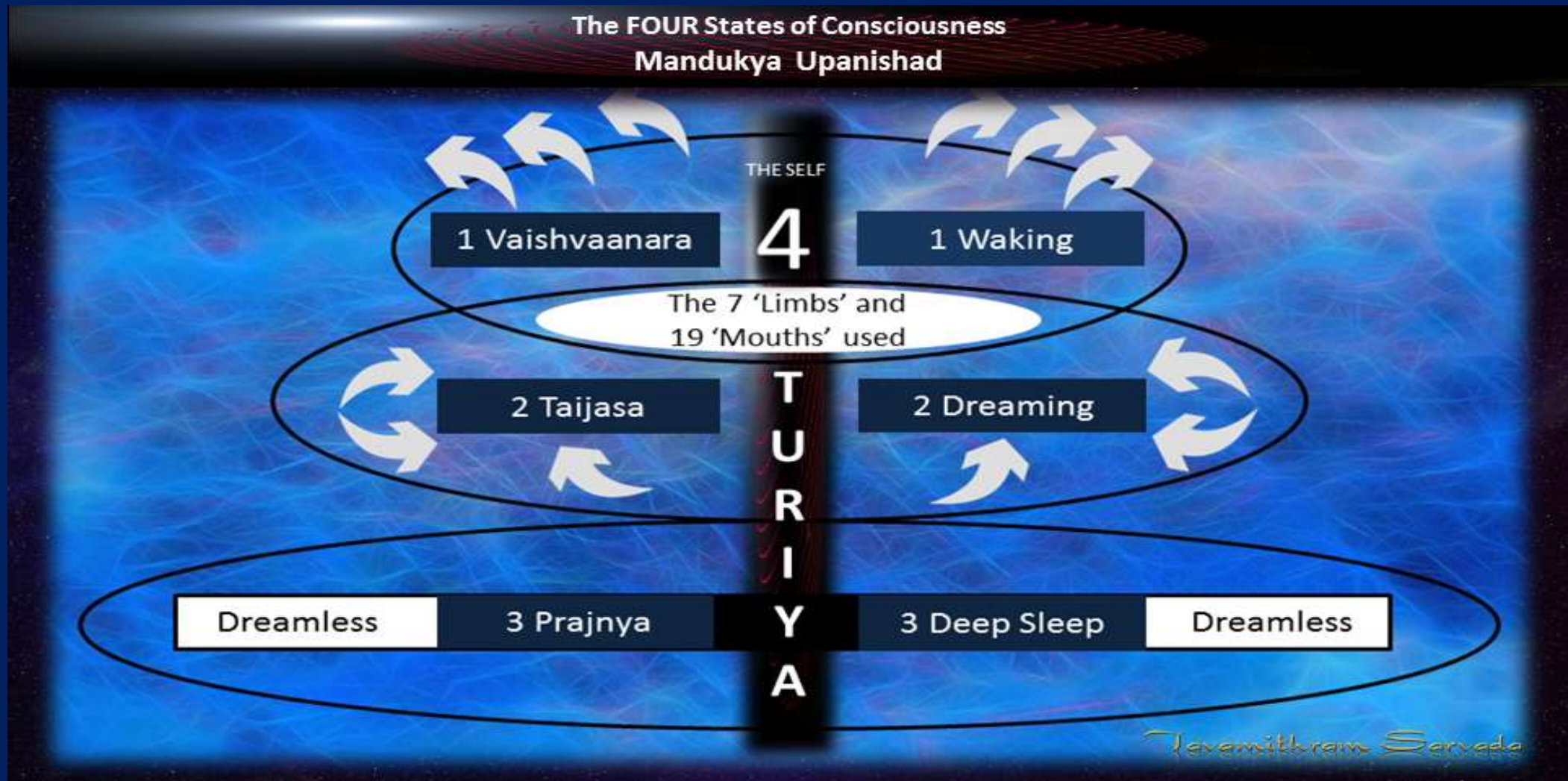
Normal human consciousness requires brainstem, basal forebrain, and diencephalic areas to support generalized arousal, as well as functioning thalamocortical networks to become aware of, and respond to environmental and internal stimuli.

Neurobiology of Consciousness

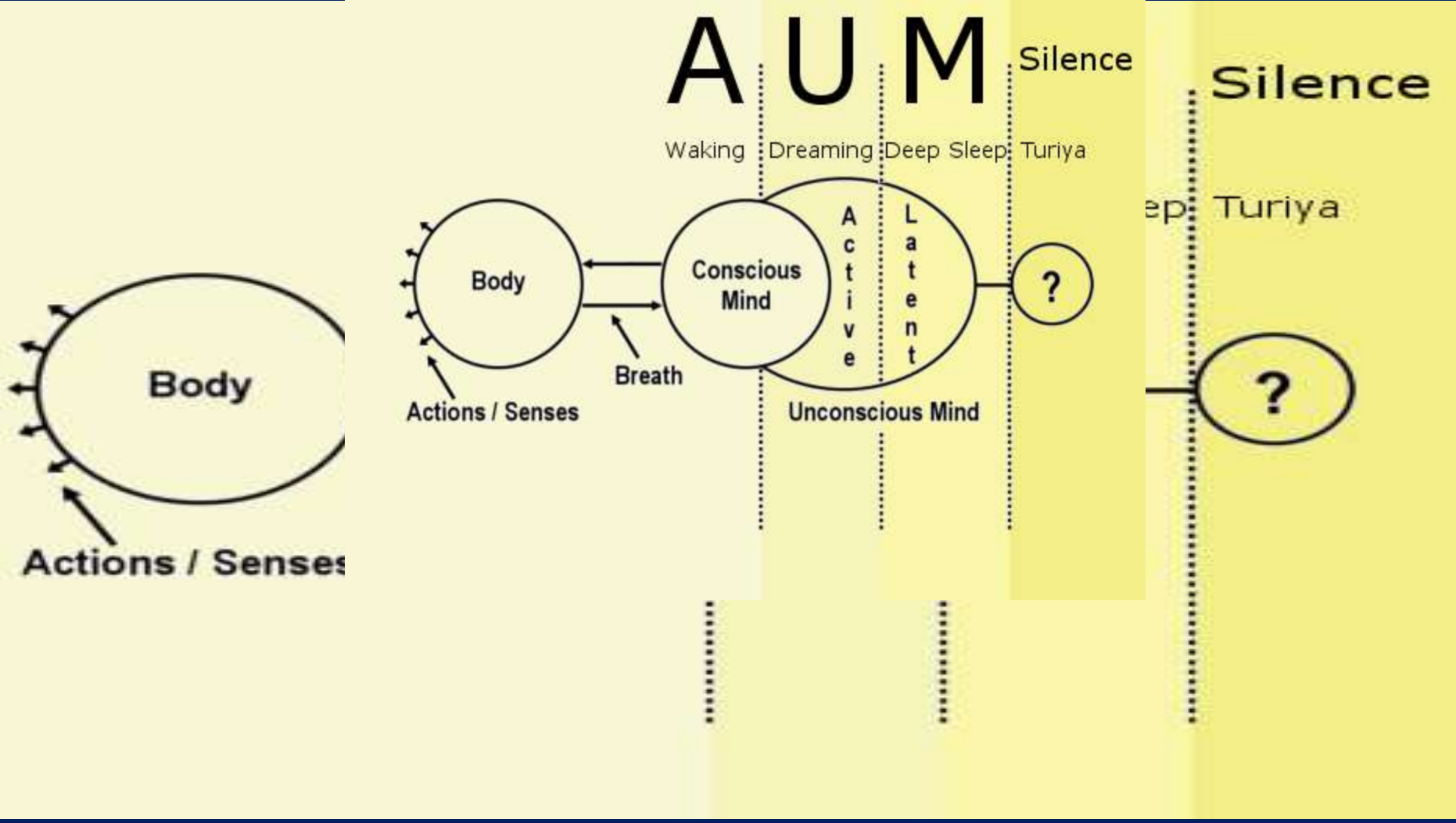
Consciousness

Injury to or disconnection of these interconnected systems, typically from cardiac arrest and traumatic brain injury, can result in disorders of consciousness, including coma.

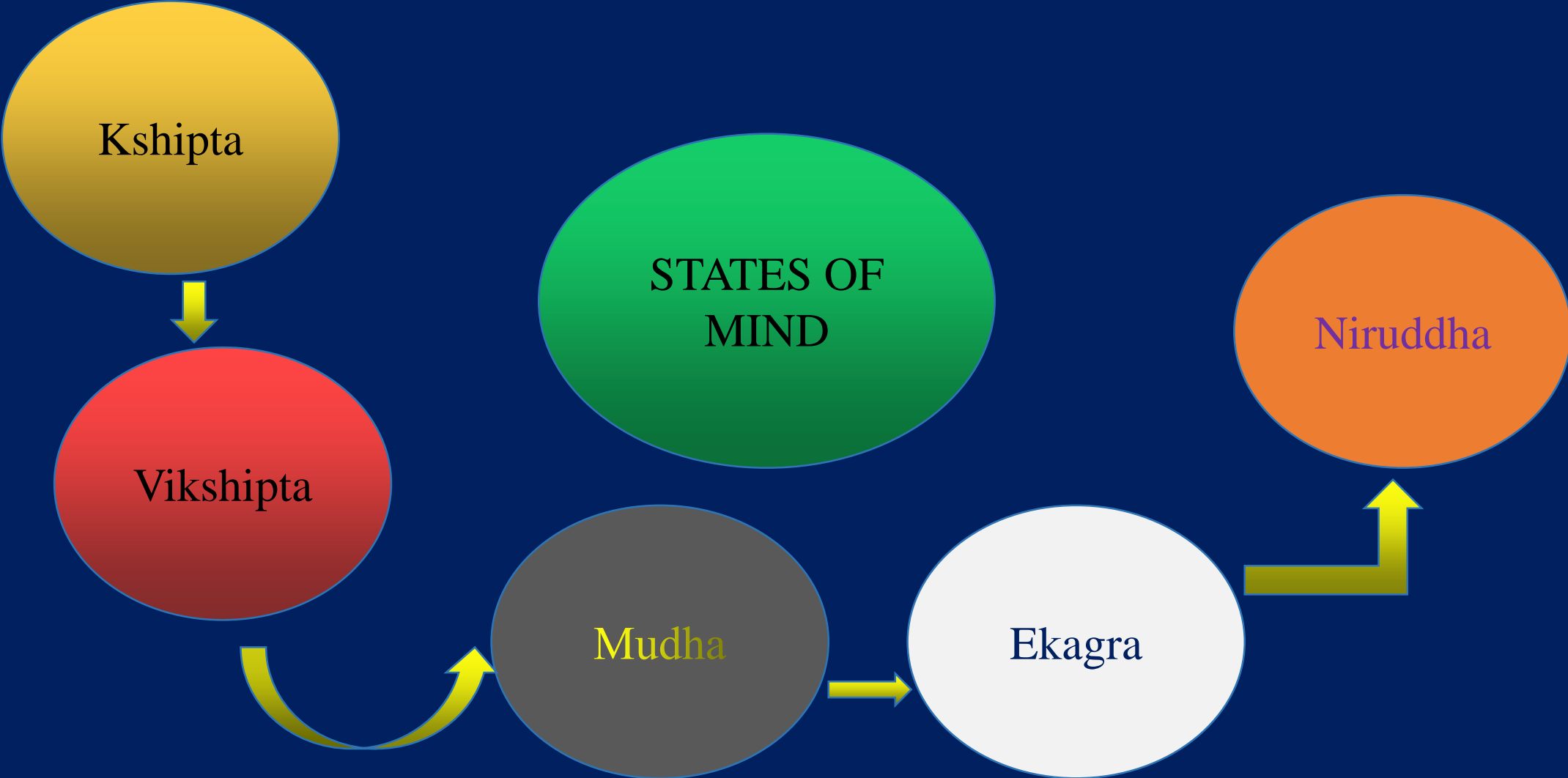
Neurobiology of Consciousness



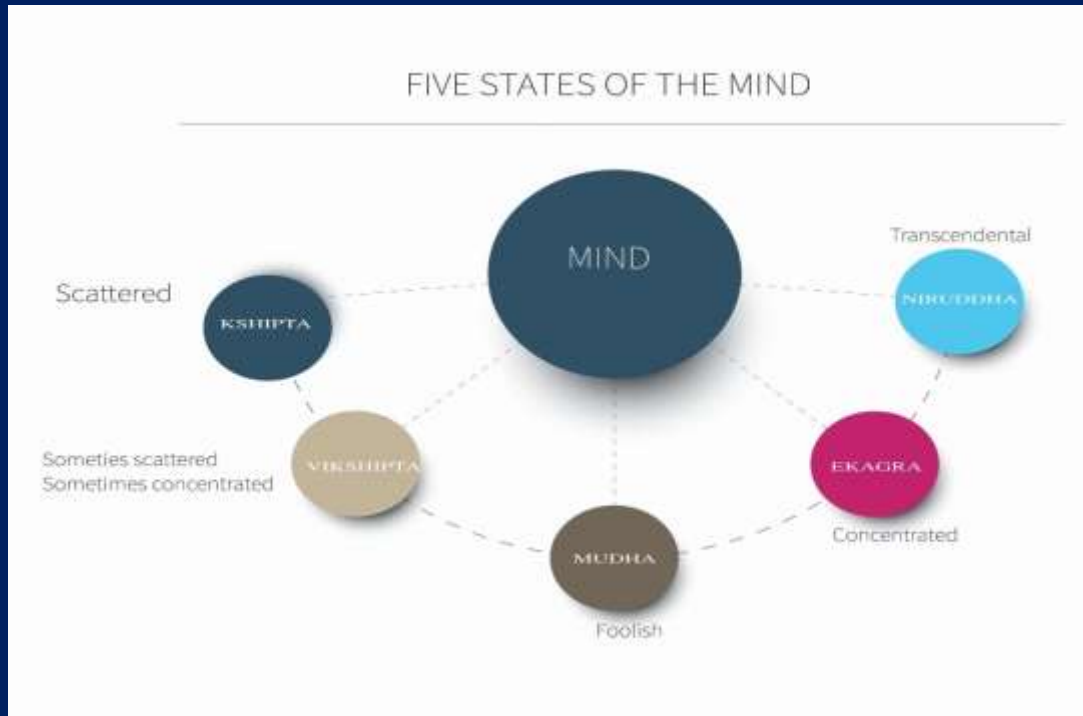
Neurobiology of Consciousness



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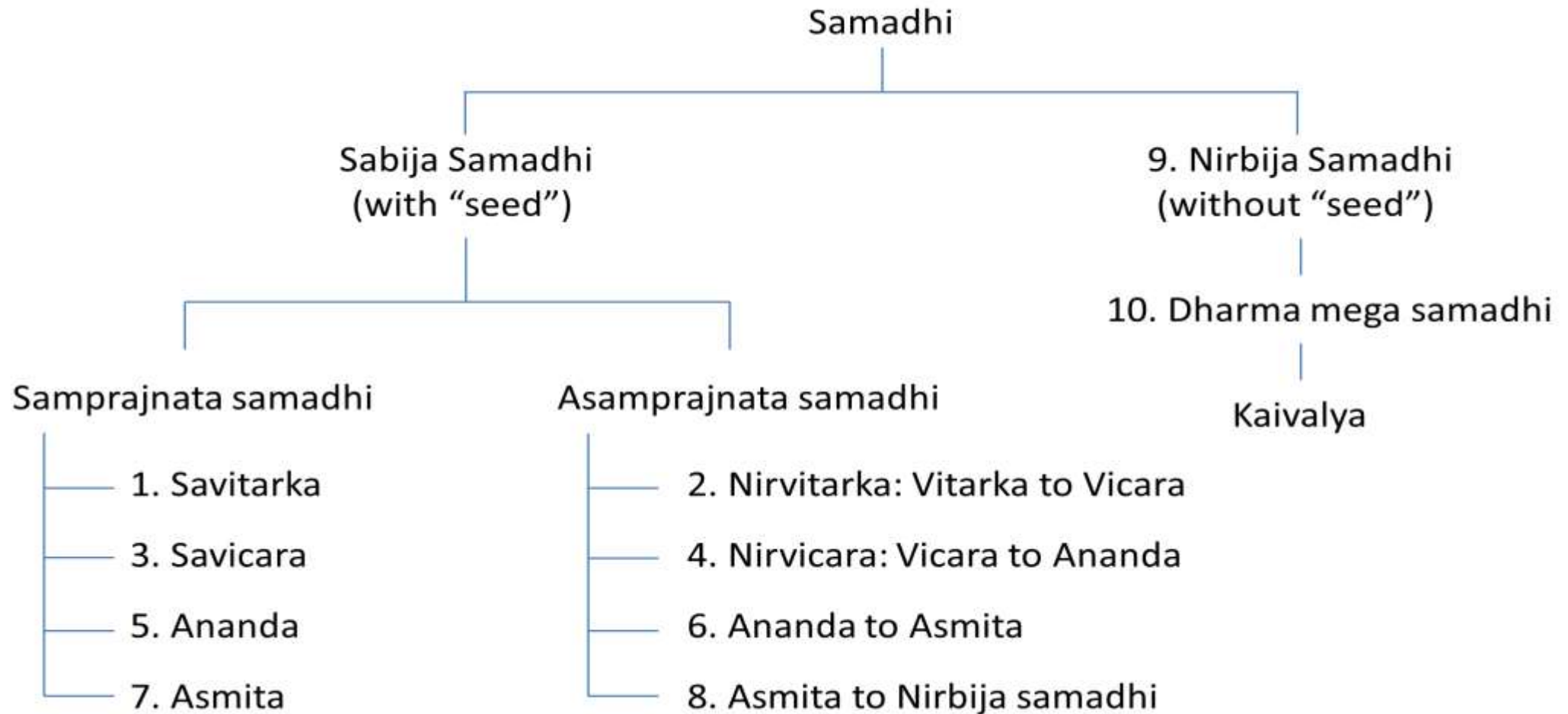
Neurobiology of Consciousness

CHITTA VRITTIS

- PRAMANA (Right knowledge)
- VIPARYAYA (Wrong knowledge)
- VIKALPA (Imagination)
- NIDRA (Sleep)
- SMRITI (Memory)



Neurobiology of Consciousness



Neurobiology of Consciousness

UNMANI AVASTHA



MANONMANI AVASTHA



Neurobiology of Consciousness



ULTIMATE TRUTH OF HUMAN LIFE



Thank
you!!
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