
OBJECTIVES

RETICULAR FORMATION

ANATOMY

CLASSIFICATION

RETICULAR NUCLEI

ASCENDING RETICULAR ACTIVATING SYSTEM

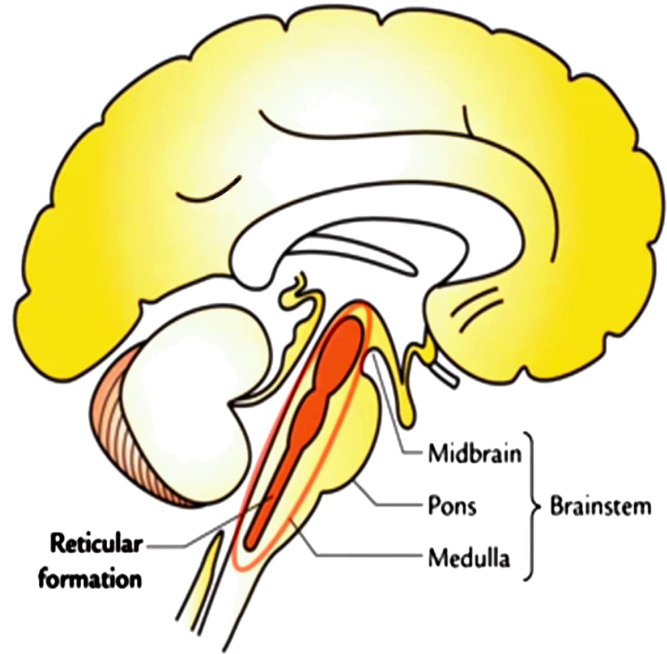
DESCENDING RESTICULAR SYSTEM

FUNCTION

CLINICAL ASPECTS

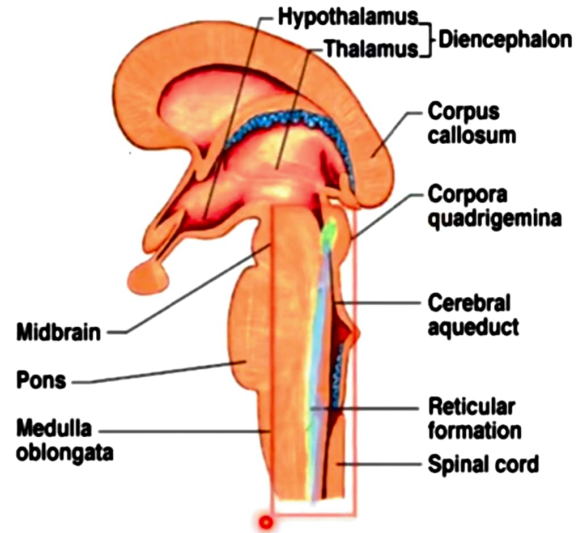
Reticular Formation

- The reticular formation is defined as diffuse ill-defined mass of intermingled neurons and nerve fibres occupying the entire core of brainstem
- when stimulated will produce **arousal**.
- Phylogenetically old system
- Fibers that traverse gives this region a net like appearance i.e. reticular



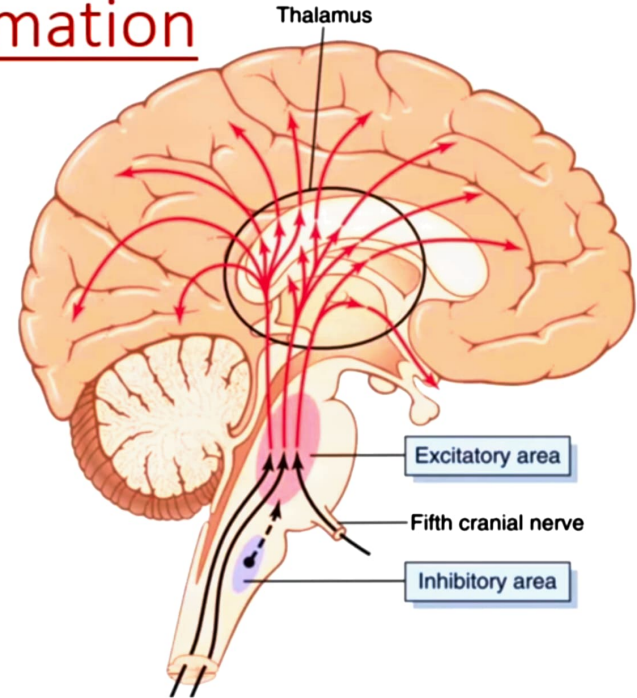
Anatomy Of Reticular Formation

- Extends
 - cranially to the diencephalon
 - caudally to the spinal cord in the cervical region.



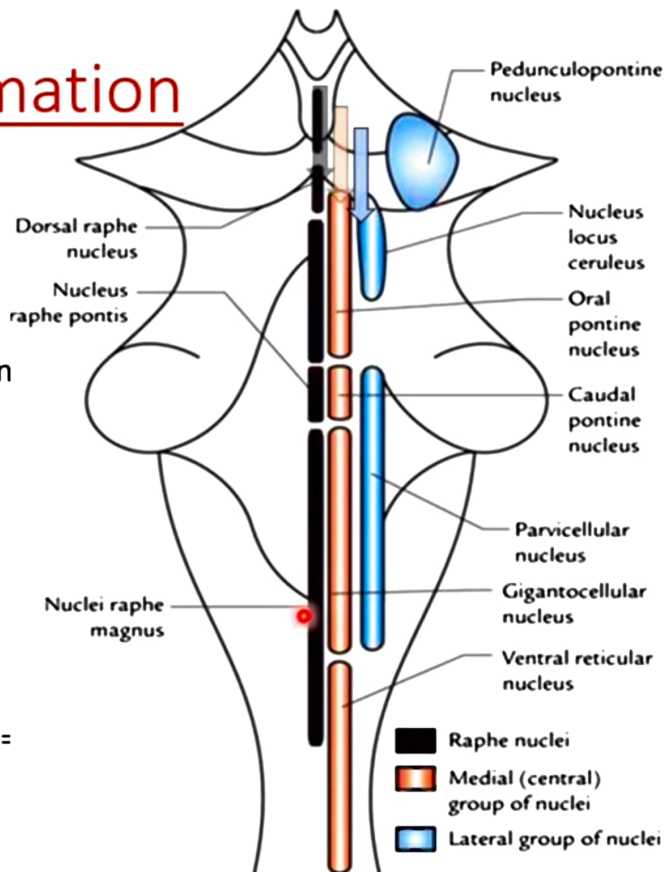
Anatomy Of Reticular Formation

- Consists of localized cell groups called **reticular nuclei**
- **BASED ON FUNCTION** classified into
 - Pontine reticular nuclei - facilitatory area
 - Medullary Reticular nuclei - inhibitory area
- **BASED ON ANATOMY** classified into
 - Median column
 - Medial column
 - Lateral column



Anatomy Of Reticular Formation

- The reticular nuclei in brainstem are arranged into three longitudinal columns
- **Median column**
- lies in the midline and consists of intermediate size neuron
- The nuclei of this column are termed **raphe nuclei**
- **Medial column**
- consists of nuclei which are made up large-size neurons,
- this column is also termed **magnocellular column**.
- **Lateral column**
- consists of nuclei which are made up of small neurons,
- this column is also termed **parvo-cellular column** (parvus = little, small).

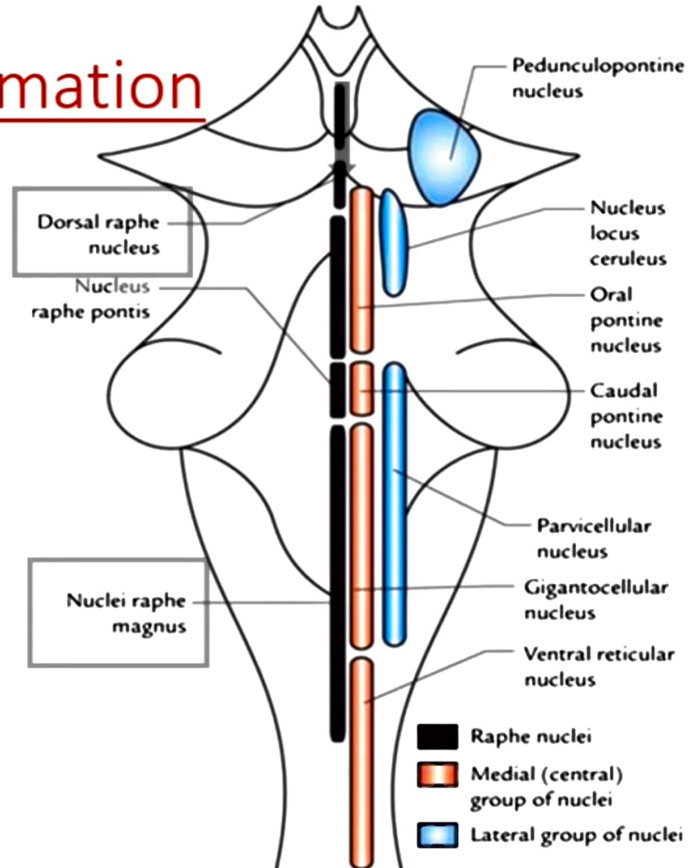


Anatomy Of Reticular Formation

- **Raphe nuclei (median group of nuclei)**
- contiguous column in the mid-line.
- The neurons produce **serotonin**
- *Contains*
- *dorsal raphe nucleus .*
- *nucleus raphe magnus*

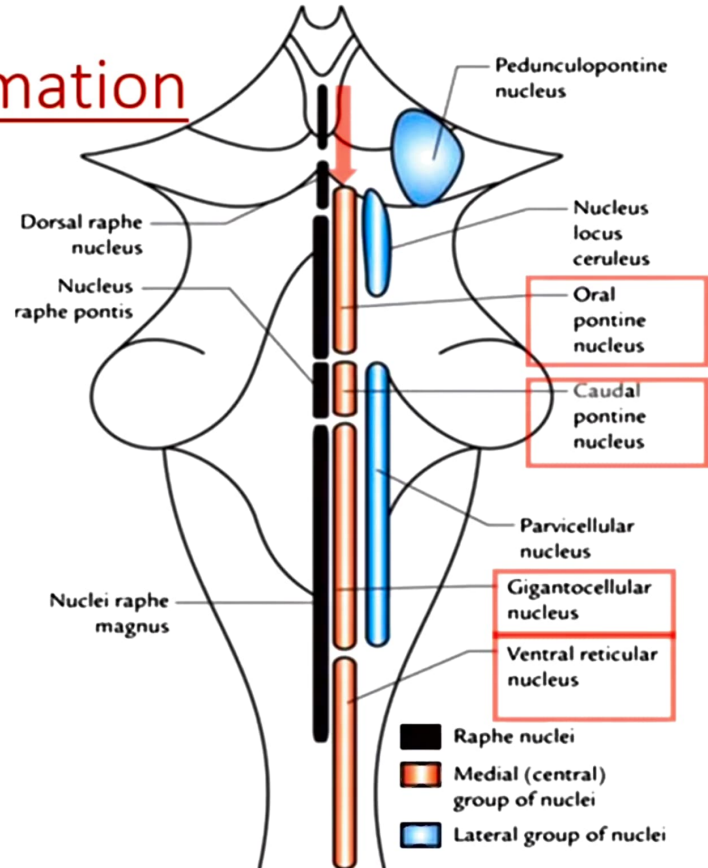
Involved in

- ✓ Pain modulating pathway
- ✓ Arousal & attention



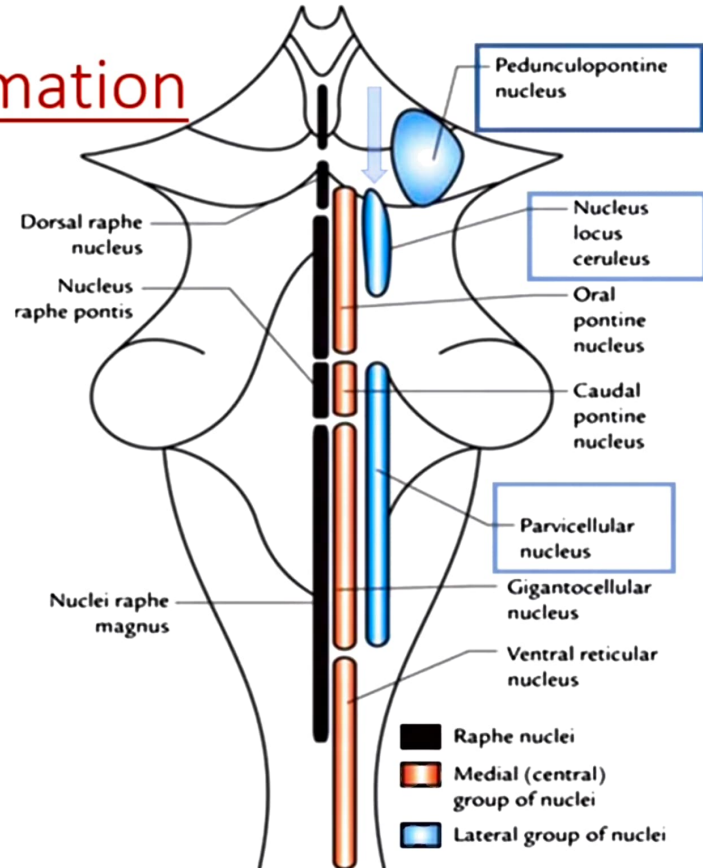
Anatomy Of Reticular Formation

- **Medial group of nuclei**
- The medial group of nuclei includes
- ventral reticular nucleus (in medulla),
- gigantocellular nucleus (in medulla and pons)
- oral and caudal pontine nuclei (in pons).
- Involved in
- ✓ Intrinsic mechanism of control of eye movement
- ✓ Swallowing
- ✓ Brainstem reflex



Anatomy Of Reticular Formation

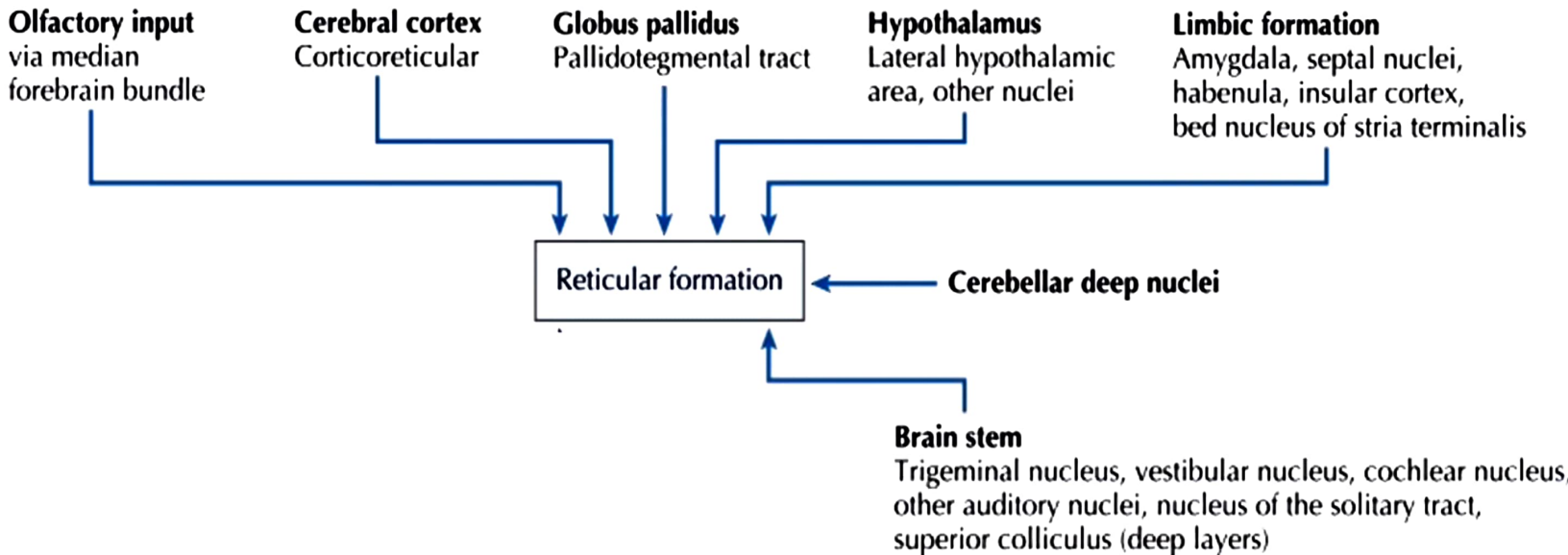
- **Lateral group of nuclei**
- The lateral group of nuclei includes
- parvicellular nuclei of medulla and pons,
- nucleus locus ceruleus of pons and
- pedunclopontine nucleus of the midbrain.



Connections Of Reticular Formation

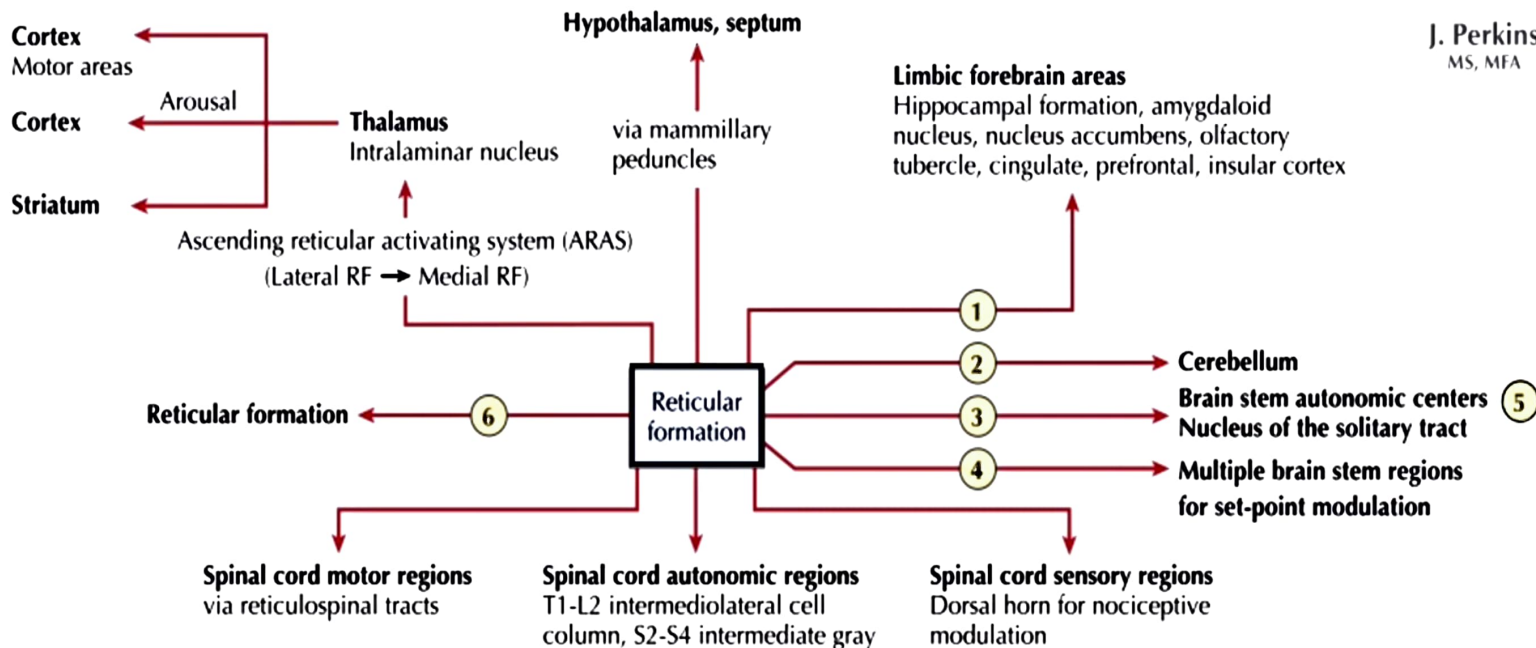
- The reticular formation receives information from almost all the principal parts of the nervous system & projects (directly or indirectly) to all these parts –
- Afferent Connections
- Efferent Connections

Afferent Connections Of Reticular Formation



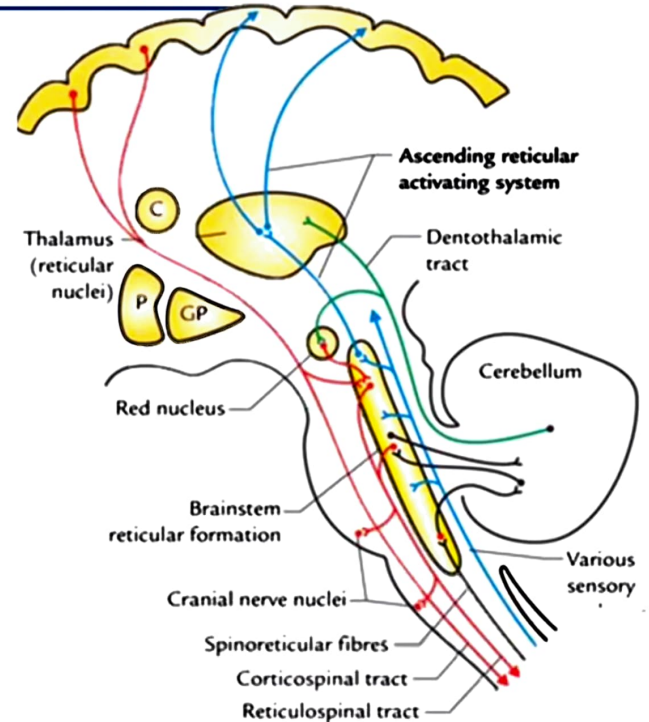
Efferent Connections Of Reticular Formation

J. Perkins
MS, MFA



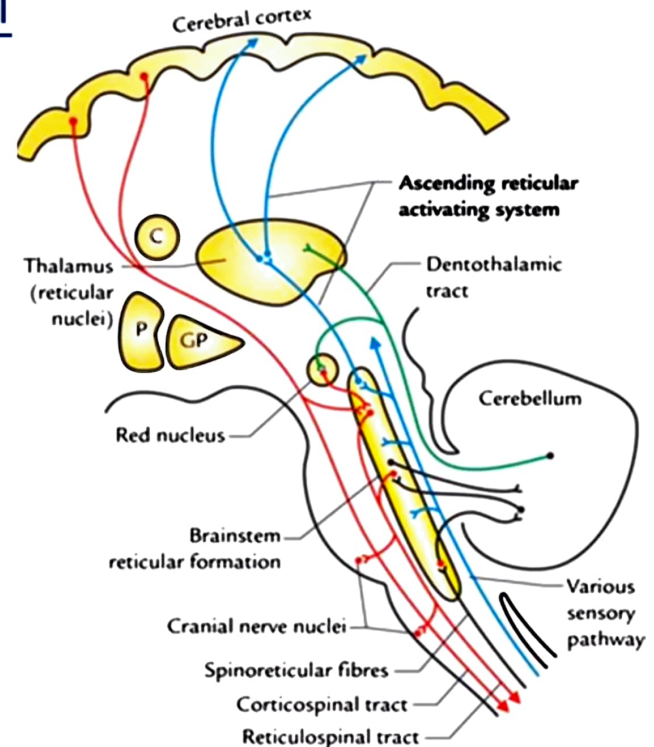
Connections Of Reticular Formation

- Functionally the reticular formation is divided into two systems:
- (a) the ascending reticular activating system (ARAS), and
- (b) the descending reticular system (DRS).



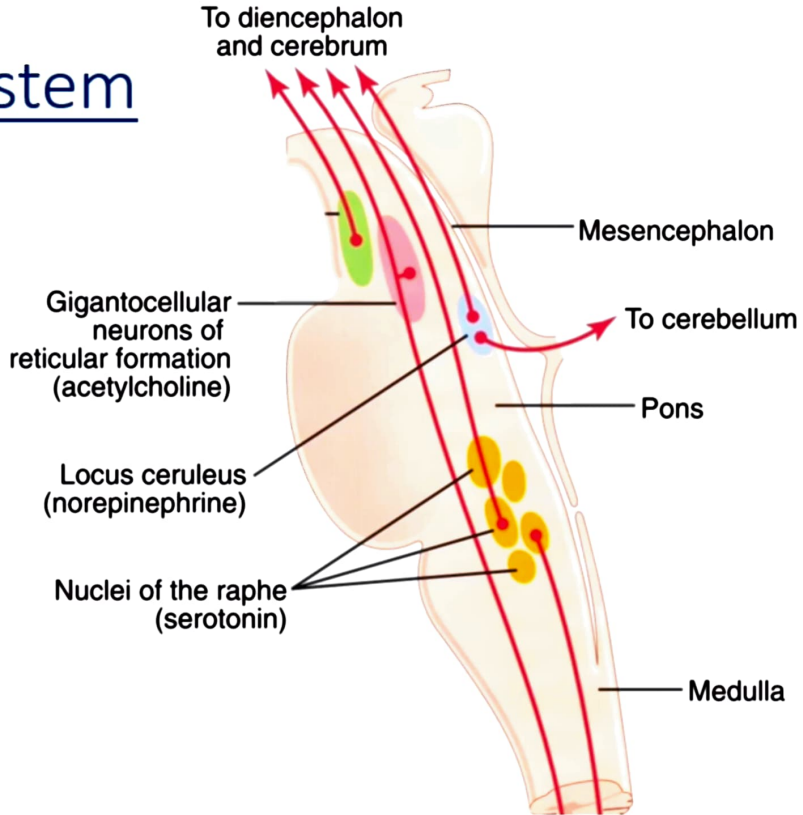
Reticular Activating System

- Complex polysynaptic pathway that projects diffusely from brainstem RF to cortex
- Responsible for regulating wakefulness and sleep wake transitions
- Two types of signals-
- Rapidly transmitted action potentials-last for few seconds
- Slow long term background excitation



Reticular Activating System

- Contains different types of neurons
- neurotransmitters that these neurons release include
 - ✓ Dopamine-excitatory /inhibitory
 - ✓ Norepinephrine- excitatory
 - ✓ Serotonin-inhibitory
 - ✓ Histamine
 - ✓ Acetylcholine



Reticular Activating System

FUNCTIONS

1. Consciousness
2. Regulating sleep-wake transitions
3. Attention
 - mediate transitions from relaxed wakefulness to periods of high attention.
4. Habituation:
 - allows the brain to ignore stimuli that are repetitive and meaningless and diverts focus to more important and changing stimuli in the environment.

Reticular Activating System

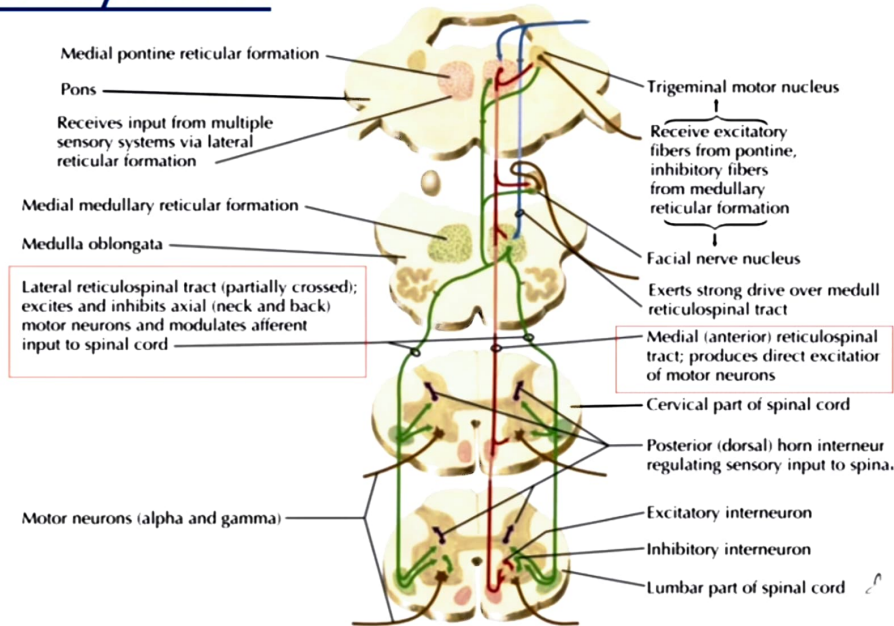
APPLIED ASPECTS

- **Age** : general decline in reactivity of the ARAS with advancing years
- **Parkinson's disease**: REM sleep disturbances are common in Parkinson's. Degeneration in the ARAS begins early in the disease process
- **Mass lesions in brainstem** ARAS nuclei can cause severe alterations in level of consciousness

Descending Reticular System

MOTOR CONTROL- RETICULOSPINAL TRACT

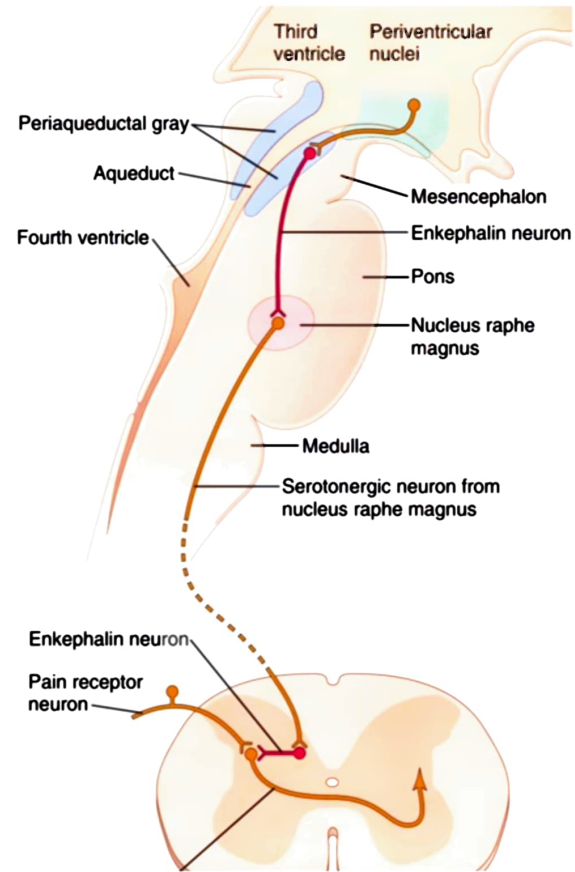
- Reticulospinal pathway
- reticulospinal pathway divides into the medial pontine and the lateral medullary reticulospinal tracts
- controls extensor musculature
- control autonomic functions of breathing.



Descending Reticular System

MODULATION OF PAIN

- Modulates the sensation of pain in the periphery
- blocks transmission of pain from the spinal cord to the cortex
- Pathways from Reticular nuclei like Nucleus Raphe Magnus & locus coeruleus is involved



FUNCTIONS OF RETICULAR FORMATION

1. Somatic motor control

- reticulospinal tracts -maintaining tone, balance, and posture, especially during movement.
- relays eye and ear signals to the cerebellum- visual, auditory, and vestibular stimuli can be integrated in motor coordination.
- Relays signals to gaze centers, which enable the eyes to track and fixate objects, and central pattern generators, which produce rhythmic signals to the muscles of breathing and swallowing.

2. Cardiovascular control:

- The reticular formation relays information to the cardiac and vasomotor centers of the medulla oblongata.

3. Pain modulation

4. Sleep and consciousness

CLINICAL ASPECTS

- DISORDERS OF SLEEP –WAKE CYCLE can be seen in
 - Hypersomnia and Coma
 - Schizophrenia
 - Post-Traumatic Stress Disorder
 - Parkinson's Disease
 - Narcolepsy

RETICULAR FORMATION

DEFINITION

ANATOMY

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AFFERENT CONNECTIONS

EFFERENT CONNECTIONS

ASCENDING RETICULAR AS

DESCENDING RESTICULAR SYSTEM

FUNCTION

CLINICAL ASPECTS