



**LECTURE 6. THE ROLE OF THE CORTEX AND SUBCORTICAL GANGLIA IN THE REGULATION OF SYSTEMIC ACTIVITY OF THE ORGANISM. EEG.**

# THALAMUS

- Consists of about 40 nuclei which are divided functionally into 4 groups

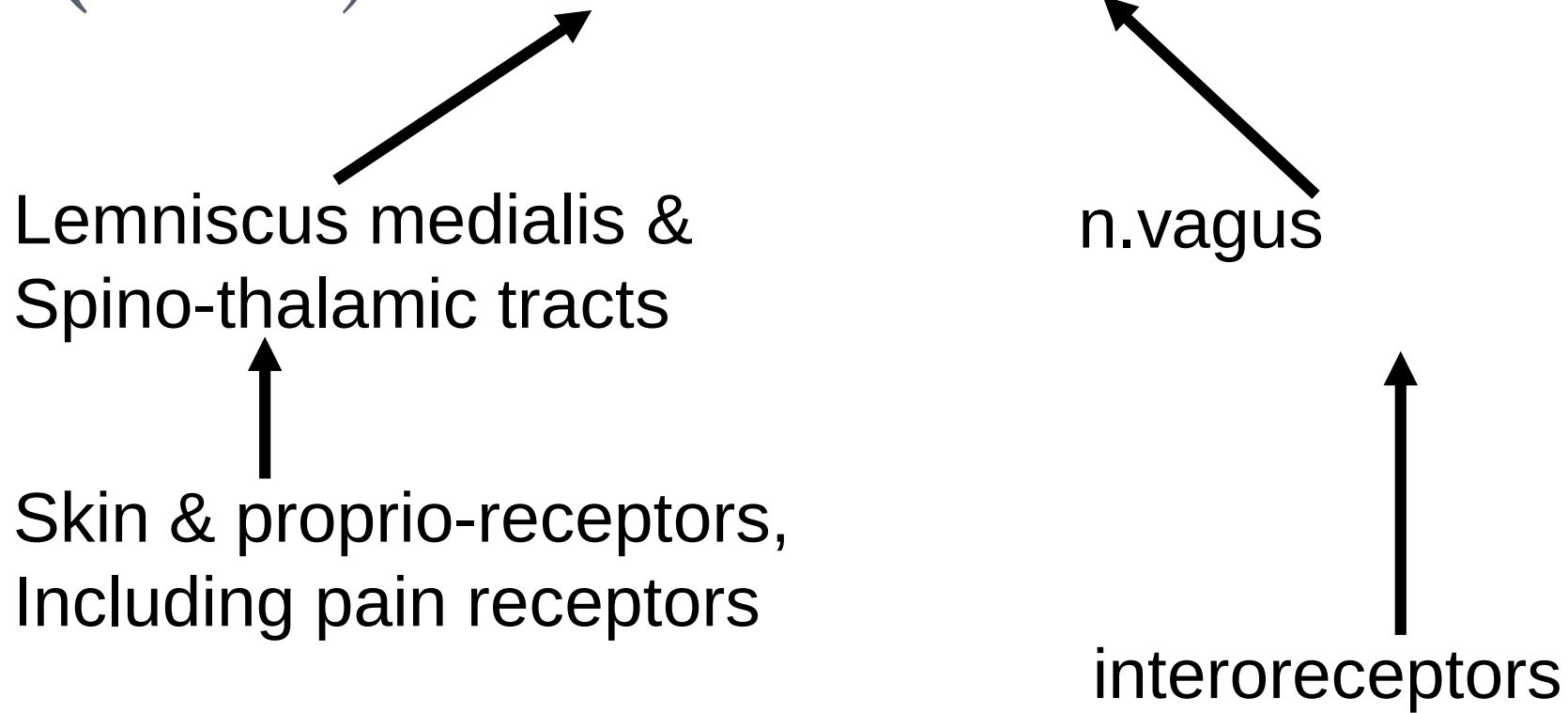


# VENTRO-POSTERIO-LATERAL NUCLEUS ( VPL )

Lemniscus medialis &  
Spino-thalamic tracts

↑

Skin & proprio-receptors,  
Including pain receptors



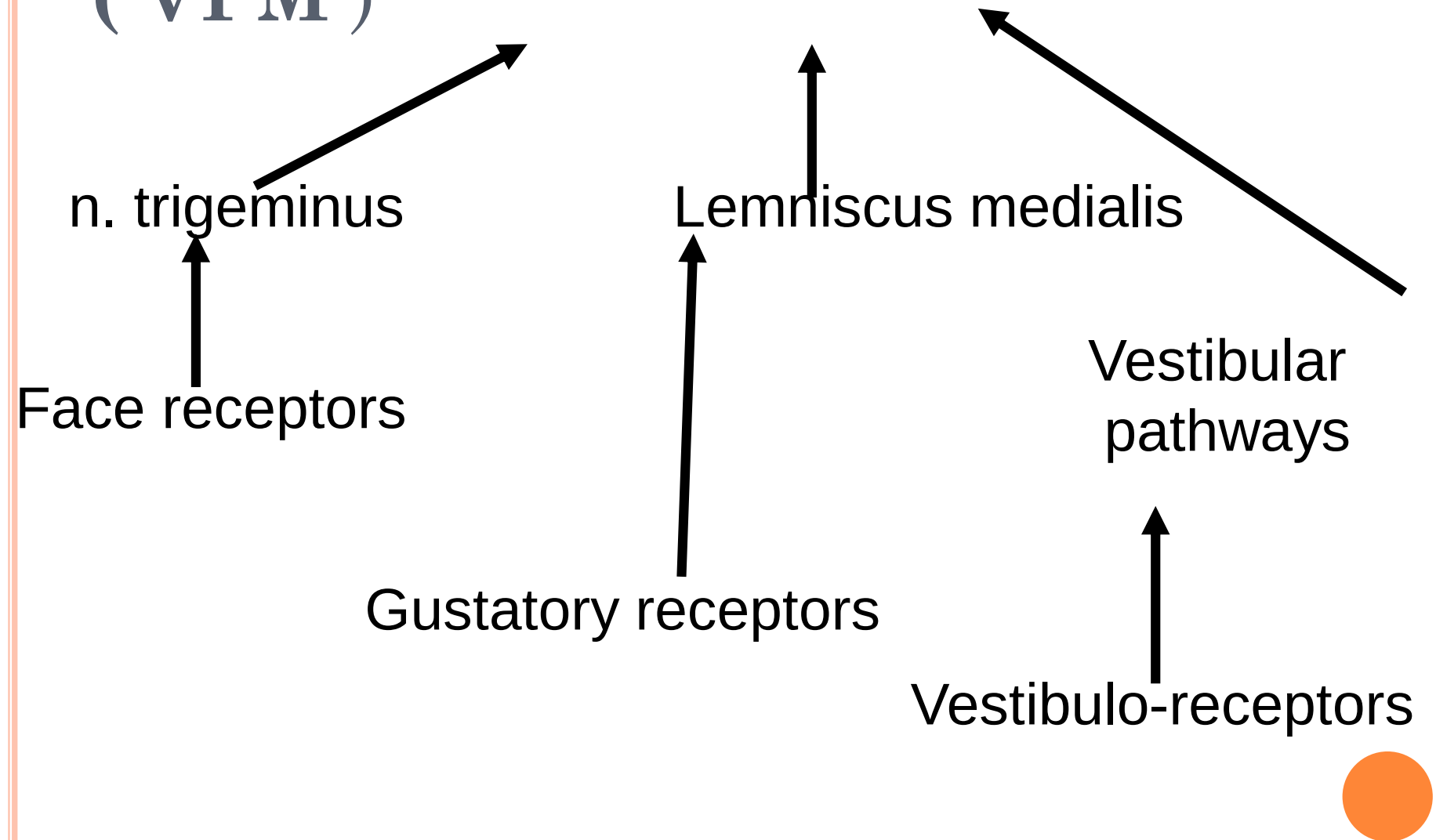
n.vagus

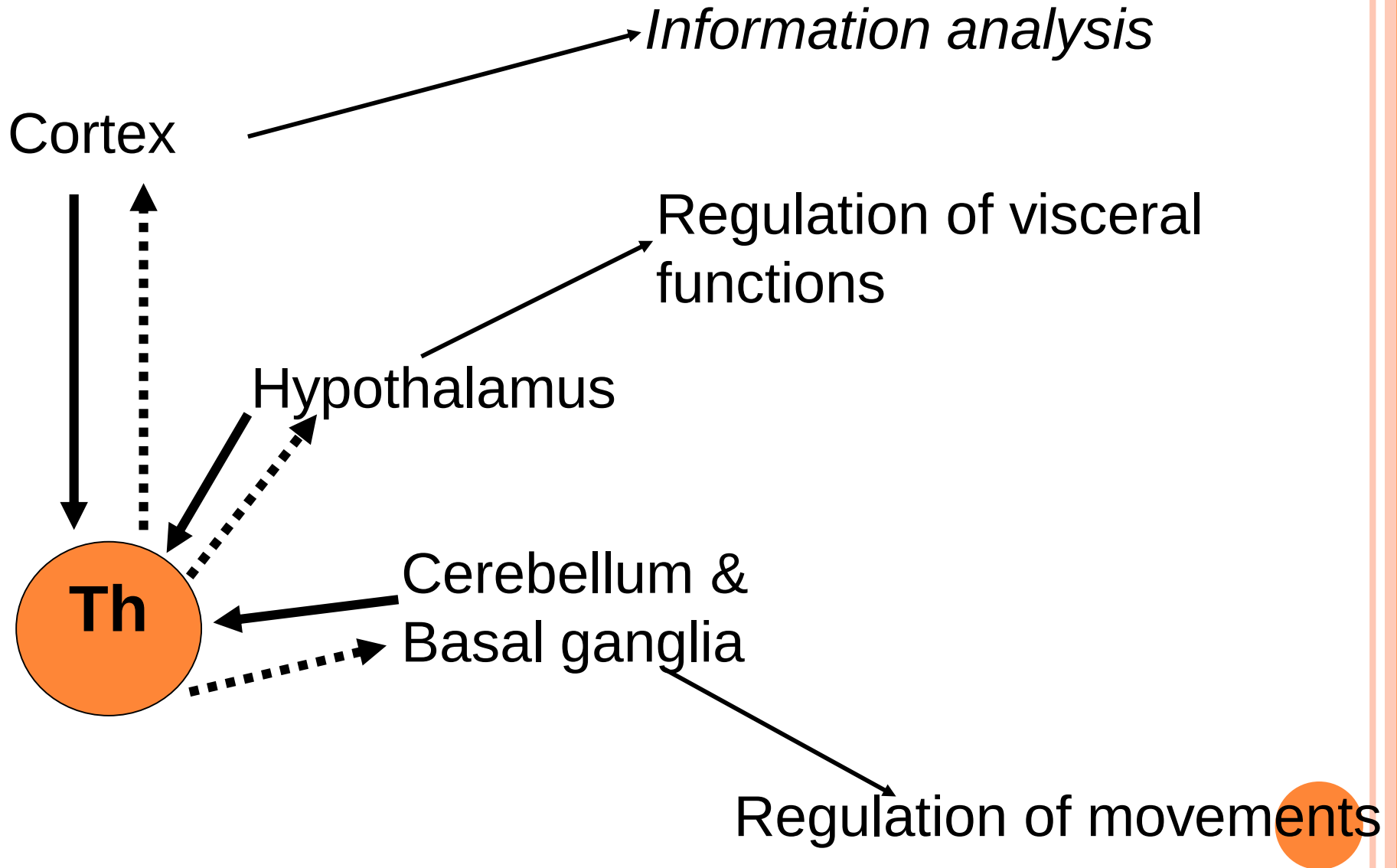
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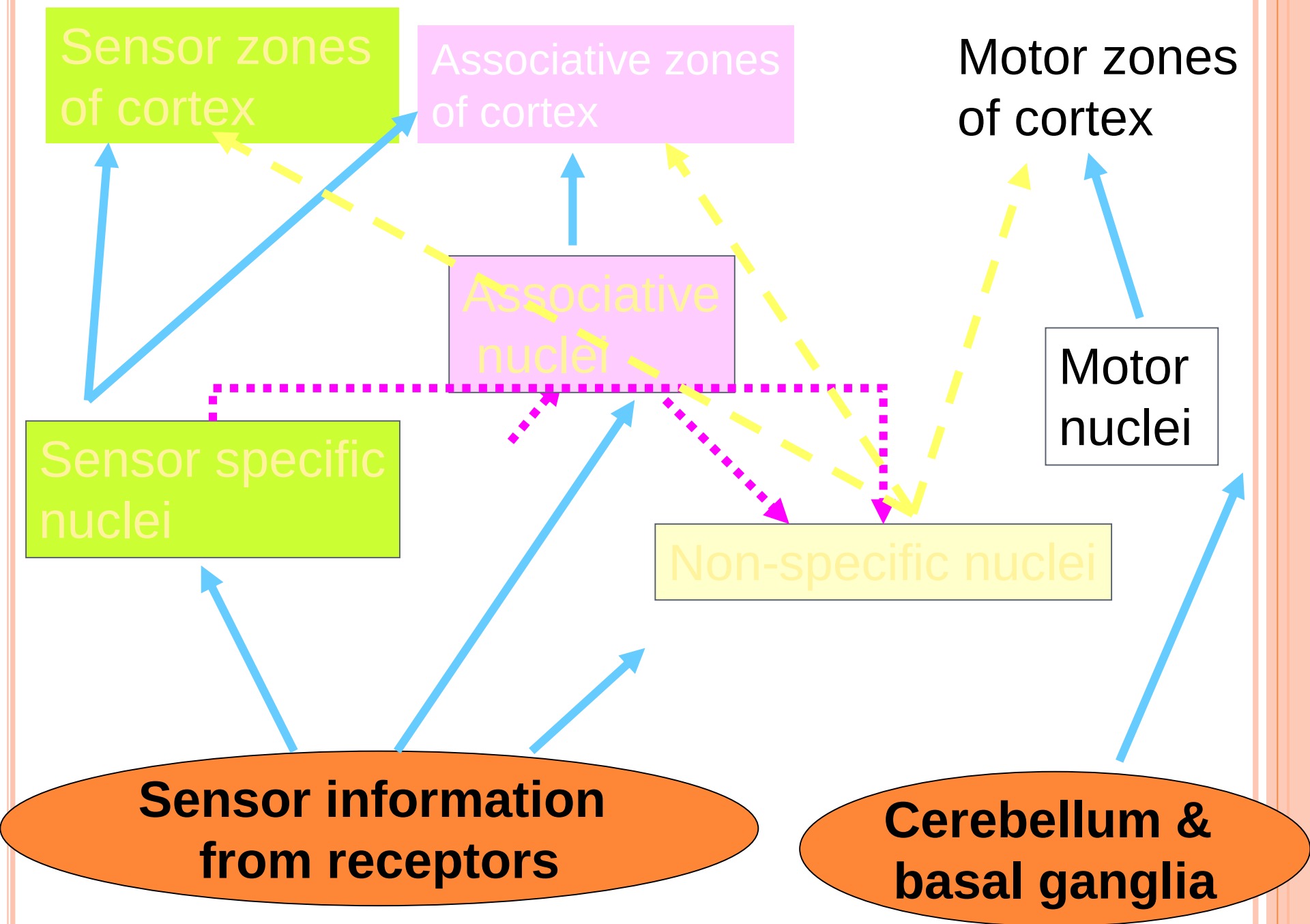
interoceptors

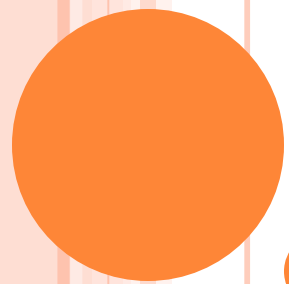


# VENTRO-POSTERIO-MEDIAL NUCLEUS ( VPM )

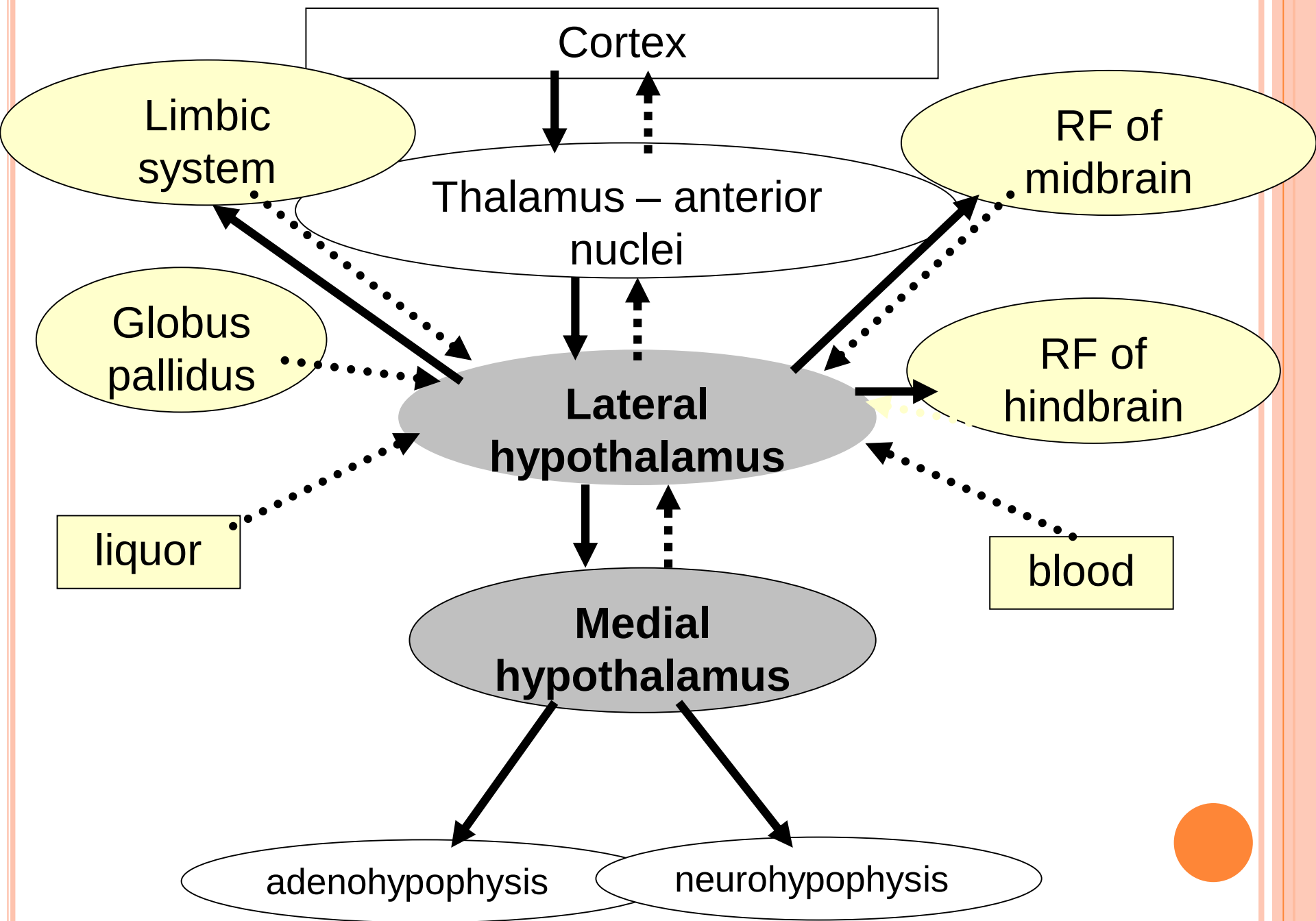








# HYPOTHALAMUS





Neurons effectors

Somatic NS

Vegetative NS  
(brain stem)

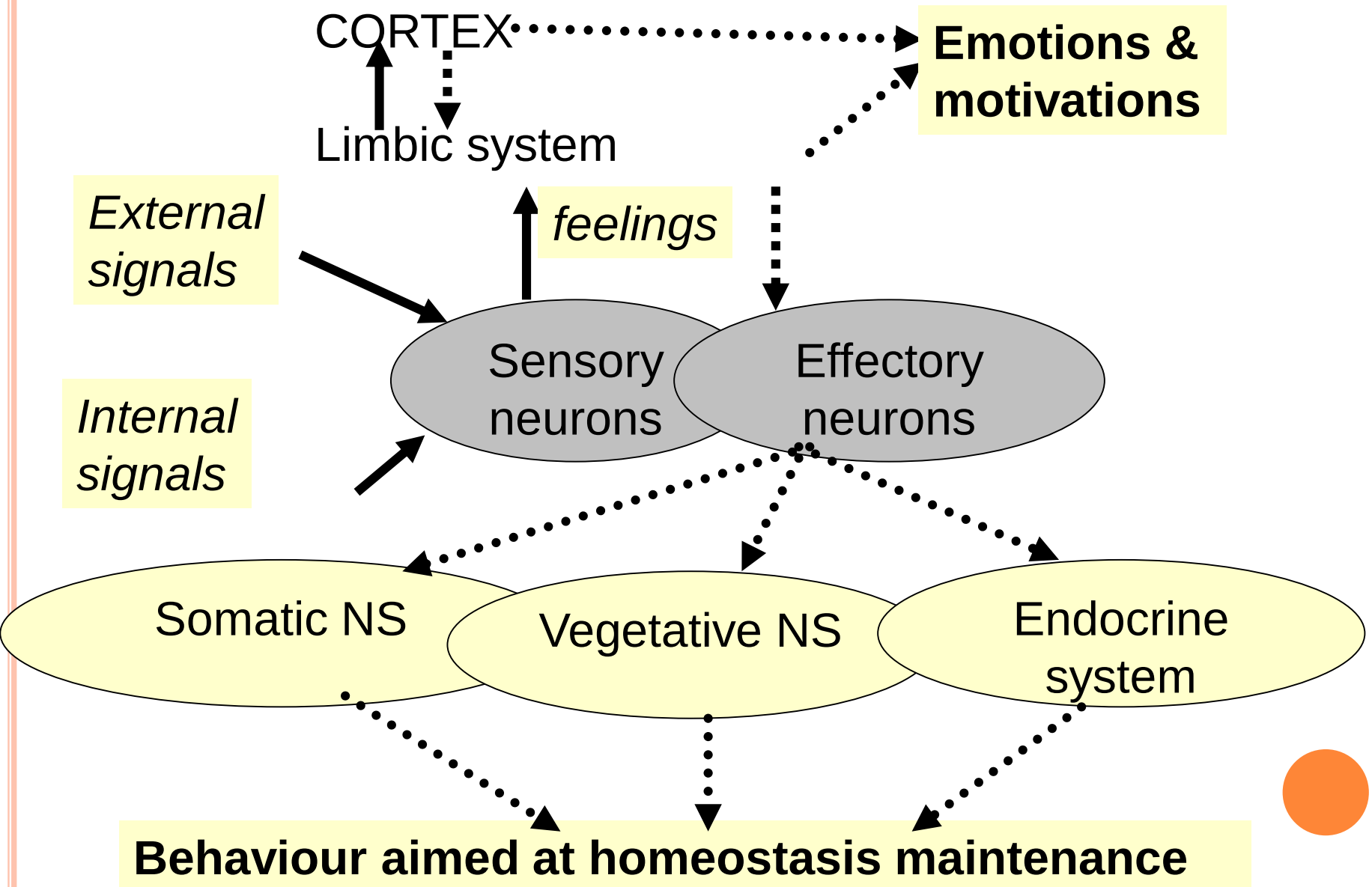
Endocrine system

Locomotor component

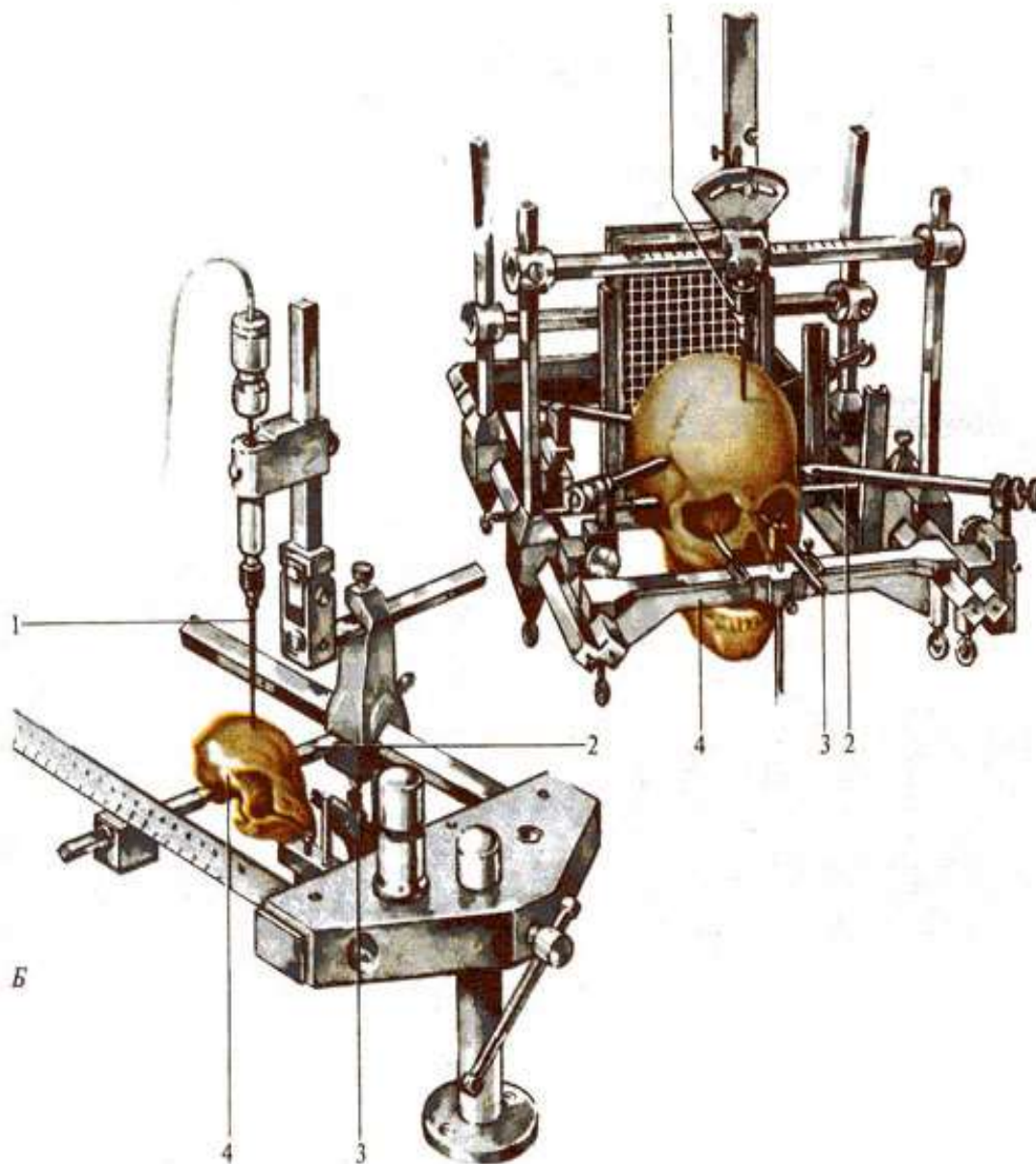
Vegetative component

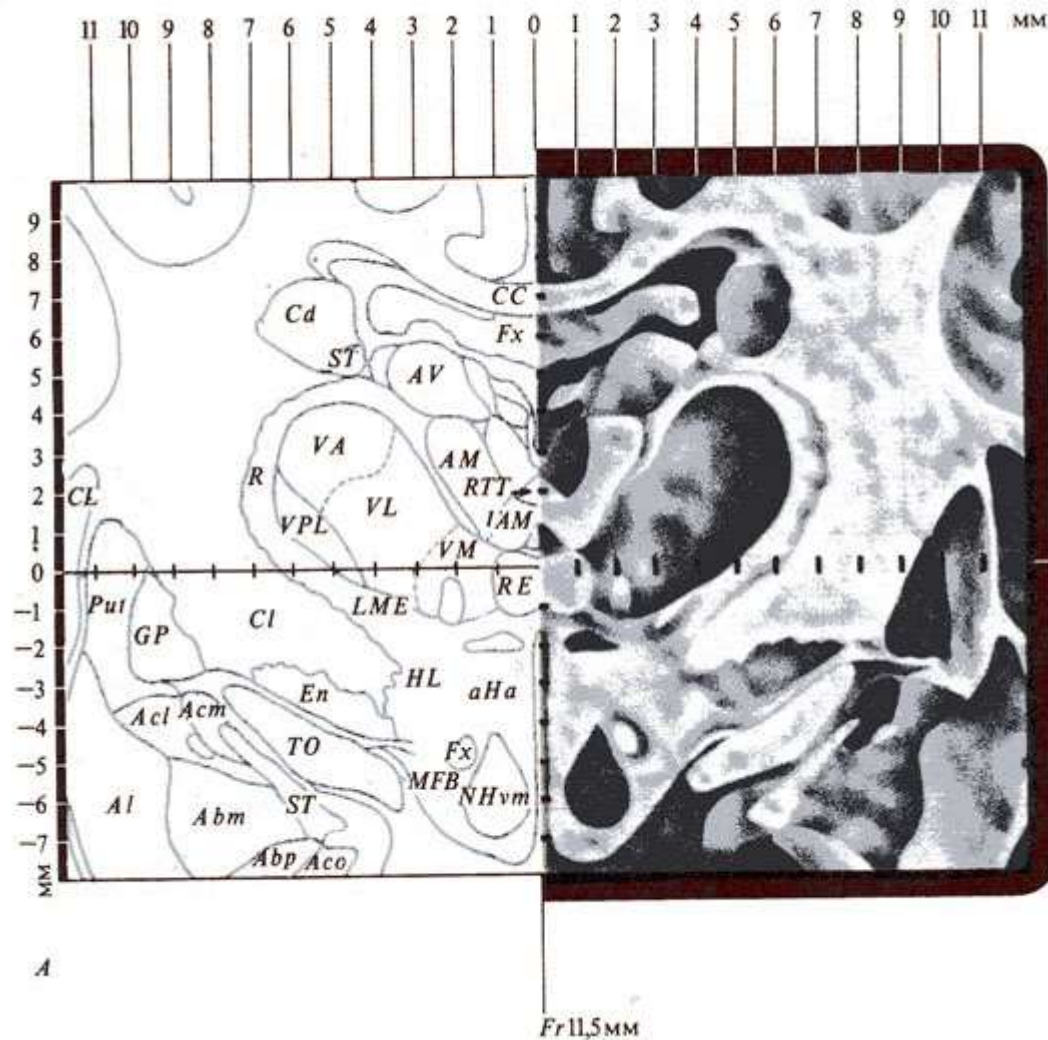


# HYPOTHALAMUS FUNCTIONS



Stereotaxis: 1 -  
electrode, 2 –  
ear fixators, 3 –  
upper jaw  
fixators





Frontal cross-section of cat/s brain with marked subcortical structures mo3ra

**Central  
sulcus**

**Lateral  
sulcus**

**Temporal  
lobe**

**Frontal  
lobe**

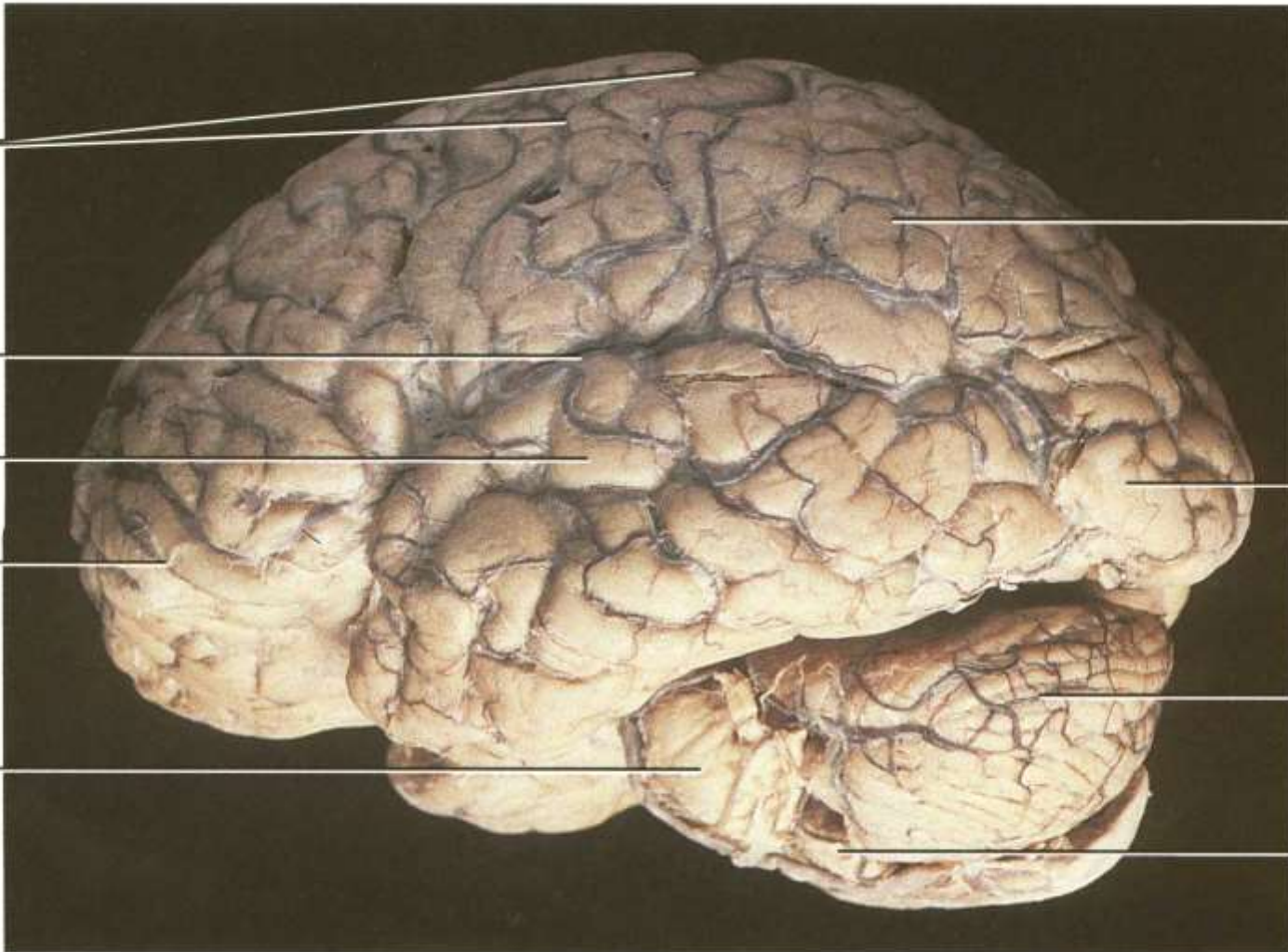
**Pons**

**Parietal  
lobe**

**Occipital  
lobe**

**Cerebellum**

**Medulla  
oblongata**



| <i>Total surface square</i>       | <i>Thick-ness</i>           | <i>Total volume</i>             | <i>Neurons number</i>                          | <i>Glyal cells</i>                 |
|-----------------------------------|-----------------------------|---------------------------------|------------------------------------------------|------------------------------------|
| <b><i>2200 cm<sup>2</sup></i></b> | <b><i>1,3 to 4,5 mm</i></b> | <b><i>600cm<sup>3</sup></i></b> | <b><i>10<sup>9</sup> - 10<sup>10</sup></i></b> | <b><i>Total number unknown</i></b> |



# 6 LAYERS OF CORTEX

- **I - Molecular**
- **II – External stellatum**
- **III – External pyramidal**
- **IV - Internal stellatum**
- **V –Internal pyramidal**
- **VI – Layer of physiformic cells**



# ELECTROENCEPHALOGRAPHY

- Method of registration ofvelectrical potential from the skin of the head
- Hanse Berger proposed this in 1929 - 1938.





# EEG ORIGIN

- Sum of EPSPs & IPSPs
- Duration of EPSPs & IPSPs is from 30 to 150 msec
- Amplitude depends on the frequency & synchronisation of EPSPs & IPSPs
- Frequency is formed by rhythmic activity of cortex neurons.
- Rhythmicity is due to the influence of RF of midbrain & thalamic nuclei.

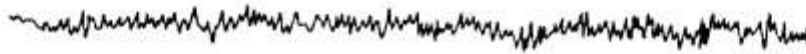


# EEG RHYTHMS

- Alfa –  $\alpha$ -rhythm - 8-13 Hz - 50-100 mcV *Rhythm of synchronization*. Registered at the state of peaceful wakefulness at closed eyes mainly in occipital & parieto-temporal zonez.
- Betha –  $\beta$ - rhythm - 14-30 Hz - 10-30 mcV. *Rhythm of desynchronization*. Registered at the state of active rest with opened eyes
- Theta-  $\theta$ -rhythm - 4-7 Hz - 100-150mcV *Rhythm of synchronization*. Registered at the state of peaceful wakefulness at closed eyes mainly in children, during sleep in adults, may be a sign of brain hypoxia.
- Delta –  $\Delta$ - rhythm - 0,5-4,5 Hz 150-200 mcV *Rhythm of synchronization*. Registered at the state of deep sleep, narcosis, at pathological states.

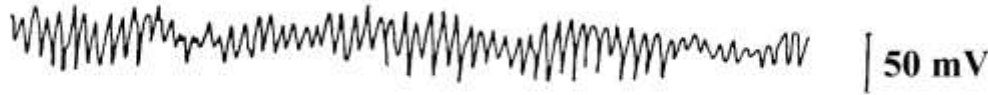


I



I -  $\alpha$  - waves

II



II -  $\beta$  - waves

III



III -  $\theta$  (theta) - waves

IV



IV -  $\Delta$  (delta) - waves

V



V - epileptic discharges



- Synchronization - occurs at anonymous impulsation to the cortex, at closed eyes.
- Desynchronization – occurs at different multiply active impulsation to the cortex, at opened eyes



# CLINICAL IMPORTANCE OF EEG

- Epilepsy diagnostics (caused potentials are preferable nowadays).
- Tumors localization.
- Cranium traumas & chronic meningitis & encephalitis
- Evaluation of narcosis depth ( $\Delta$  rhythm at deep narcosis).
- To determine the state of death in some cases («flat» EEG).

