

Behavioral & Motivational Mechanisms of Brain:

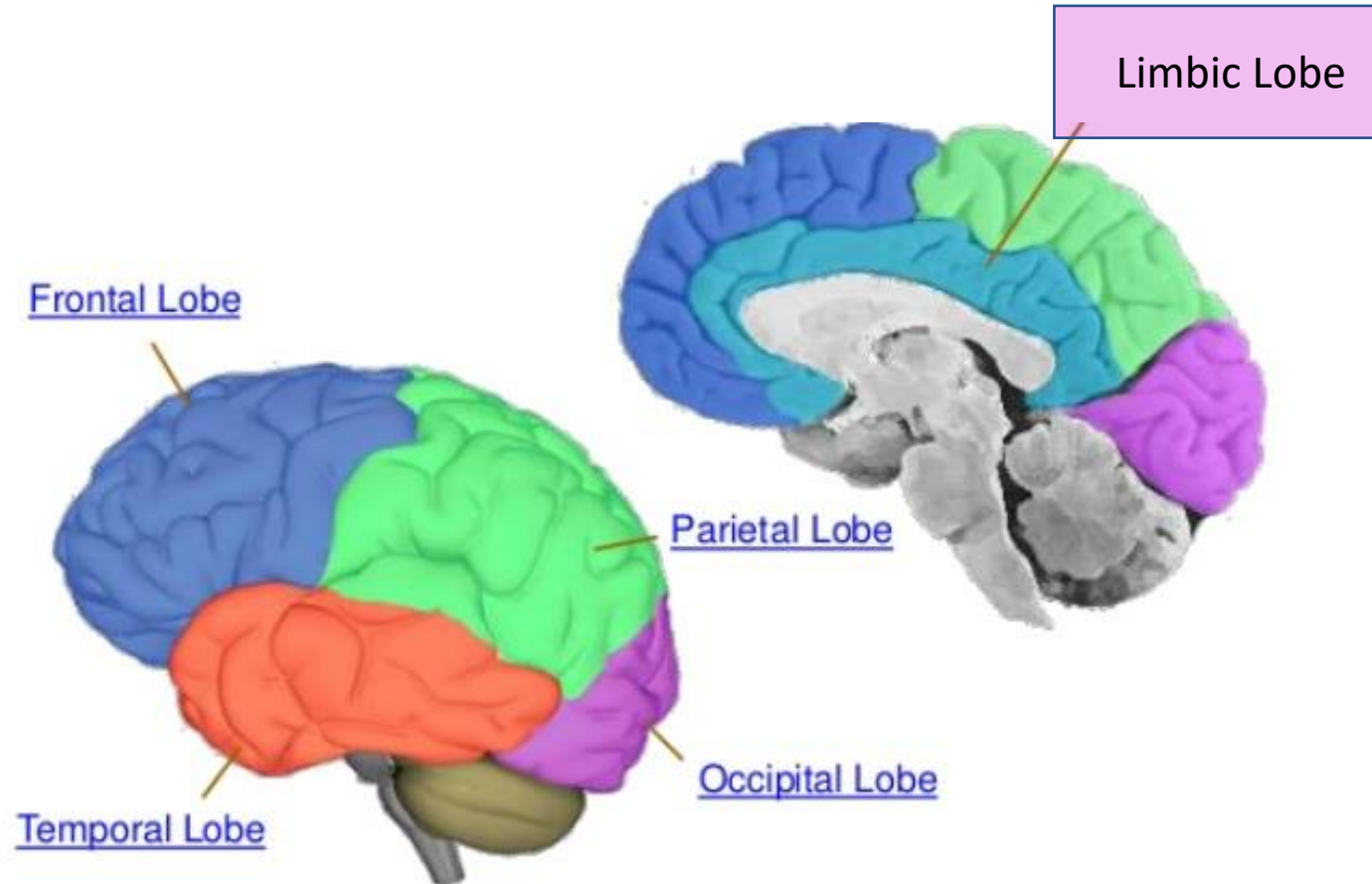
Limbic System:

Hippocampus, Hypothalamus, Amygdala

Behavioral & Emotional Mechanisms:

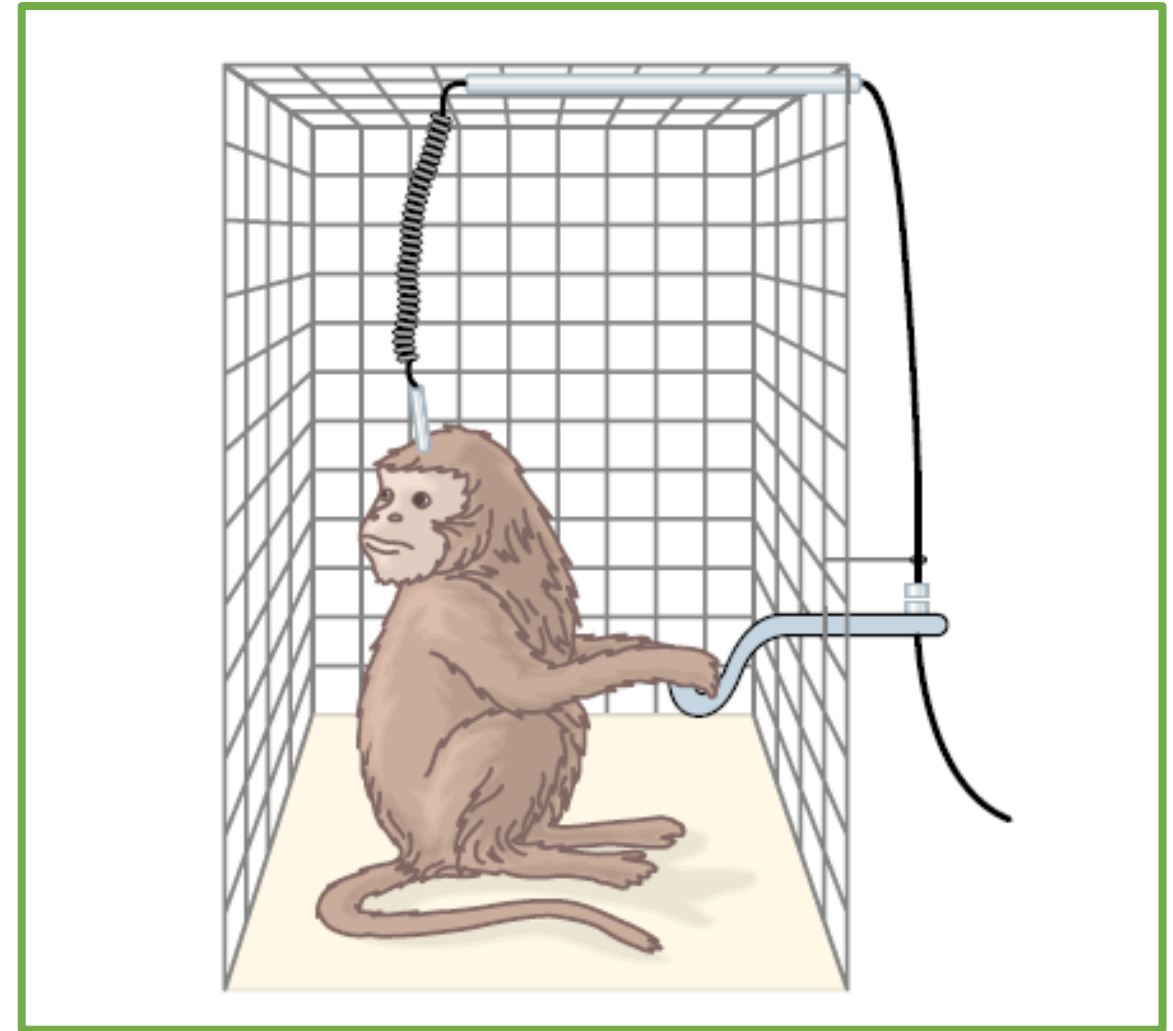
Recap.

Limbic Lobe: Medial surface:
Hypo-Thalamus (GPS) & Hippo-Campus (Physio. Controller)



Reward / “Punishment” Function of Limbic System

Testing Reward / Punishment Modalities

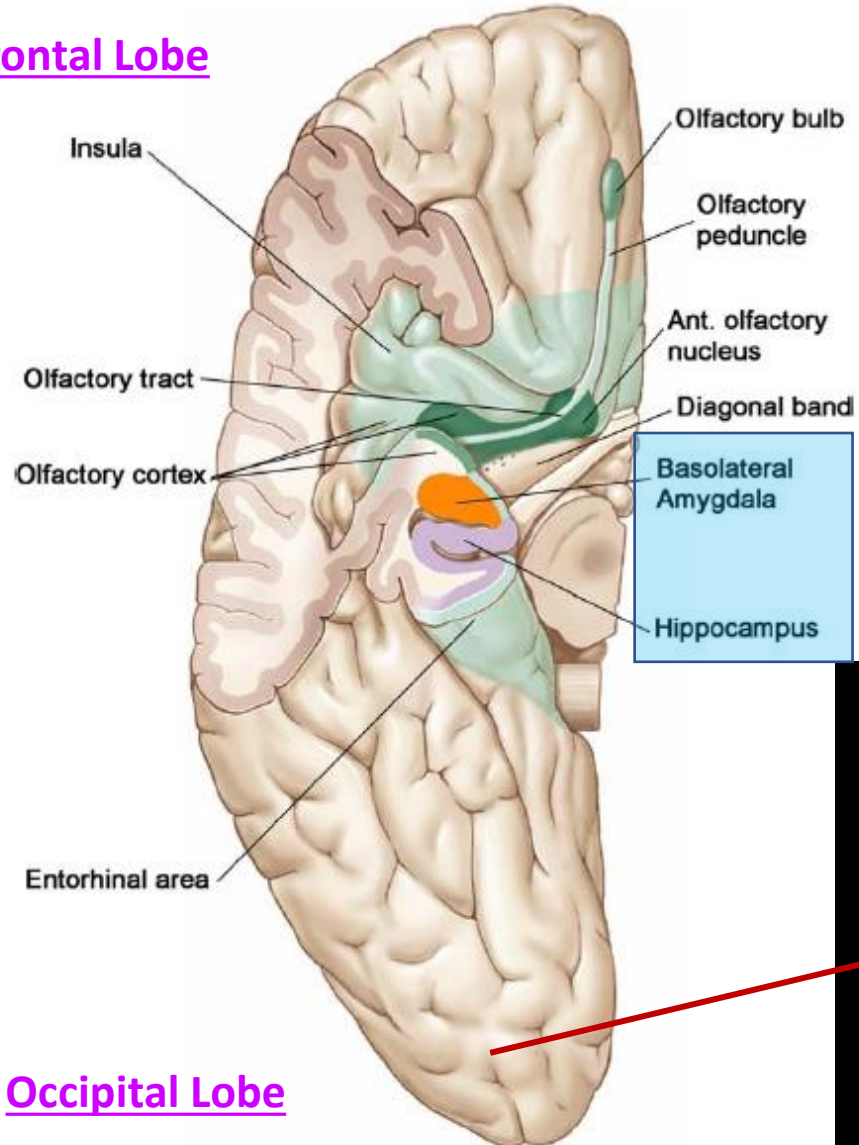


- Electrical stimulation of certain limbic areas pleases or satisfies the organism.
- Stimulation of other regions causes terror, pain, fear and elements of punishment

Recap.

Brain's Underside:
Limbic, Frontal, Occipital, Temporal Lobes

Frontal Lobe

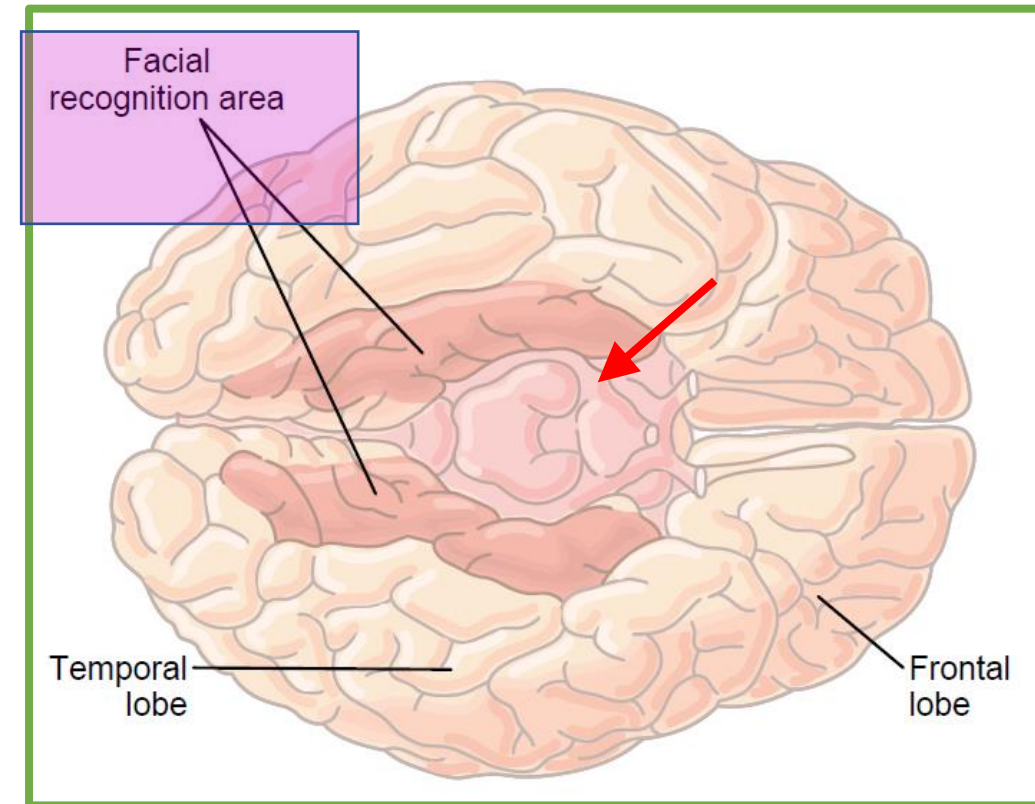


Occipital Lobe



Ventral Surface:

Person/Face recognition areas
(Fusiform Gyrus)



Hippocampus:

Memory & Brain's GPS

Short Communications

The hippocampus as a spatial map. Preliminary evidence from unit activity in the freely-moving rat

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The Nobel Prize in Physiology or Medicine 2014



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John O'Keefe

Prize share: 1/2



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May-Britt Moser

Prize share: 1/4



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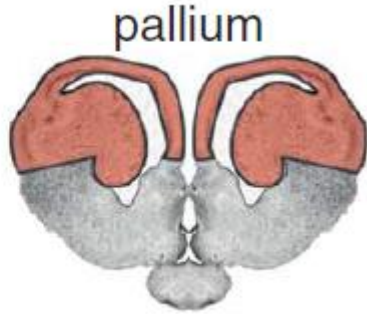
Edvard I. Moser

Prize share: 1/4

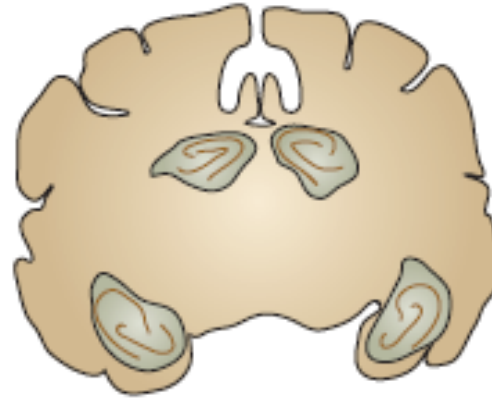
The Nobel Prize in Physiology or Medicine 2014 was divided, one half awarded to John O'Keefe, the other half jointly to May-Britt Moser and Edvard I. Moser "for their discoveries of cells that constitute a positioning system in the brain."

Hippocampus:

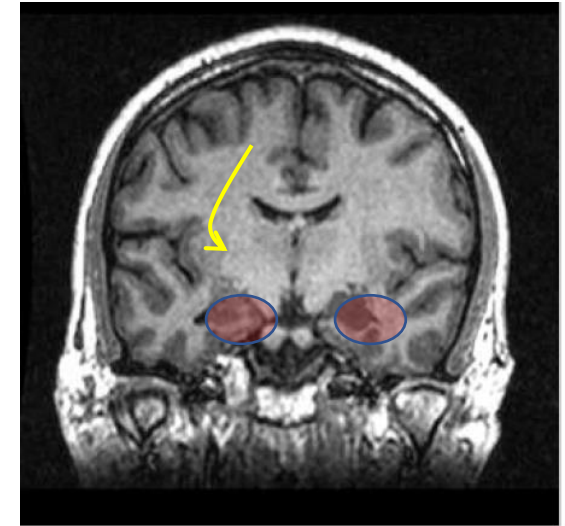
Memory & Brain's GPS



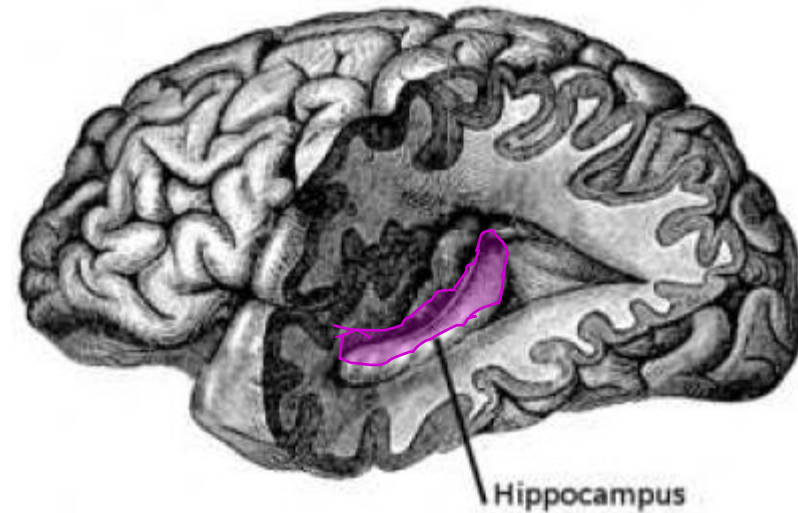
Red fox



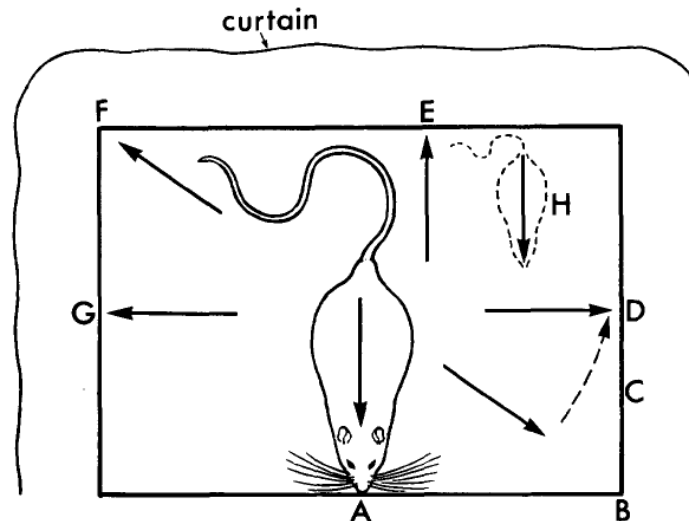
Man



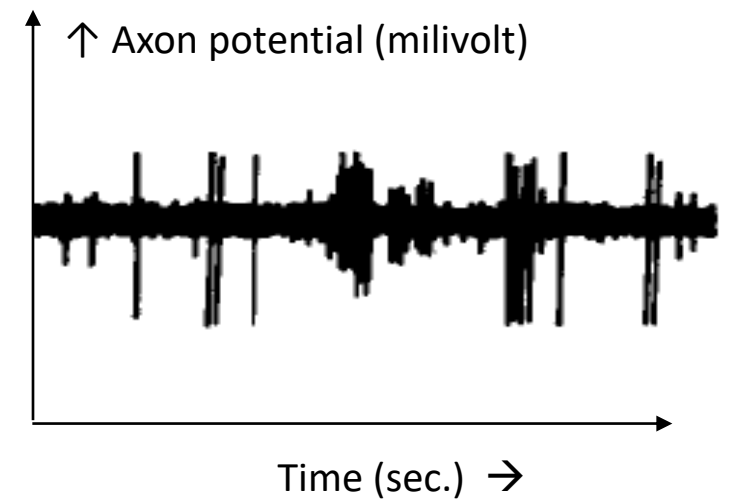
Man



Rat Experiment Box



Electrical Firing of Place Cells / Grid Cells



Hypothalamus:

**Feedback Controller Of
Body's Physiological State**

The Nobel Prize in Physiology or Medicine 1949

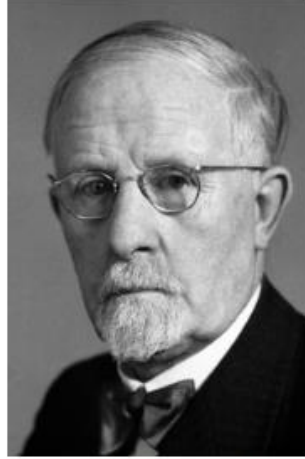


Photo from the Nobel Foundation archive.

Walter Rudolf Hess

Prize share: 1/2

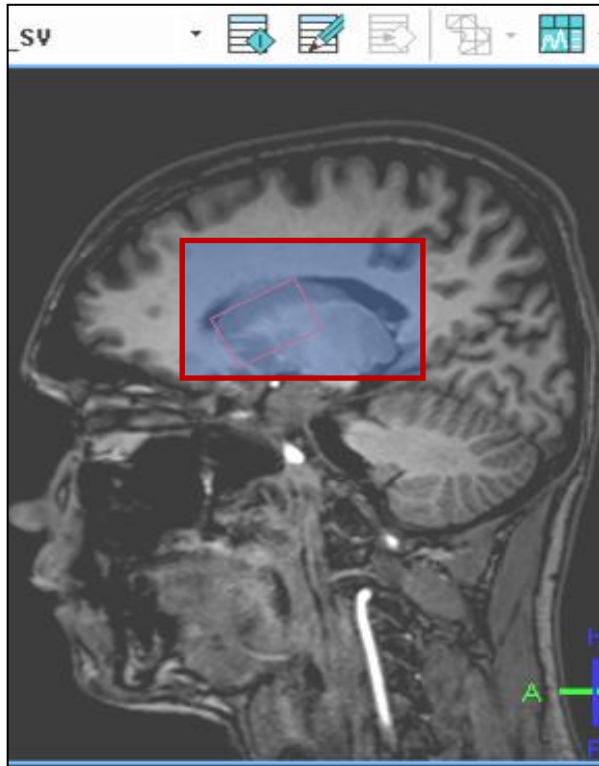


Photo from the Nobel Foundation archive.

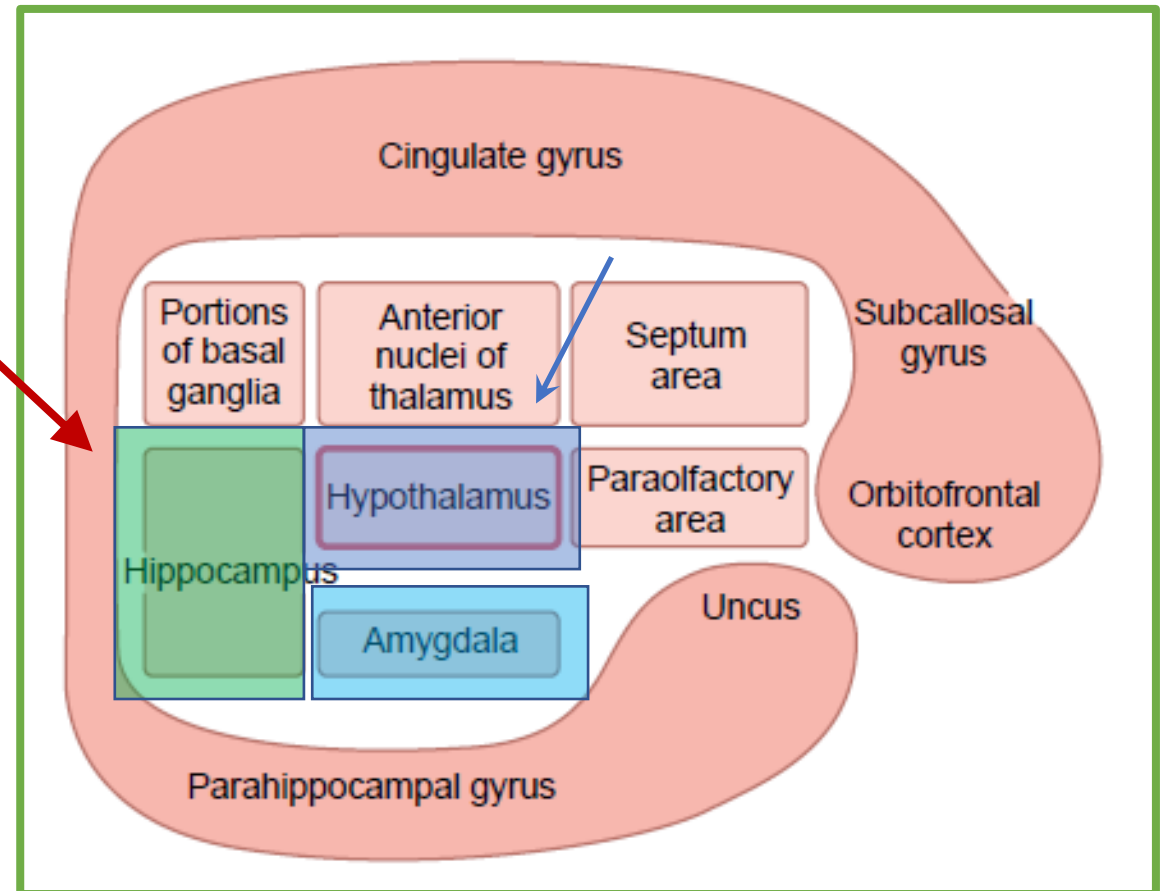
**Antonio Caetano de
Abreu Freire Egas
Moniz**

Prize share: 1/2

The Nobel Prize in Physiology or Medicine 1949 was divided equally between Walter Rudolf Hess "for his discovery of the functional organization of the interbrain as a coordinator of the activities of the internal organs" and Antonio Caetano de Abreu Freire Egas Moniz "for his discovery of the therapeutic value of leucotomy in certain psychoses."



Hypothalamus: Feedback Controller

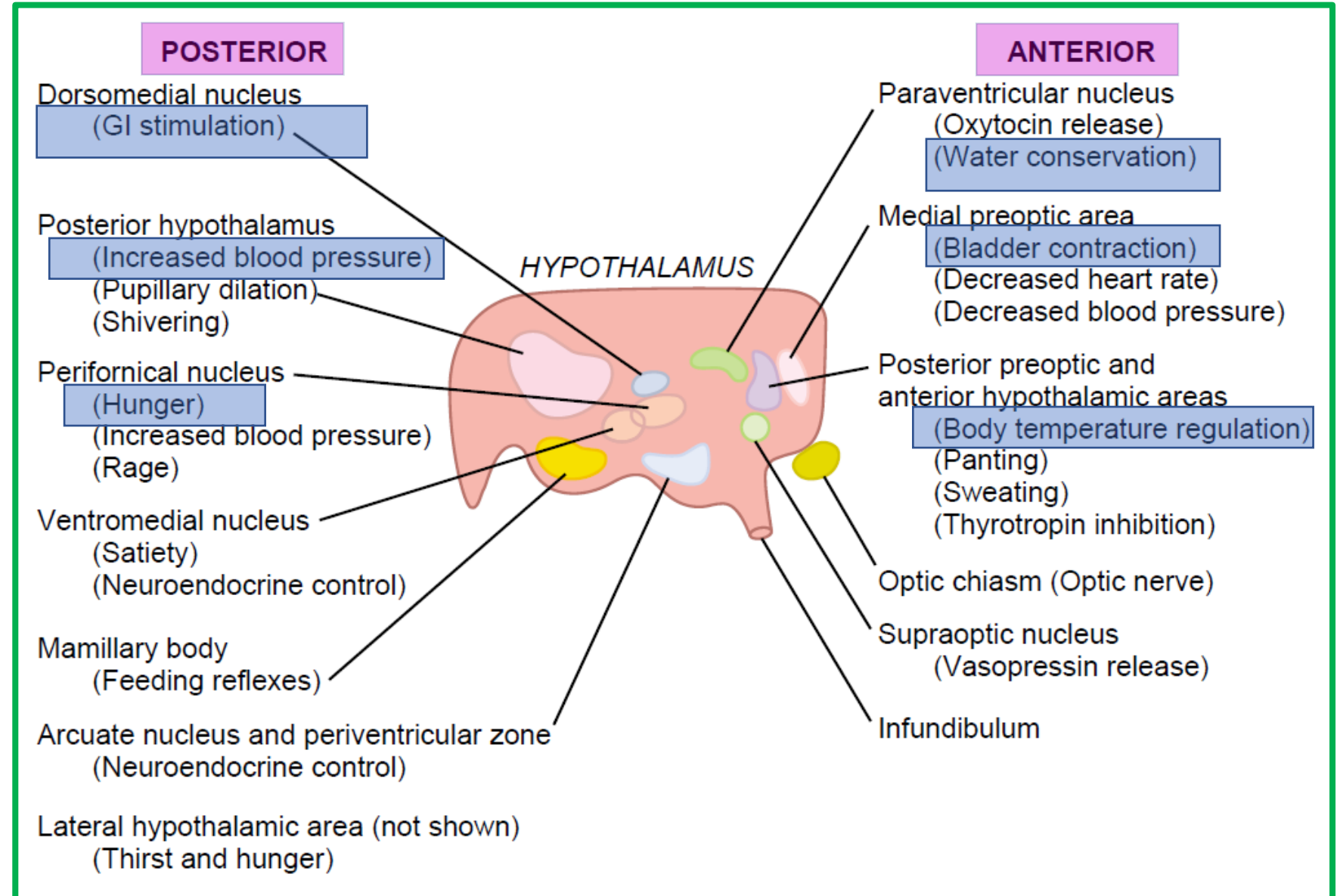


Recap.

Control centers of the hypothalamus



(sagittal view)



Amygdala:

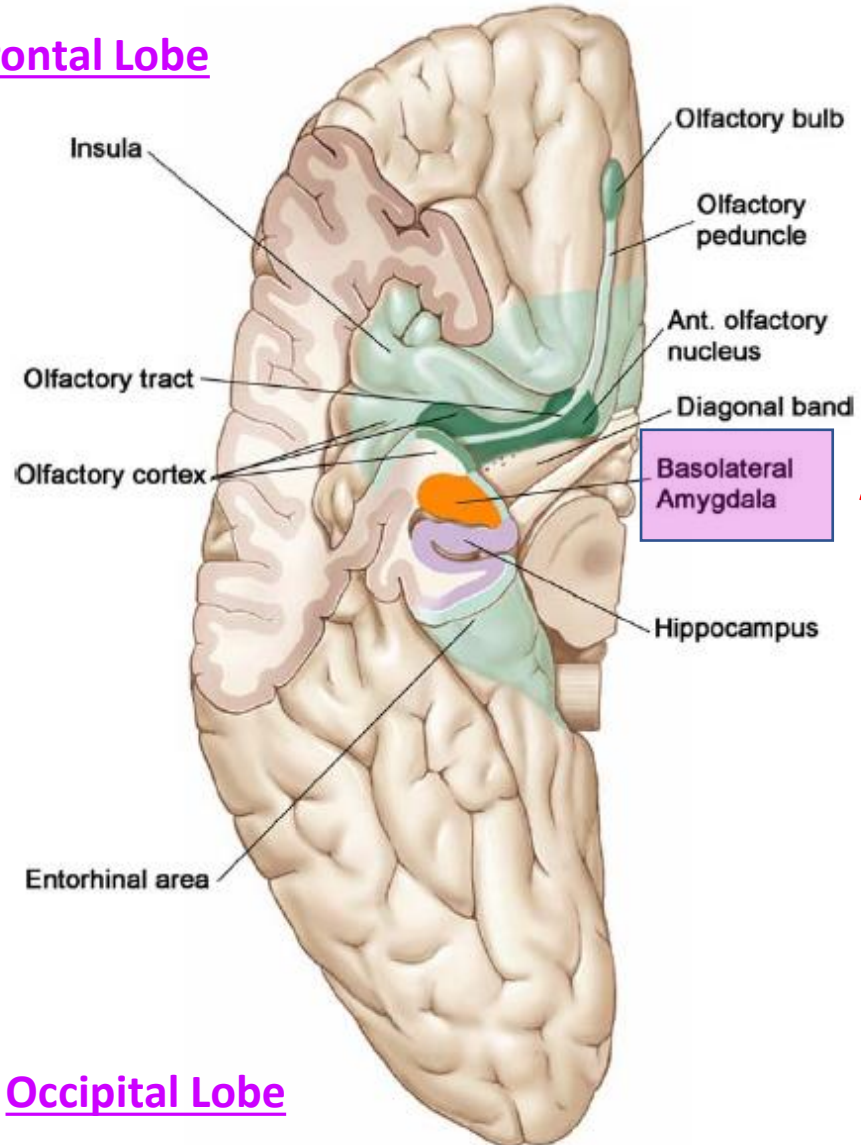
Emotion & Decision-Making Node

Recap.

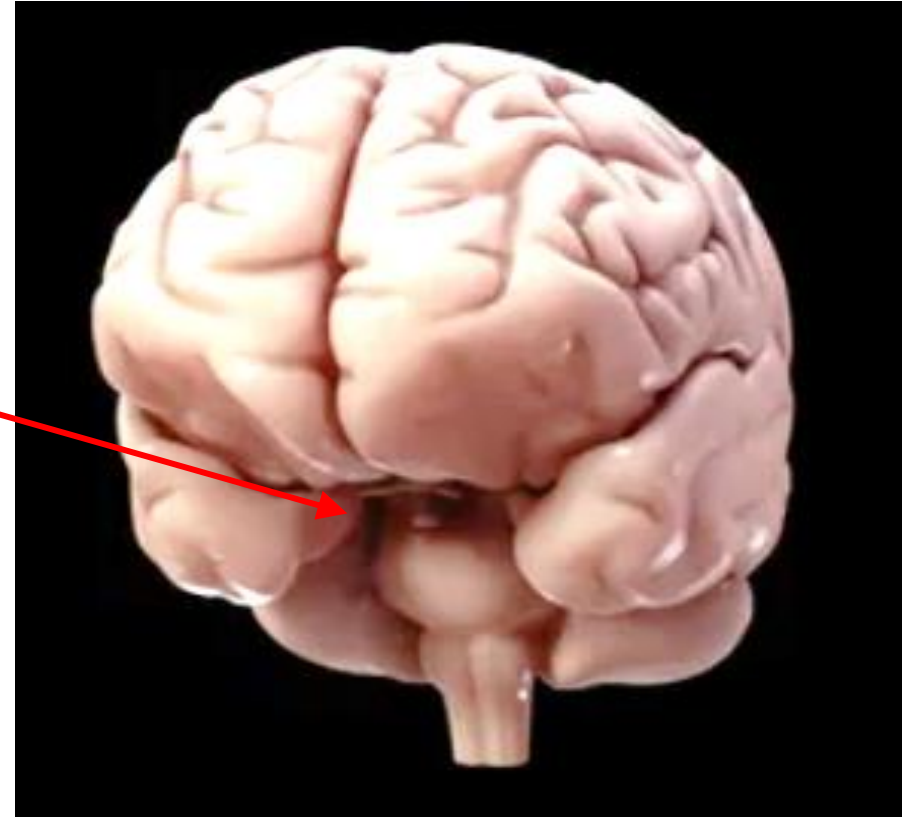
Brain's Underside:

Limbic, Frontal, Occipital, Temporal Lobes

Frontal Lobe

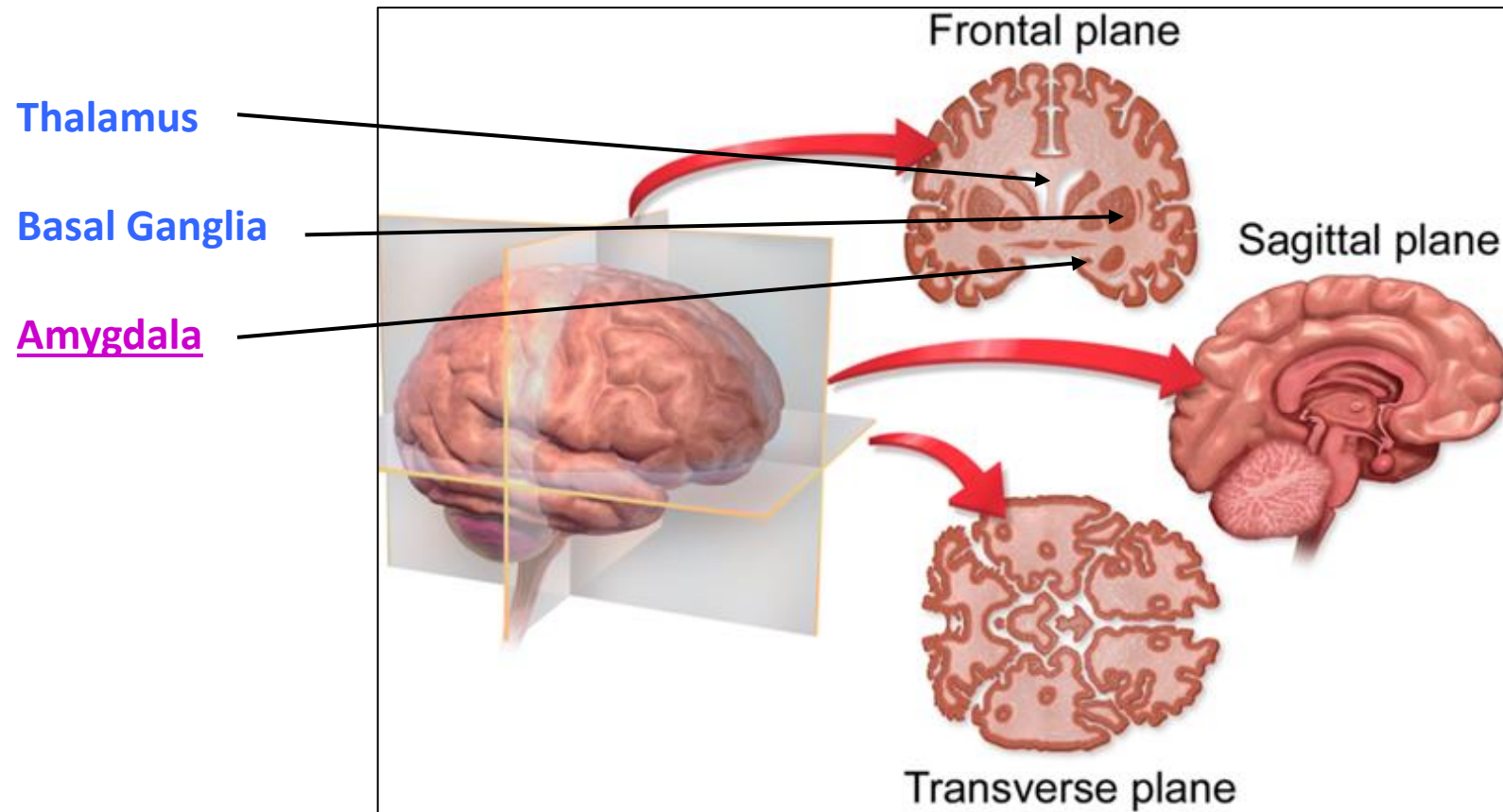


Occipital Lobe



Amygdala (Greek: Almond)

Coronal Section



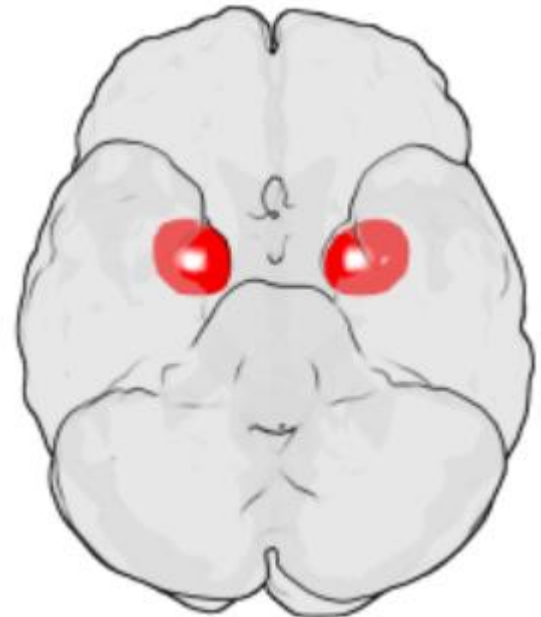
Functions:

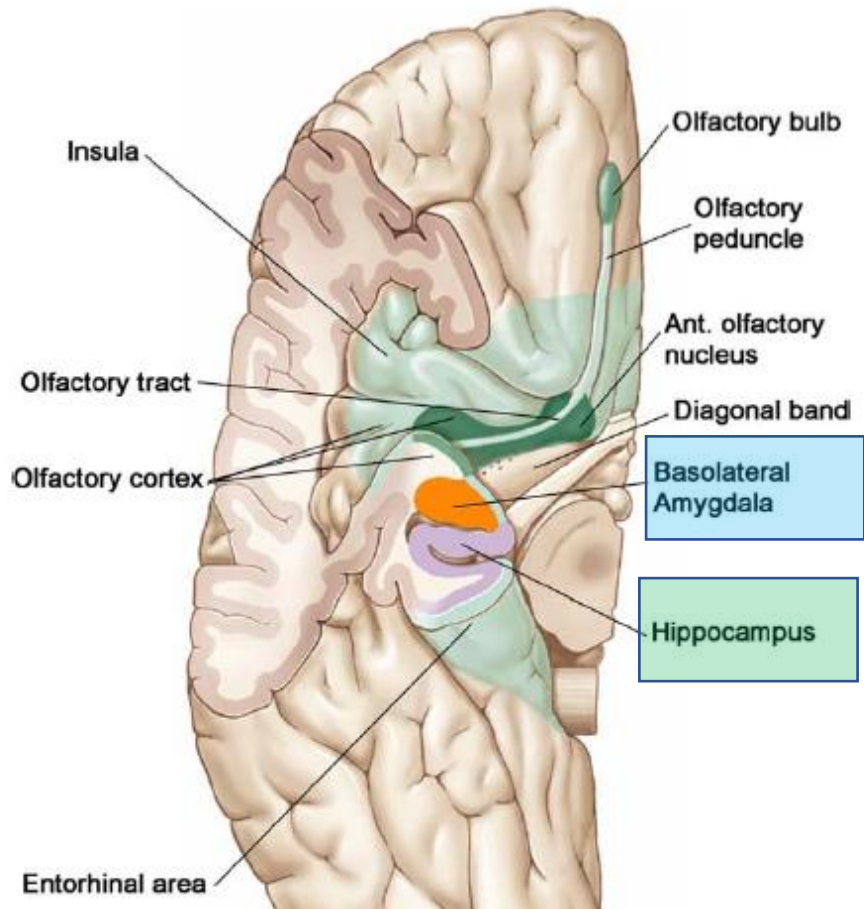
Decision-making;

Emotional Responses:

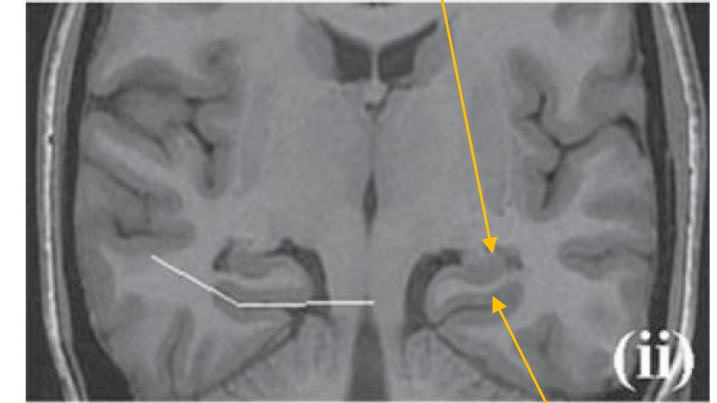
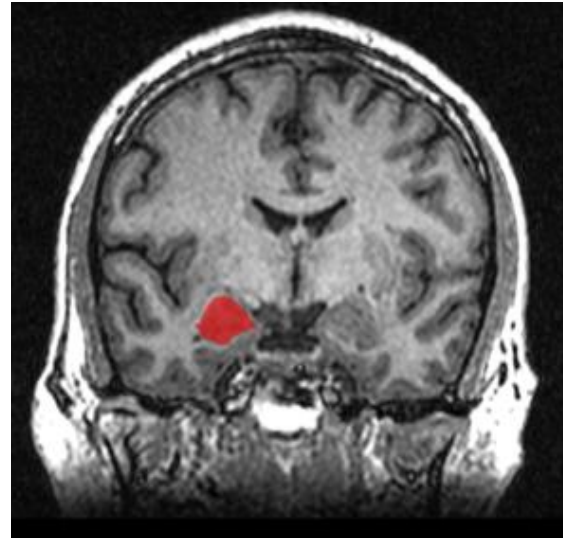
e.g. Fear, Anxiety, Aggression

Amygdala in Ventral View
(Brain's Undersurface)





MRI Scan (Coronal Section)



Hippocampus

Amygdala

Amygdala Stimulated by:

Random Ink-bLOTS
(Rorschach Test)



Neuroradiology
DOI 10.1007/s00234-015-1540-6

DIAGNOSTIC NEURORADIOLOGY

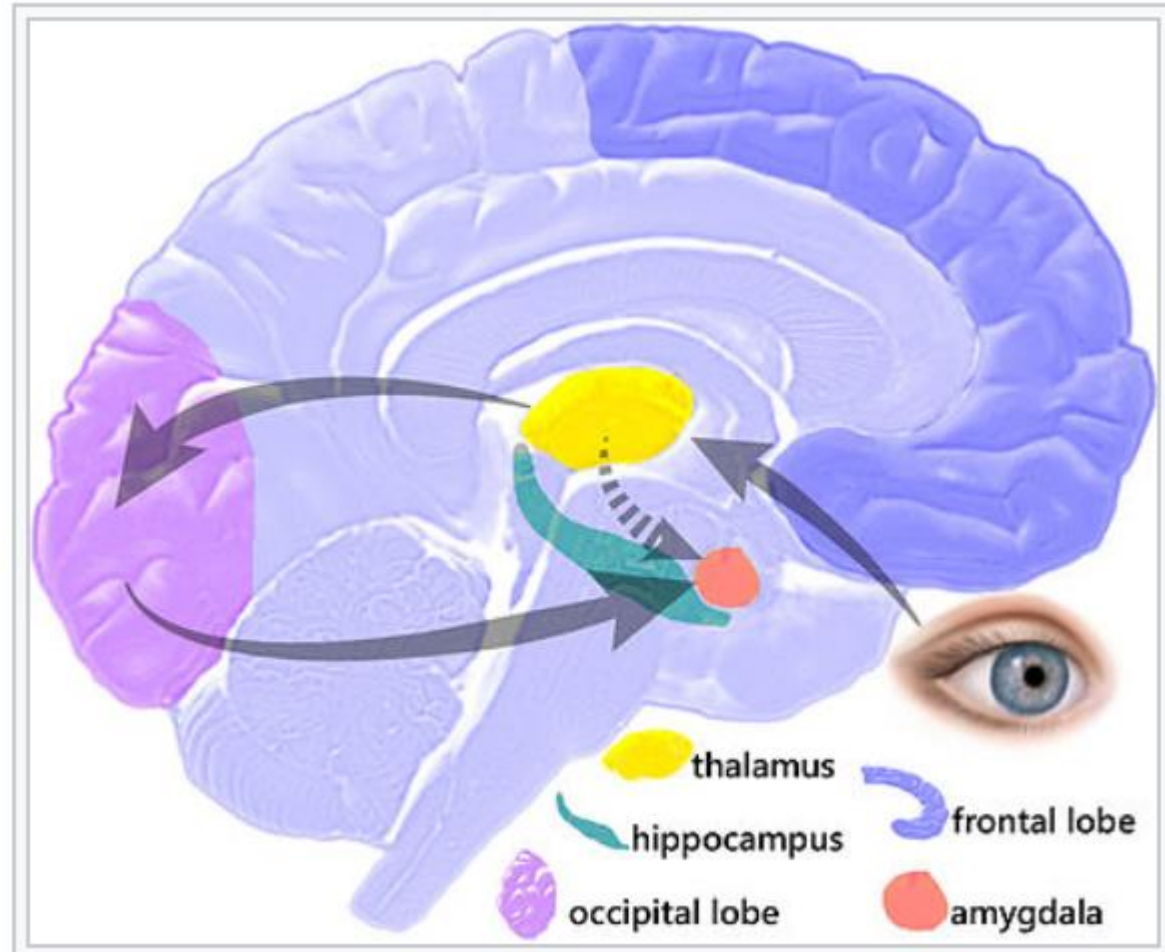
MRI characterization of temporal lobe epilepsy using rapidly measurable spatial indices with hemisphere asymmetries and gender features

Siddhartha Datta¹ • Sudipta Sarkar² • Sumit Chakraborty² • Sai Krishna Mulpuru³ •
Swadhapiya Basu² • Basant K. Tiwary⁴ • Nilkanta Chakrabarti¹ •
Prasun Kumar Roy^{5,6}

Amygdala Hijacking:

Positive Feedback Node:

Sudden Fear & Panic Attacks
caused by Unpleasant Visual Stimulus

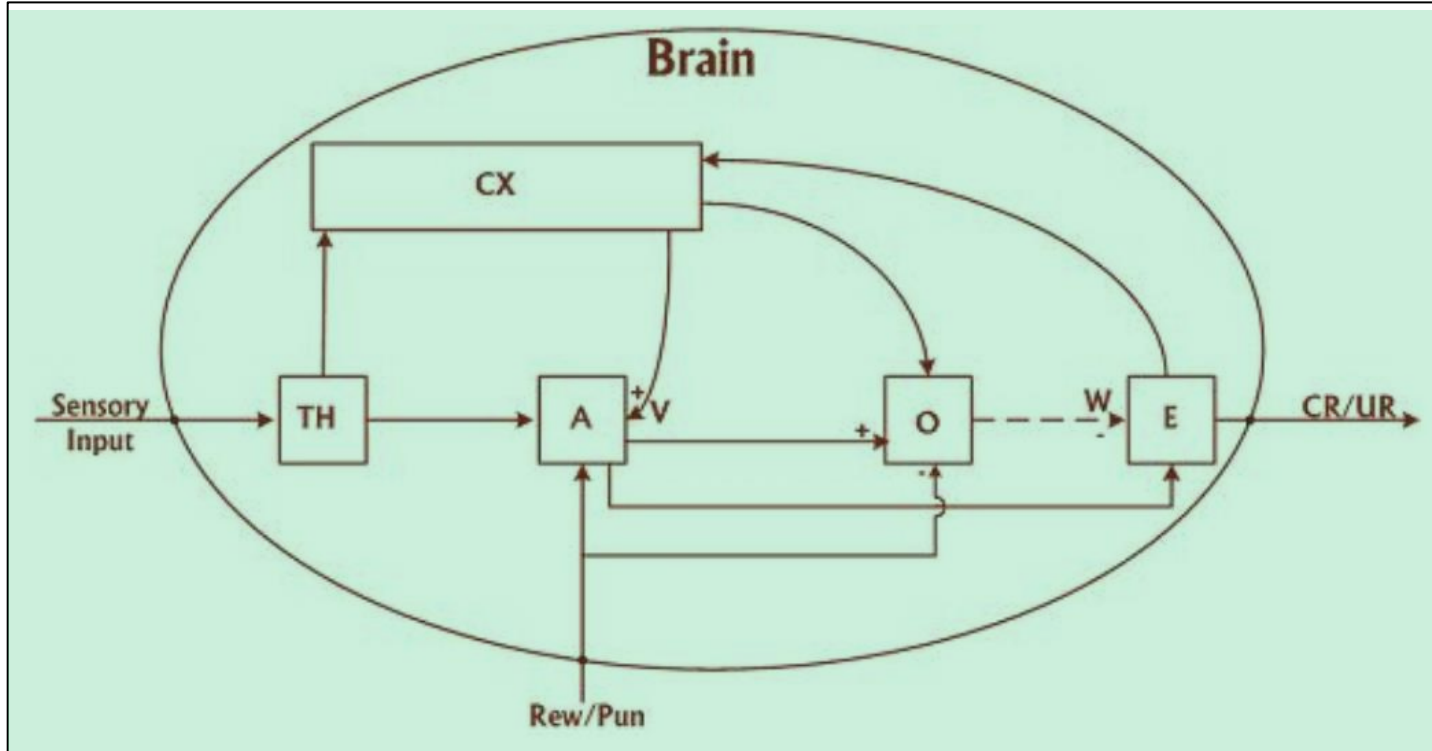


NeuroMorphic Computing Application (Brain-Inspired Computational Architecture):

Evolutionary algorithm: To Solve and analyze complex computational problems. “Emotive Computing”

“BEL-BIC” (*Brain Emotional Learning Based Intelligent Controller*): For Modelling of Human Emotion:

Simulation of Neuro-Cognitive Circuitry of Amygdala, Orbito-Frontal cortex, Thalamus.



Evolutionary algorithm: To Solve and analyze complex computational problems

Neurocomputing & Immunocomputing

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IEEE TRANSACTIONS ON EVOLUTIONARY COMPUTATION, VOL. 6, NO. 3, JUNE 2002

From Neurocomputation to Immunocomputation—A Model and Algorithm for Fluctuation-Induced Instability and Phase Transition in Biological Systems

Prasun K. Roy, Robert Kozma, and D. Dutta Majumder

