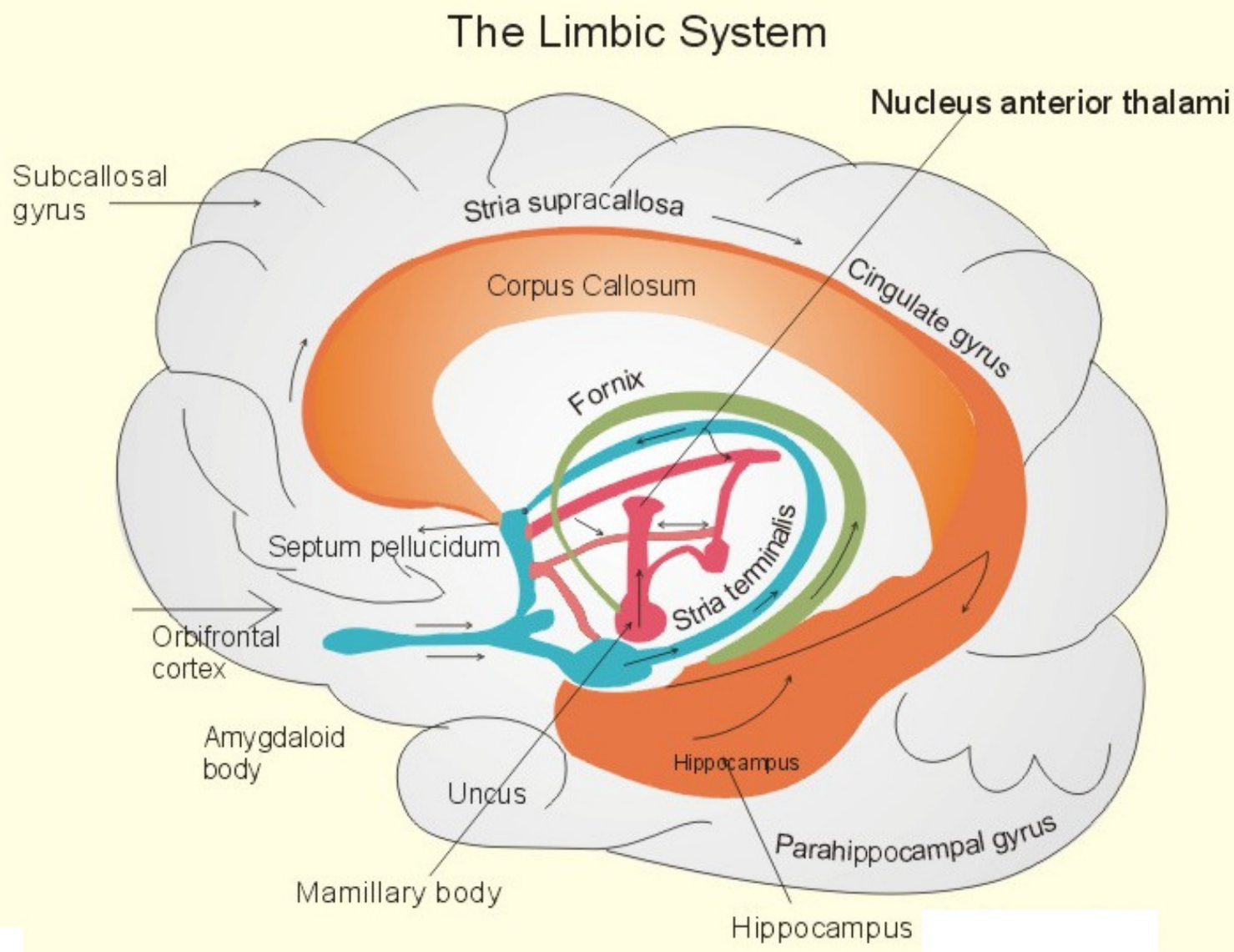
Limbic system

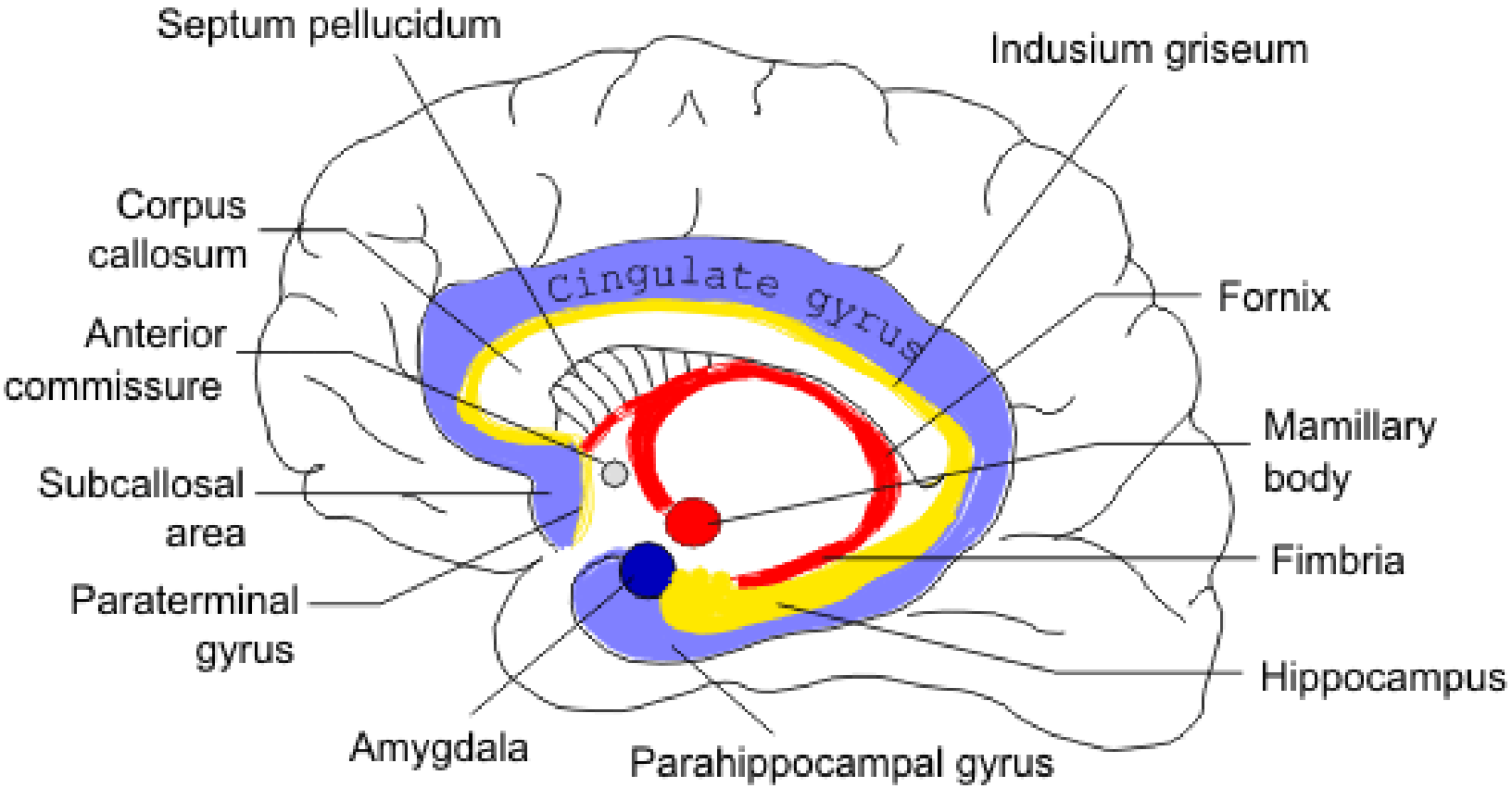
- Cortical structures
  - Limbic lobe
  - Hippocampal formation
  - Prefrontal cortex
  - Septal areas
- Subcortical structures
  - Hypothalamus
  - Anterior neuclus of thalamus
  - Amygdaloid necleus
- Connecting pathways
  - Fornix
  - Cigulum



- Straia terminalis
- Medial forebrain bundle

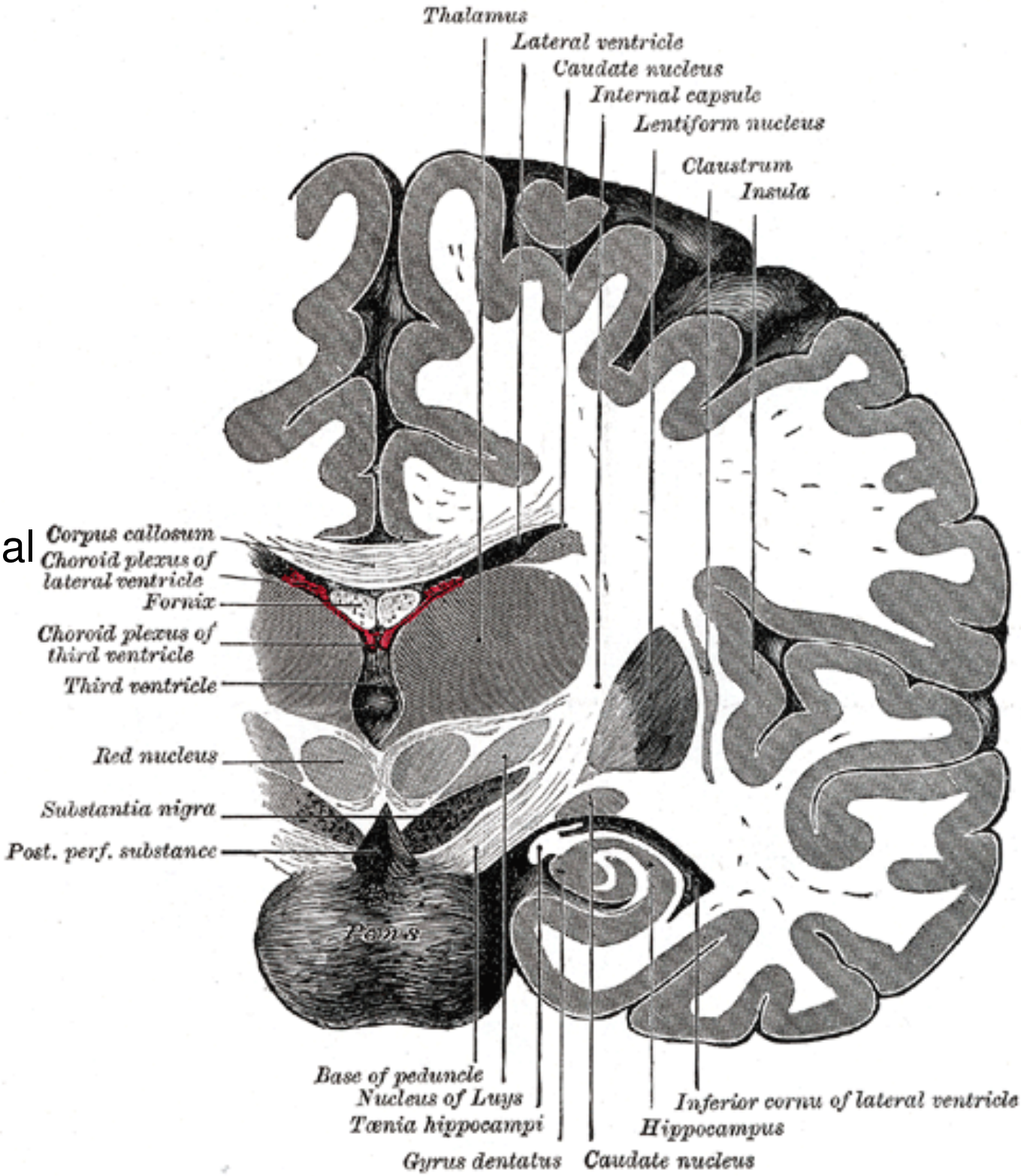
The Limbic System

- **Limbic lobe:** C shape group of structures seen on the medial surface of the brain between the cerebral cortex and diencephalon



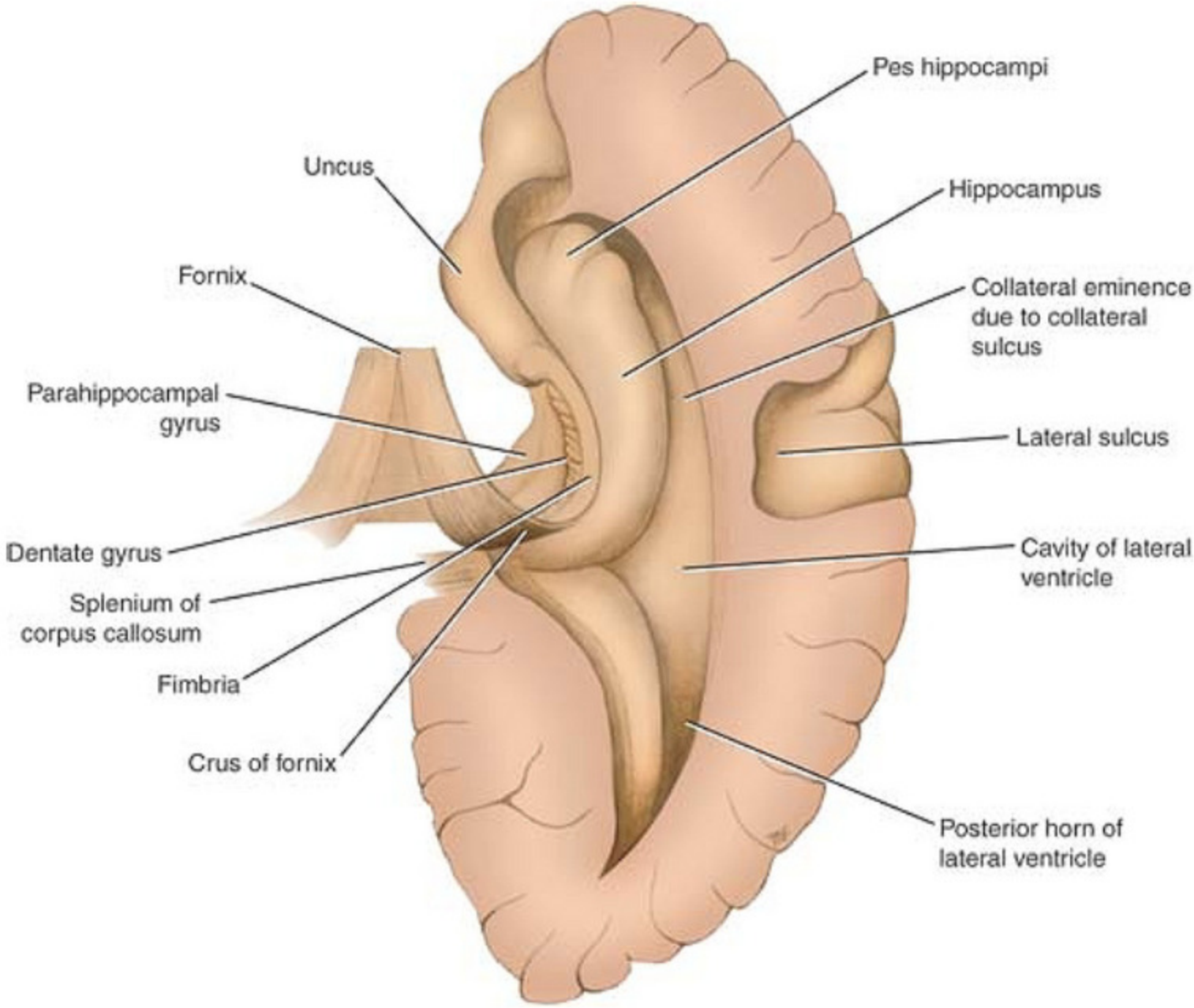
- Components
  - Subcollosal area
  - Isthmus
  - Cingulate gyrus
  - Parahippocampal gyrus
  - Uncus

- The hippocampal formation consists of
  - Hippocampus
  - Dentate gyrus
  - Parahippocampal gyrus



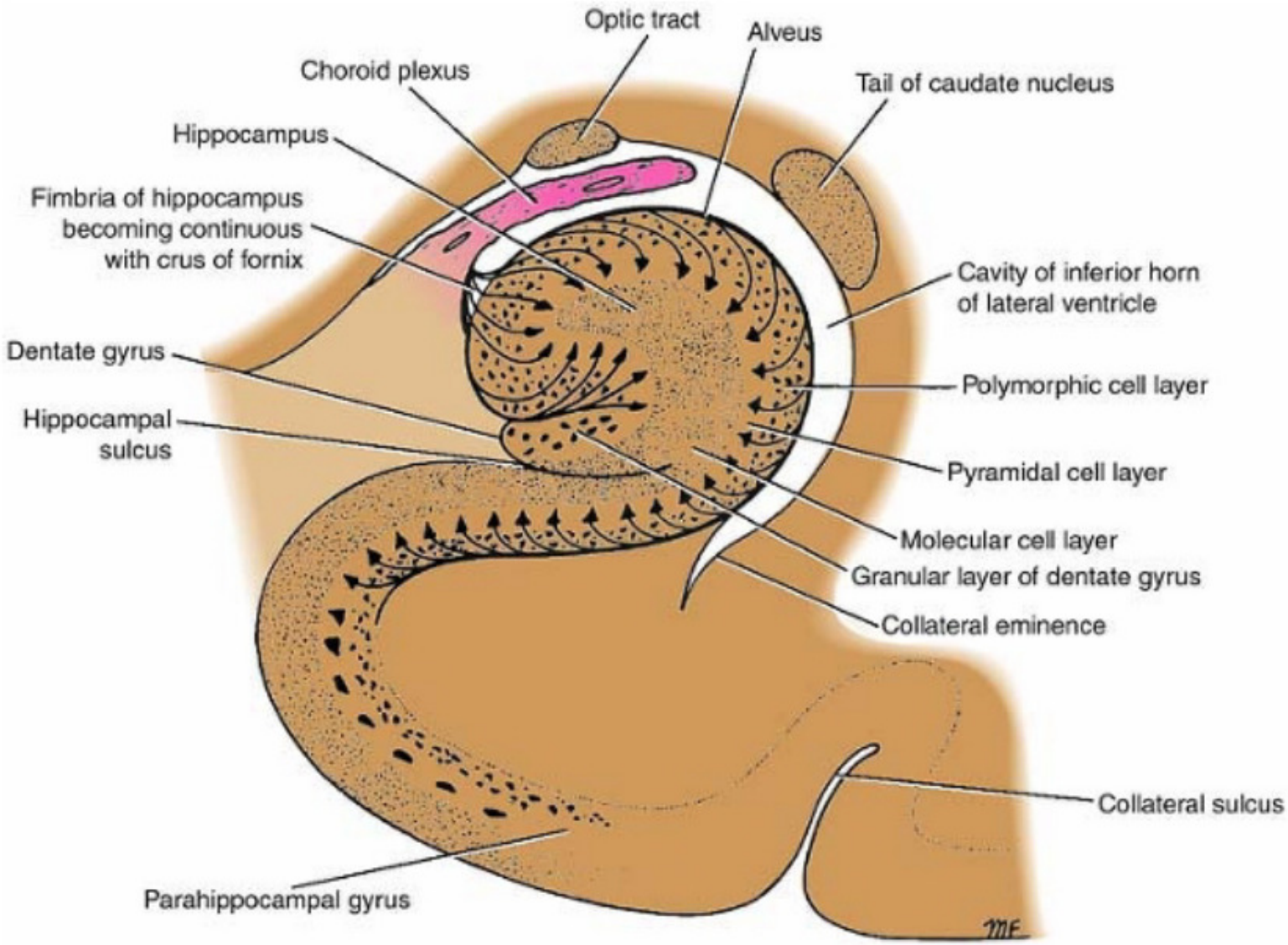
Hippocampus

- Curved elevation of gray matter that extends throughout the entire length of the floor of the inferior horn of the lateral ventricle
- **Anterior end**: pes hippocampus
- **Posterior end:** beneath the splenium of the corpus callosum



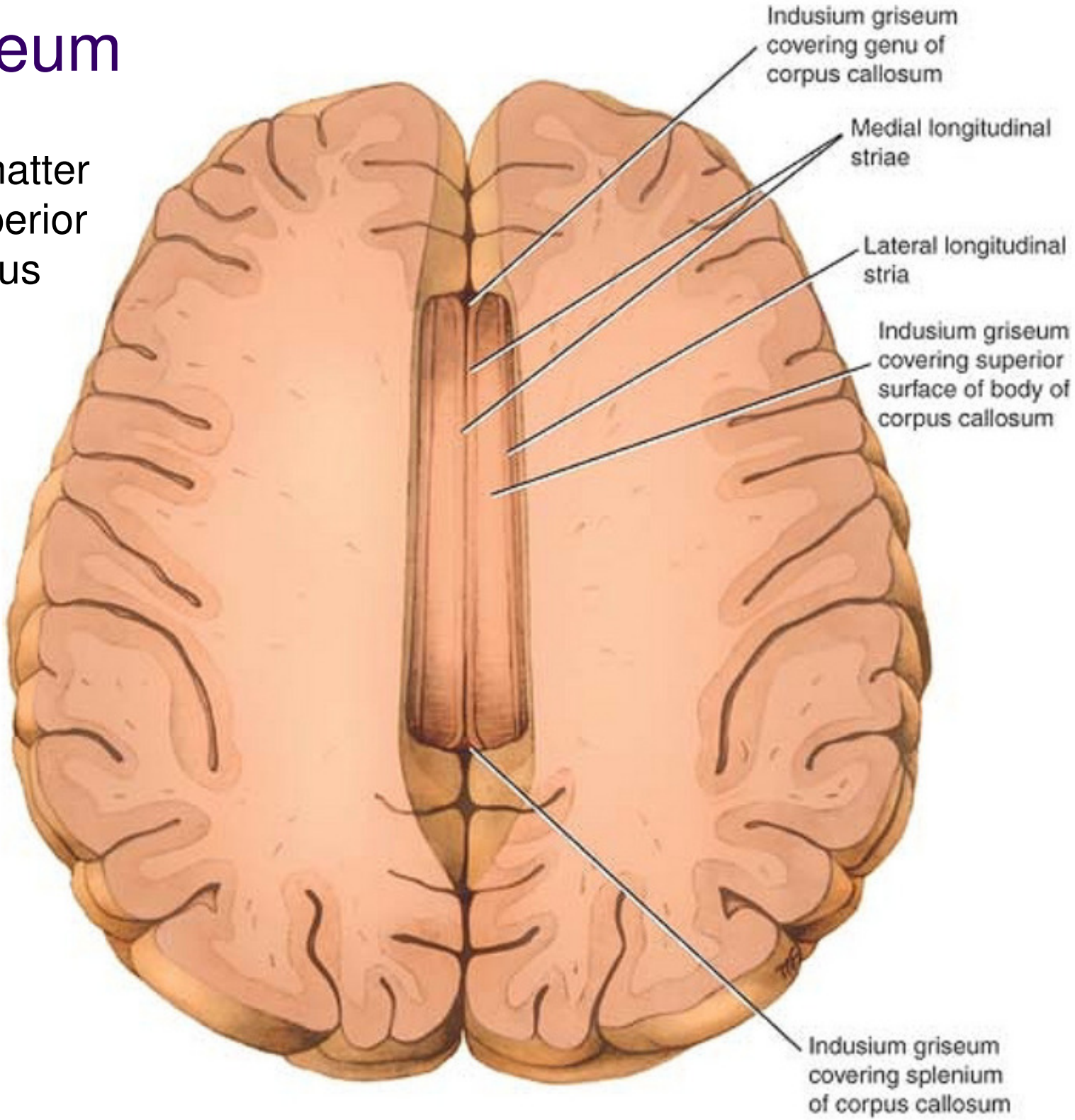
- **Alveus:** thin layer of white matter covering the ventricular surface of the hippocampus),
- **fimbria**
- **Crus** of the fornix
- **Dentate gyrus:**
  - narrow, notched band of gray matter that lies between fimbria and parahippocampal gyrus
  - **Anteriorly:** continued into the **uncus**

Posteriorly: becomes continuous with the **indusium griseum**



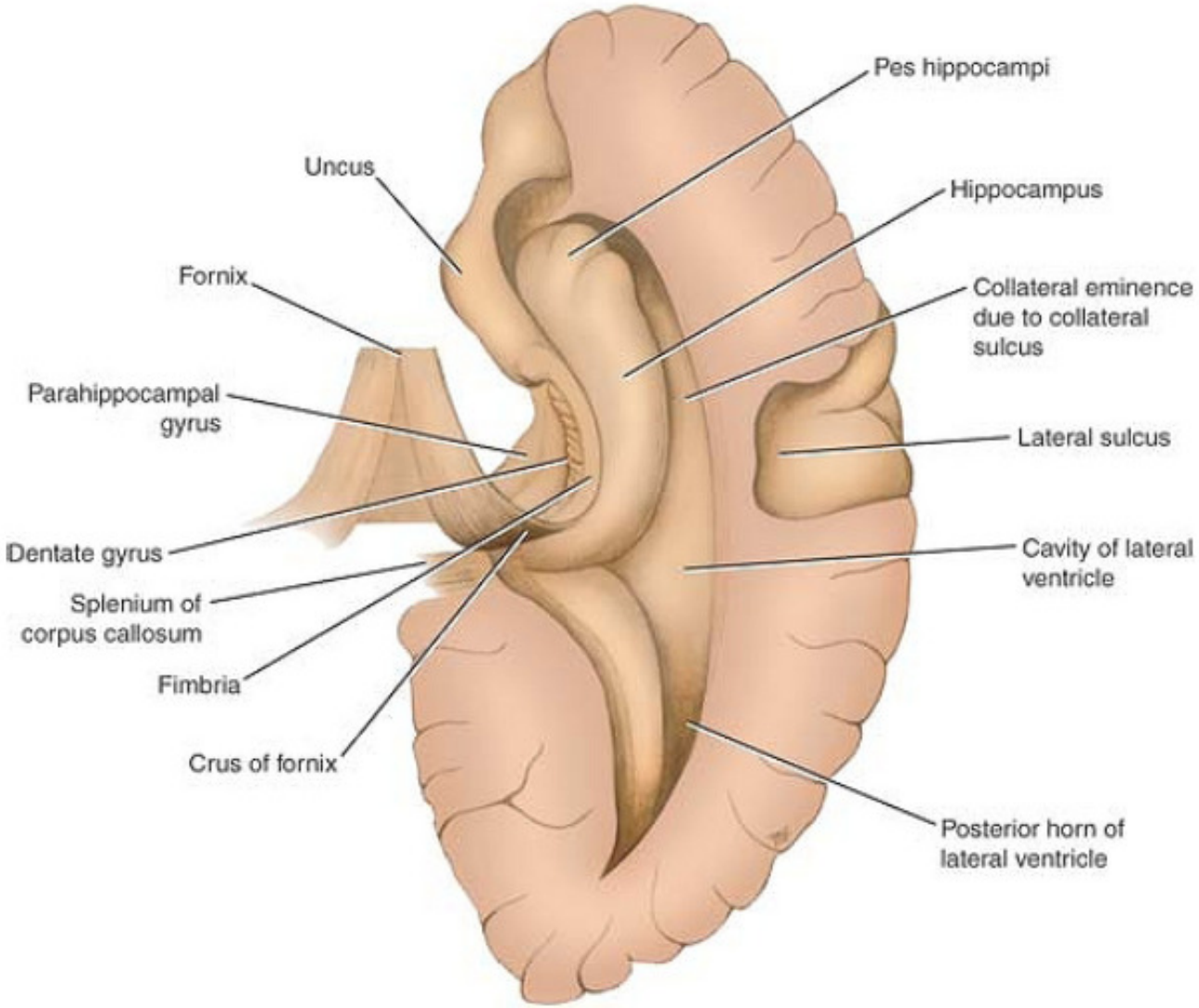
Indusium griseum

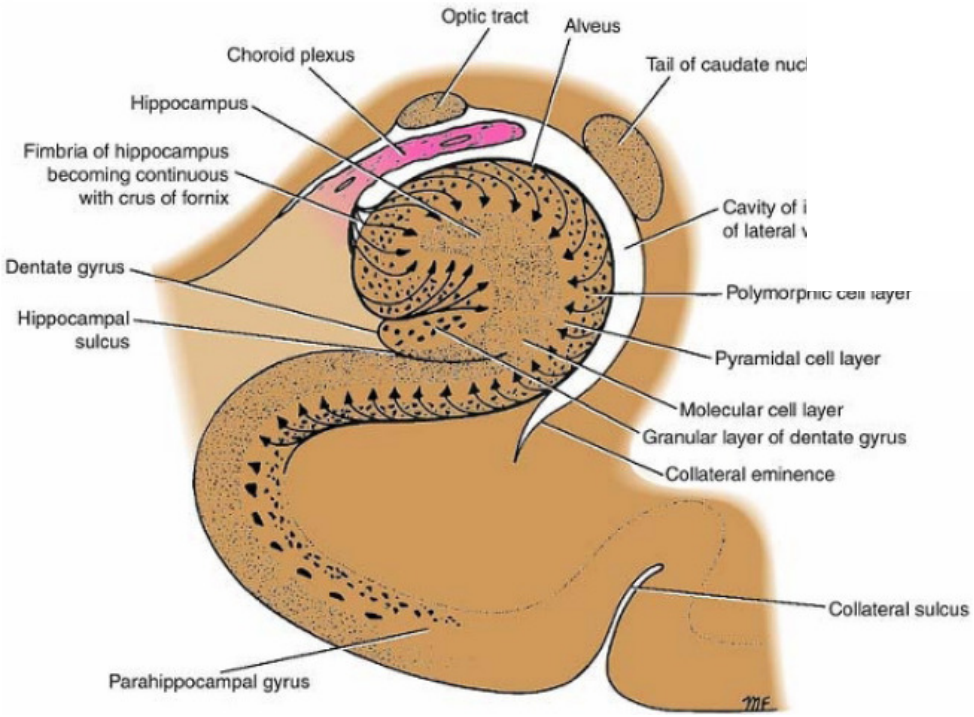
- thin layer of gray matter that covers the superior surface of the corpus callosum



The fornix

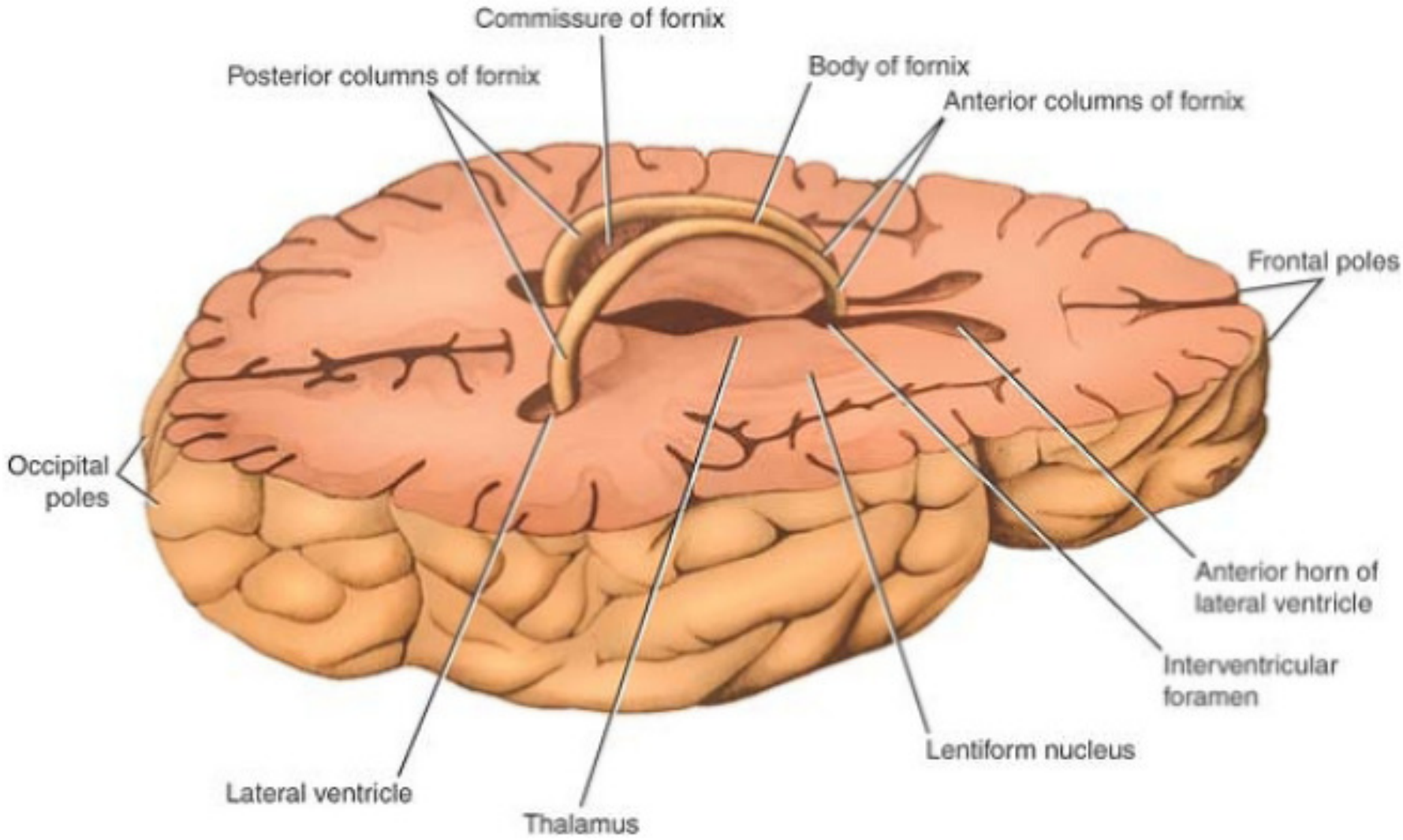
- From the hippocampus to the hypothalamus.





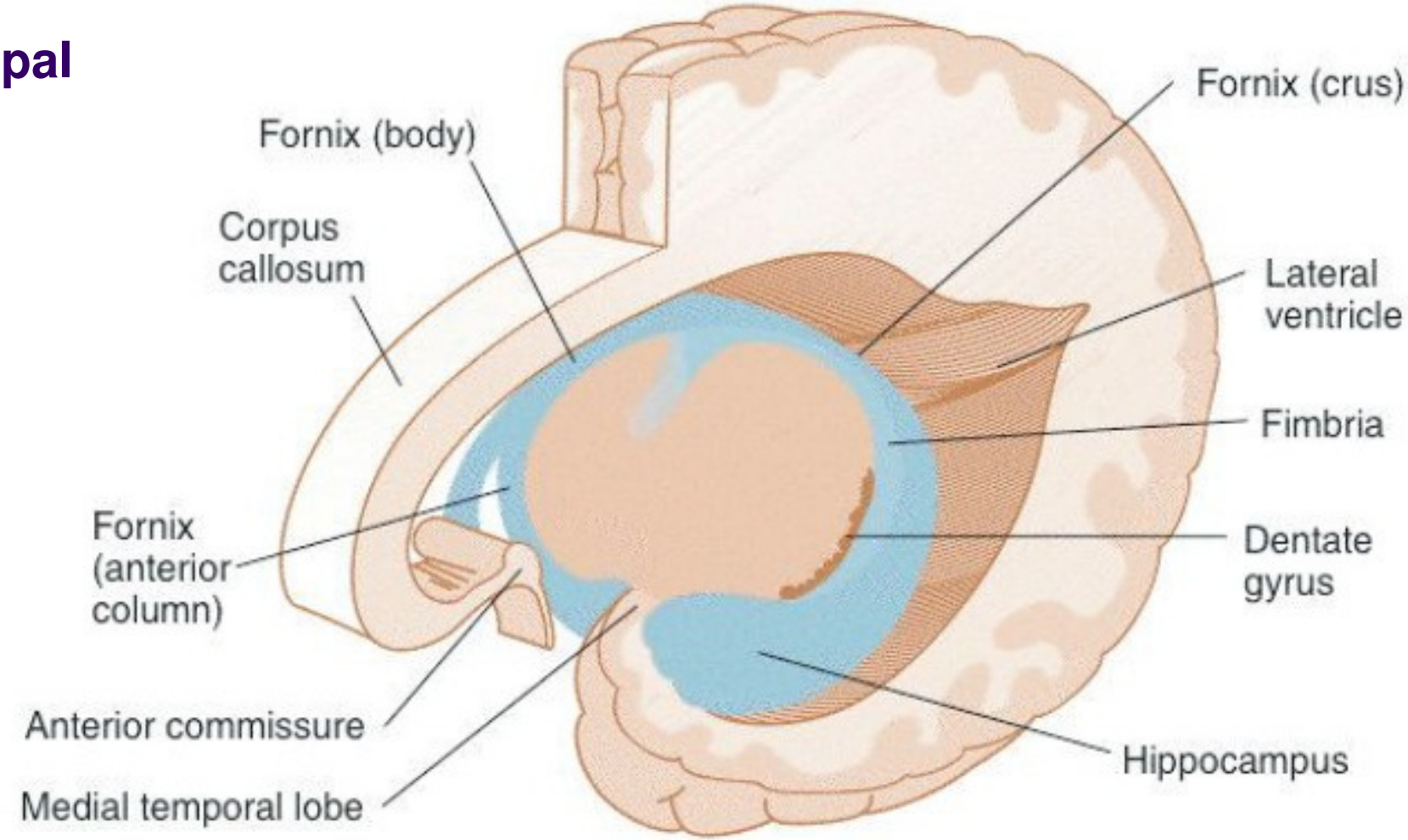
- The nerve fibers first form the alveus, (thin layer of white matter covering the ventricular surface of the hippocampus), then converge to form the fimbria.

Fornix



- The fimbriae of the two sides arch forward above the thalamus and below the corpus callosum to form the posterior columns of the fornix.
- The two columns then come together in the midline to form the body of the fornix
- The commissure of the fornix consists of transverse fibers that cross the midline from one column to another just before the formation of the body of the fornix.

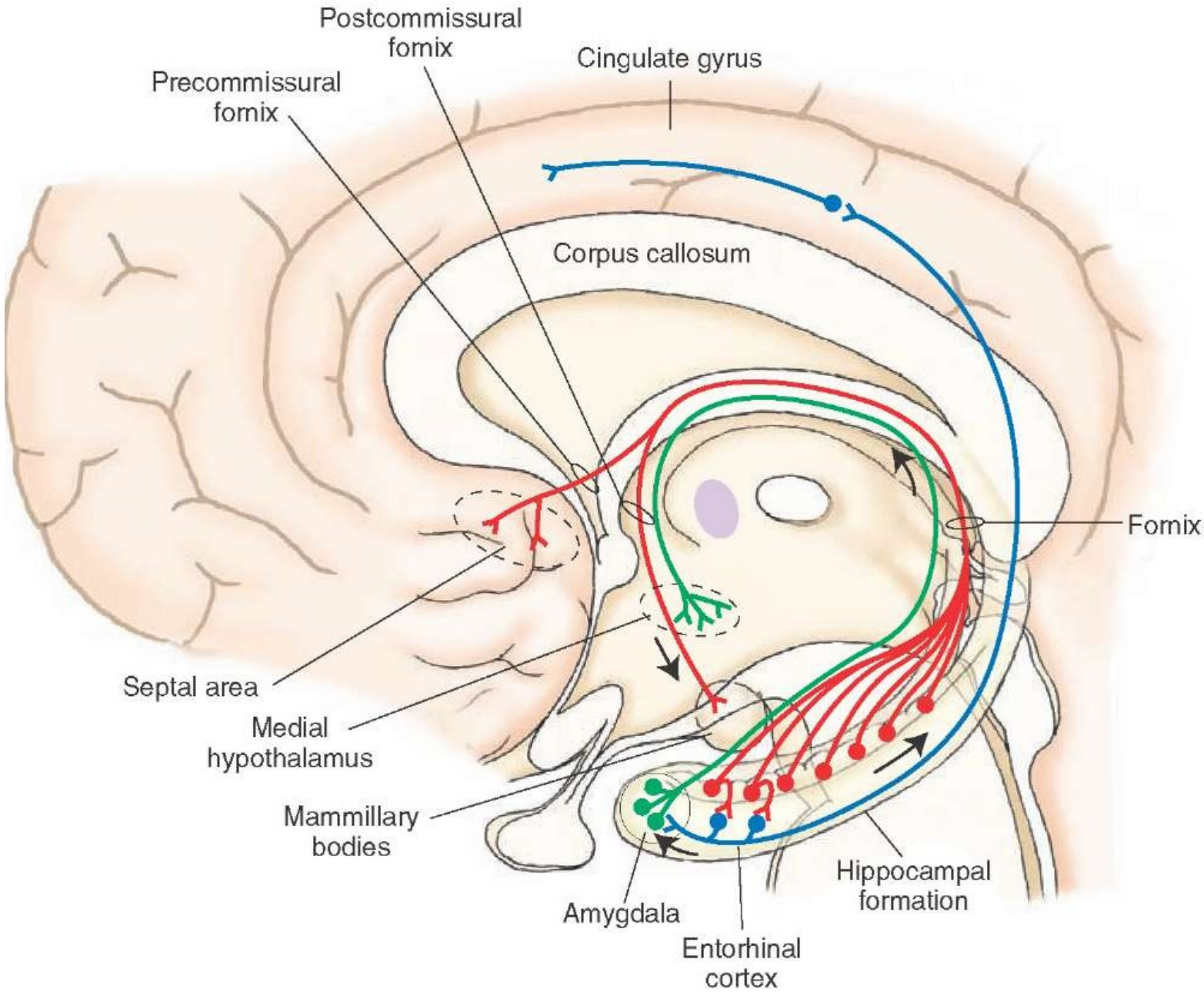
The hippocampal formation



- Hippocampus
- Dentate gyrus
- Parahippocampal gyrus

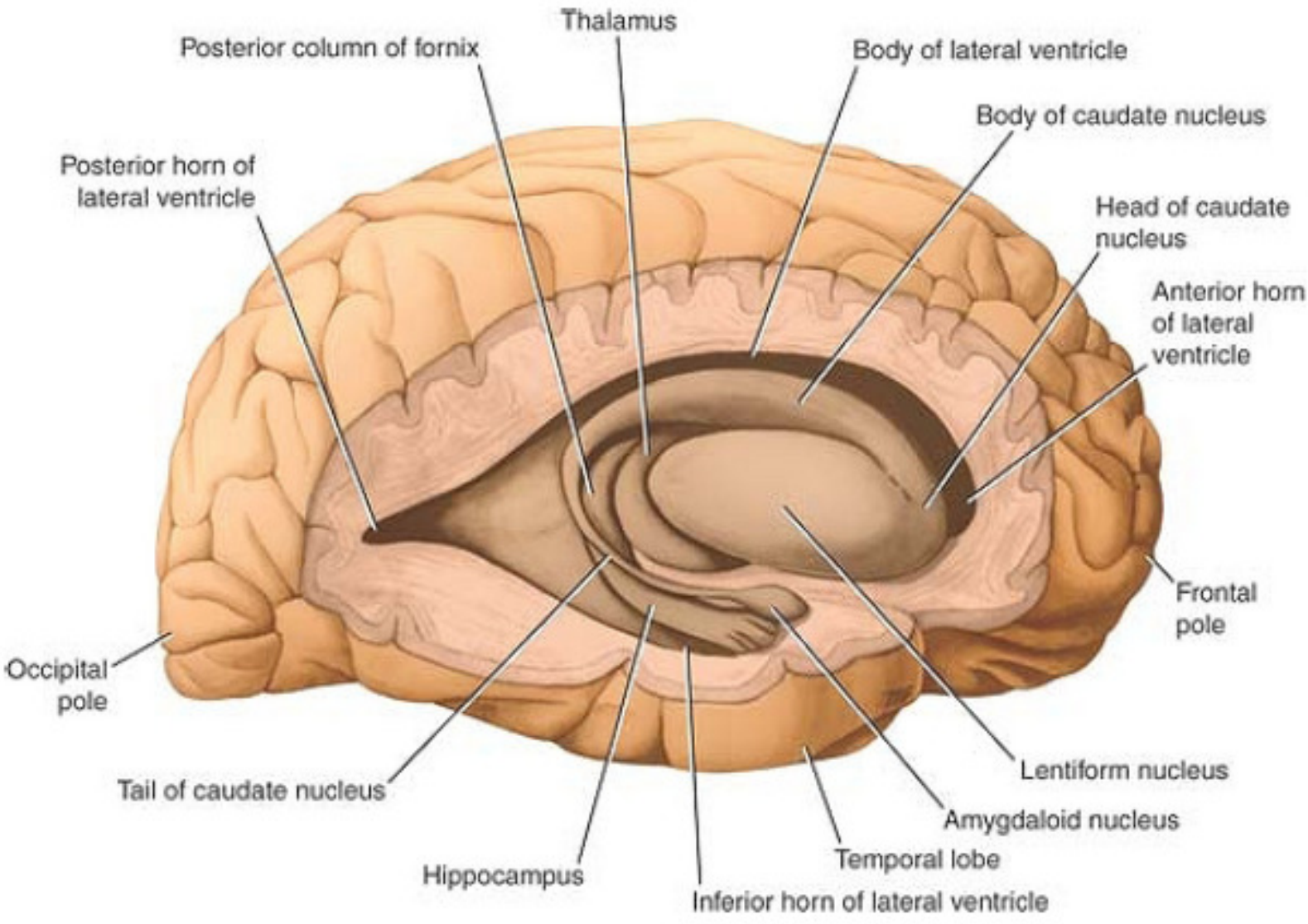
Septal areas

- Grey matter in the septum pallucidum in front of lamina terminalis
- Connections from the olfactory bulb, hippocampus, hypothalamus, amygdala
- Centre of pleasure



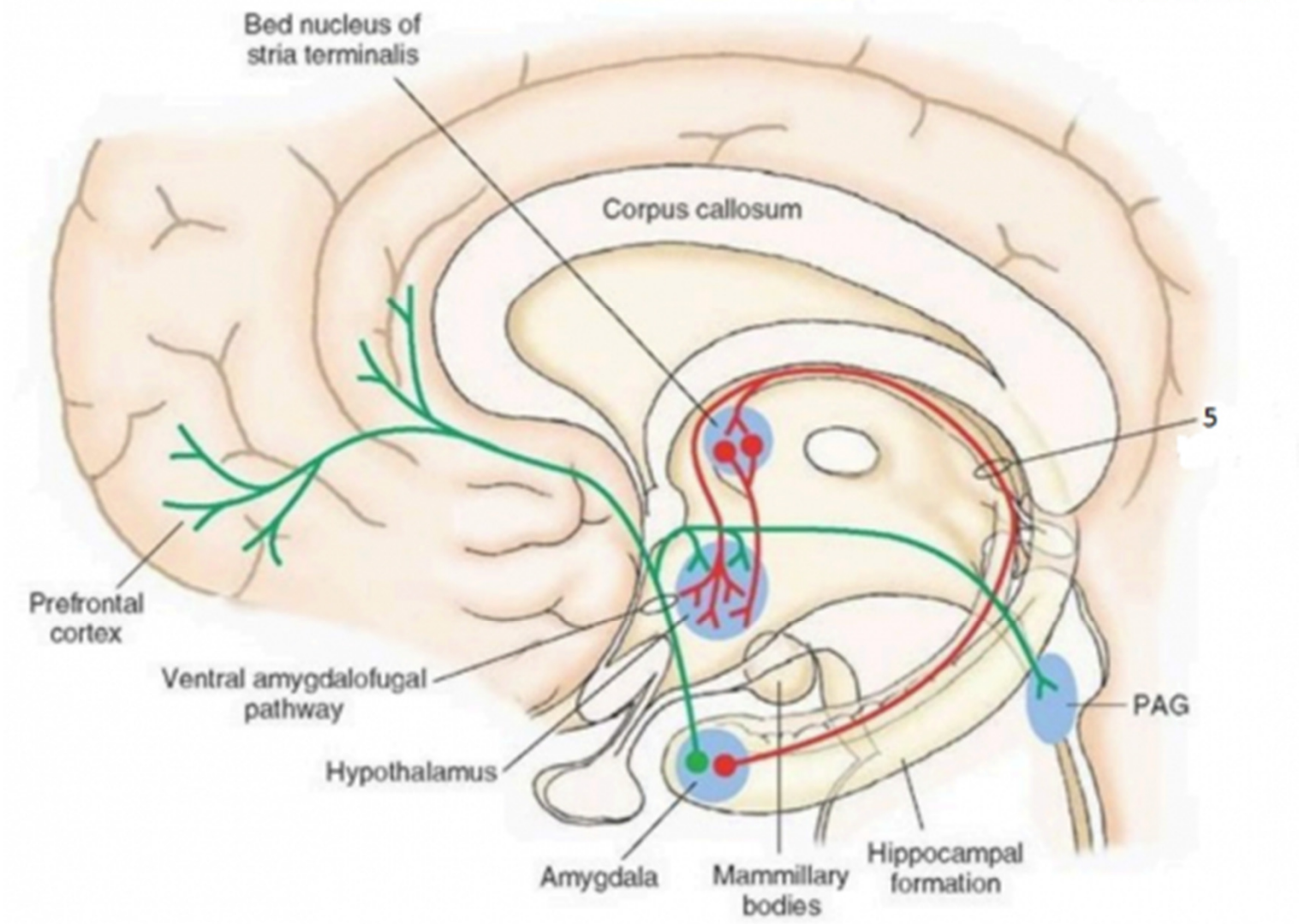
Amygdaloid nucleus

- Anatomically (basal ganglia)
- Functionally limbic system
- Involved in:
  - Memory
  - Decision making
  - Emotions

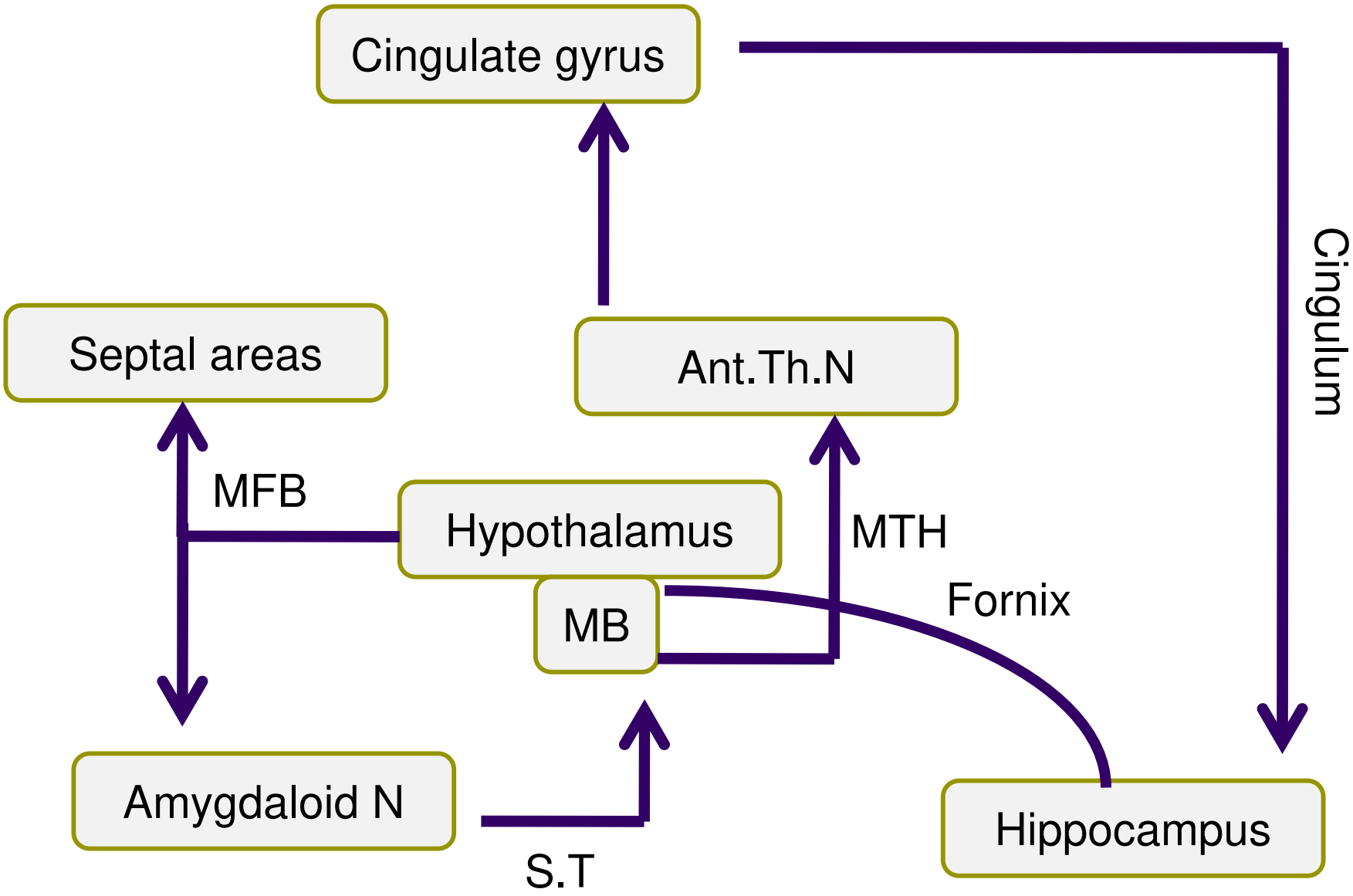


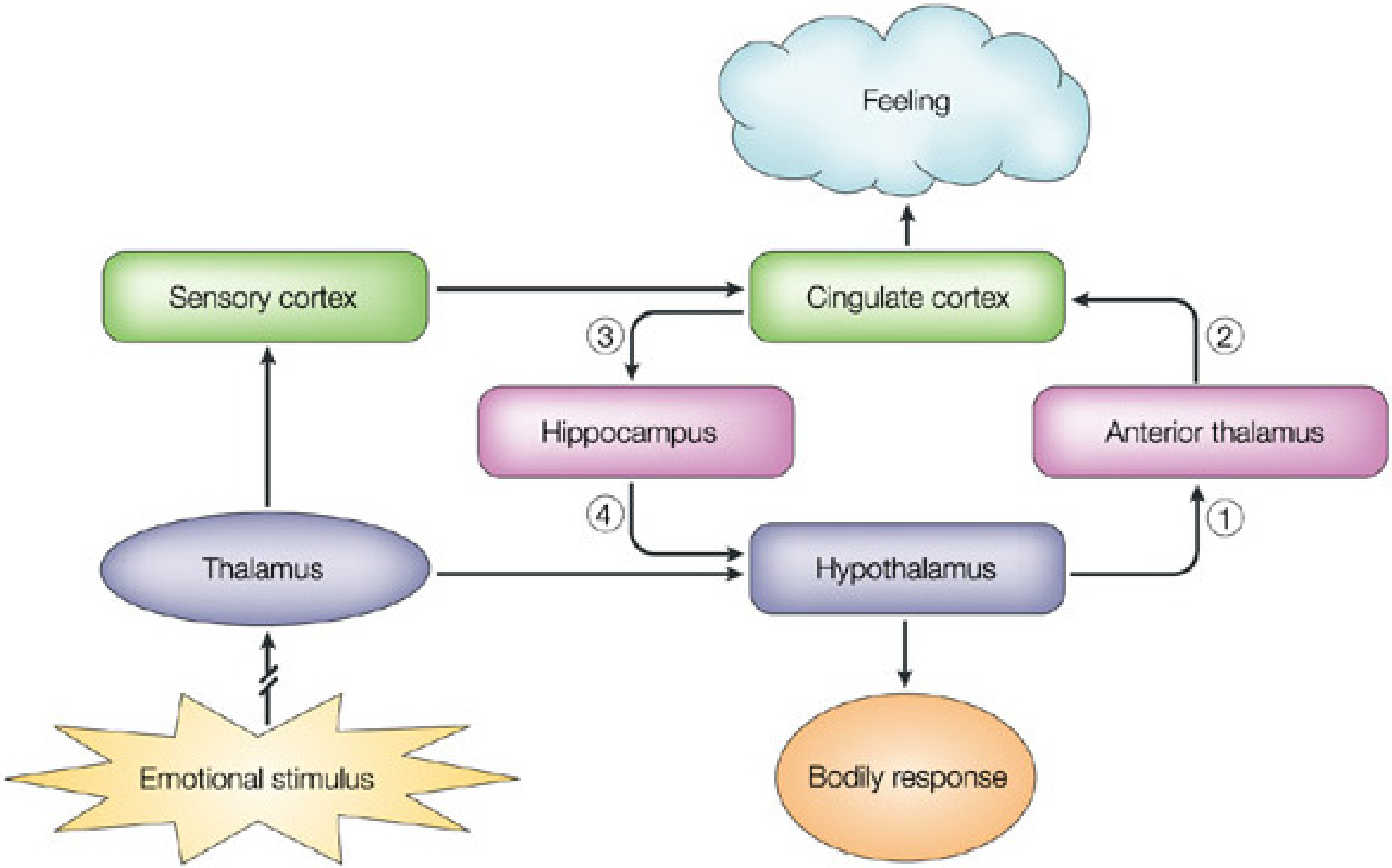
Connecting pathways

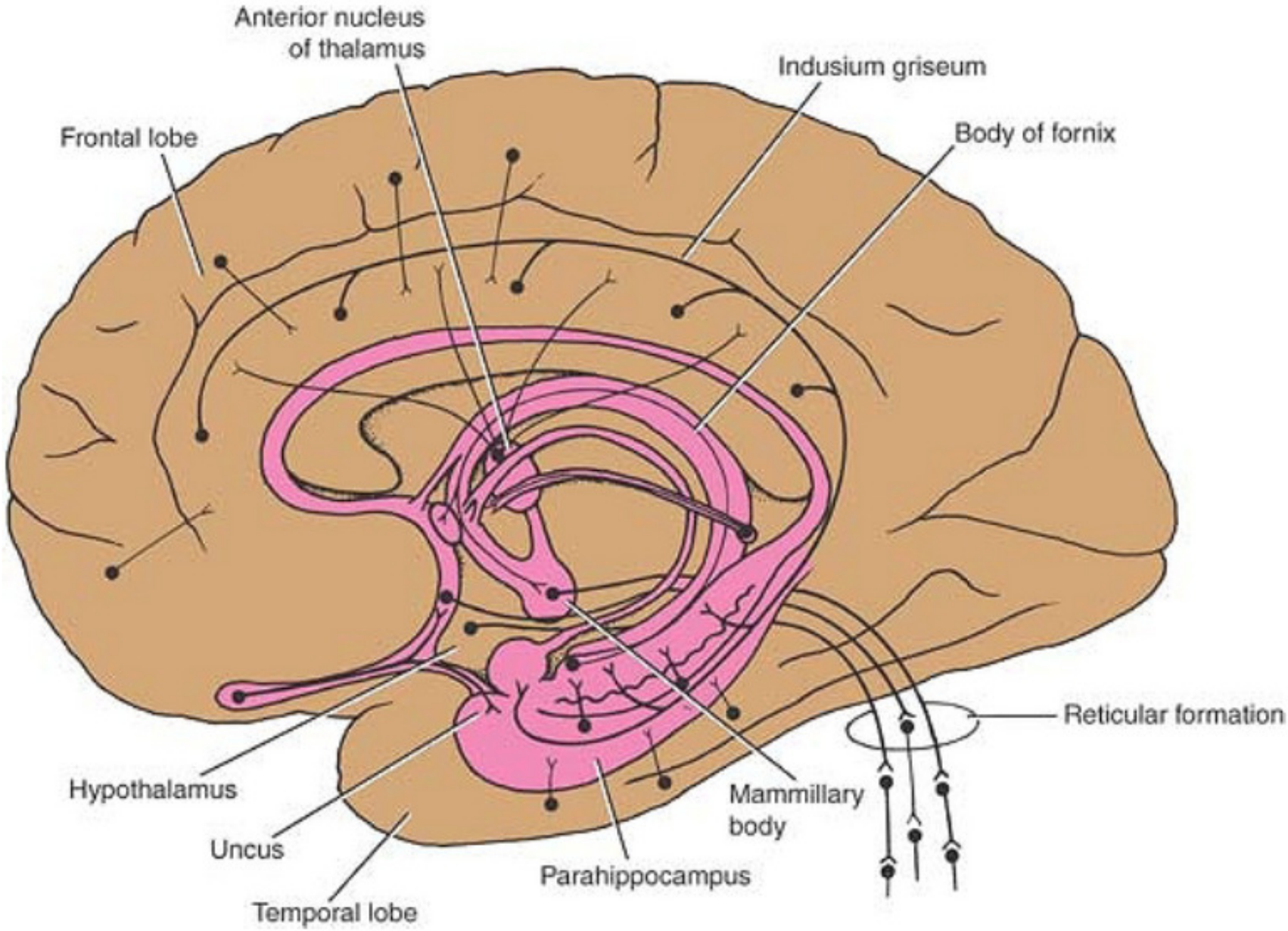
- **Stria terminalis** bundle of nerve fibers runs posteriorly in the roof of the inferior horn of the lateral ventricle on the medial side of the tail of the caudate nucleus



Papez circuit

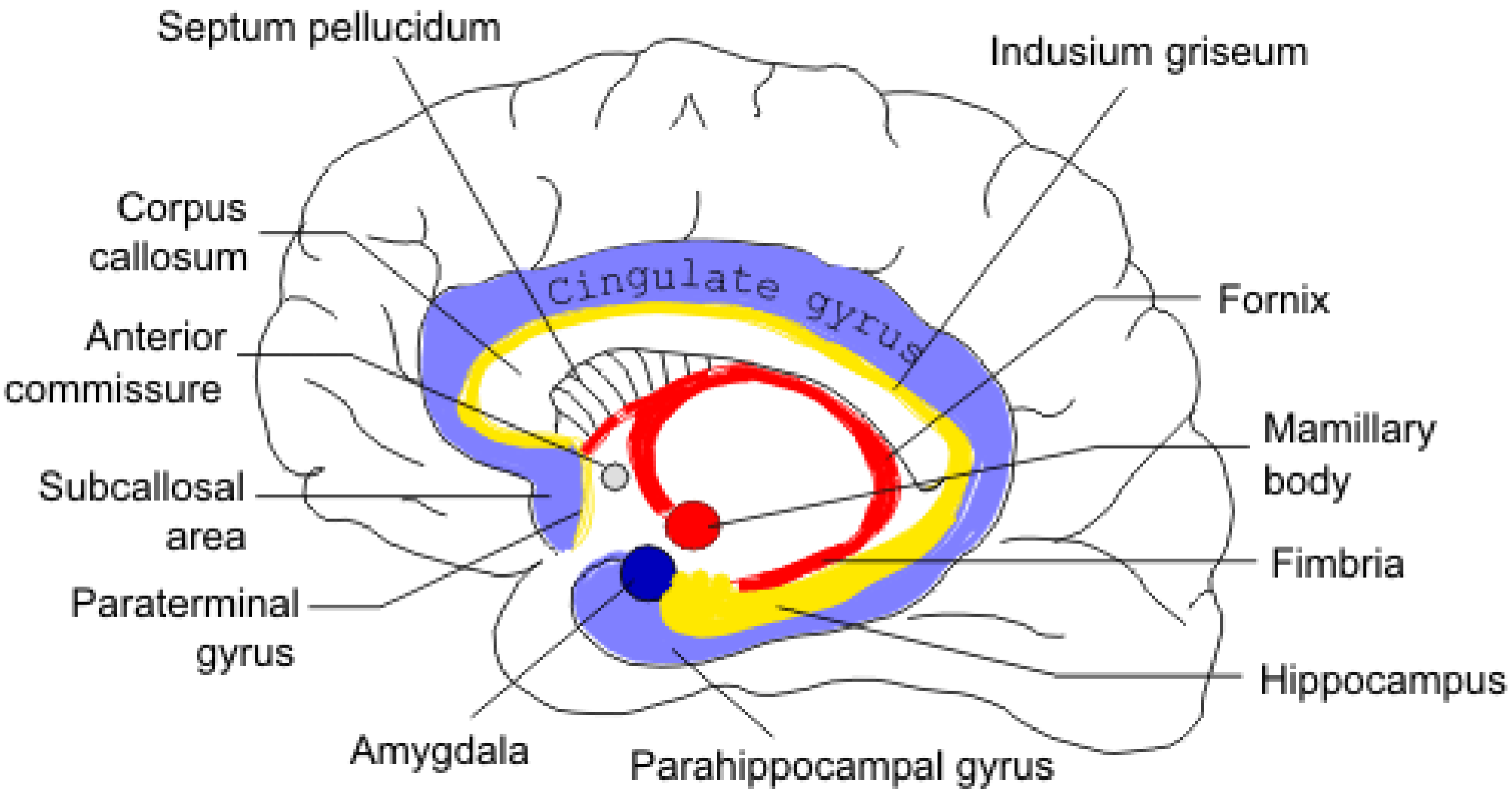



Feeling
Sensory cortex
Cingulate cortex
3
2
Hippocampus
Anterior thalamus
4
1
Thalamus
Hypothalamus
Emotional stimulus
Bodily response



- **Hypothalamus is the major output pathway of the limbic system**
- **Functions:**
  - Emotions
  - Recent memory

The Limbic System



Function

- Instinct (Hypothalamus)
- Memory (Hippocampus)
- Emotions (Hippocampus, Amygdala, Prefrontal cortex, septal areas)

Clinical points

- Lesion of the hippocampus results in (**anterograde amnesia)**
  - The individual is unable to store long-term memory
  - Memory of remote past events before the lesion developed is unaffected
- First area to show damage in Alzheimer disease
- **Kluver-Bucy syndrome:** bilateral removal of amygdala
  - Docility
  - Show no evidence of fear or anger
  - increased sexual activity
  - Hyperphagia