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Eidgenössische Technische Hochschule Zürich
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# Limbic System I

David P. Wolfer MD

Institute of Anatomy, University of Zurich
Institute for Human Movement Sciences and Sport, ETH Zurich
http://www.dpwolfer.ch
dpwolfer@anatom.uzh.ch, dwolfer@ethz.ch

# Limbic system – outline

1 *Introduction*
- history
- definition

2 *Review of anatomy*
- amygdaloid complex
- septal complex

3 *Theories of hippocampal function*
- declarative memory
- episodic memory
- cognitive map
- relational memory

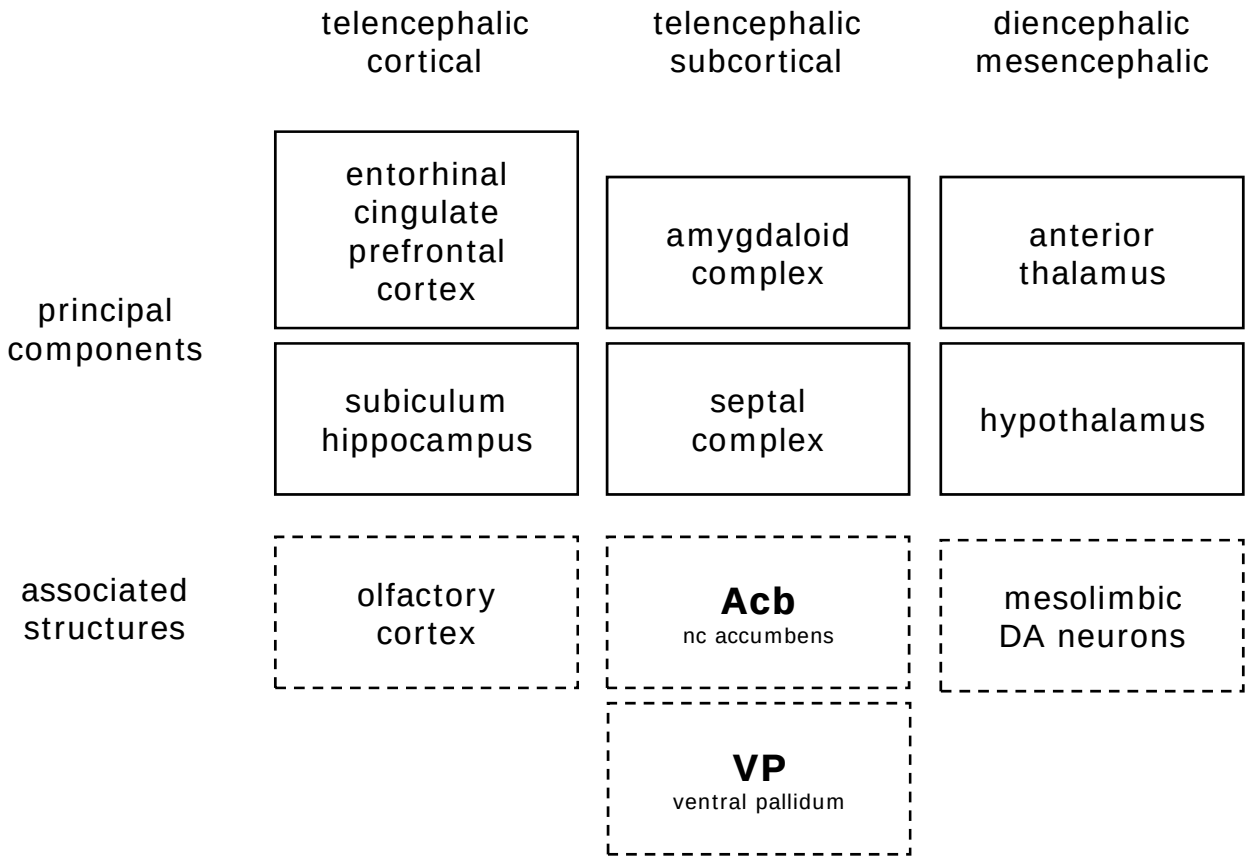
4 *The amygdala and emotion*
- theories of emotion
- fear and fear conditioning

5 *The hippocampus beyond memory*
- exploratory behavior and anxiety
- species typical behaviors
- home cage behavior

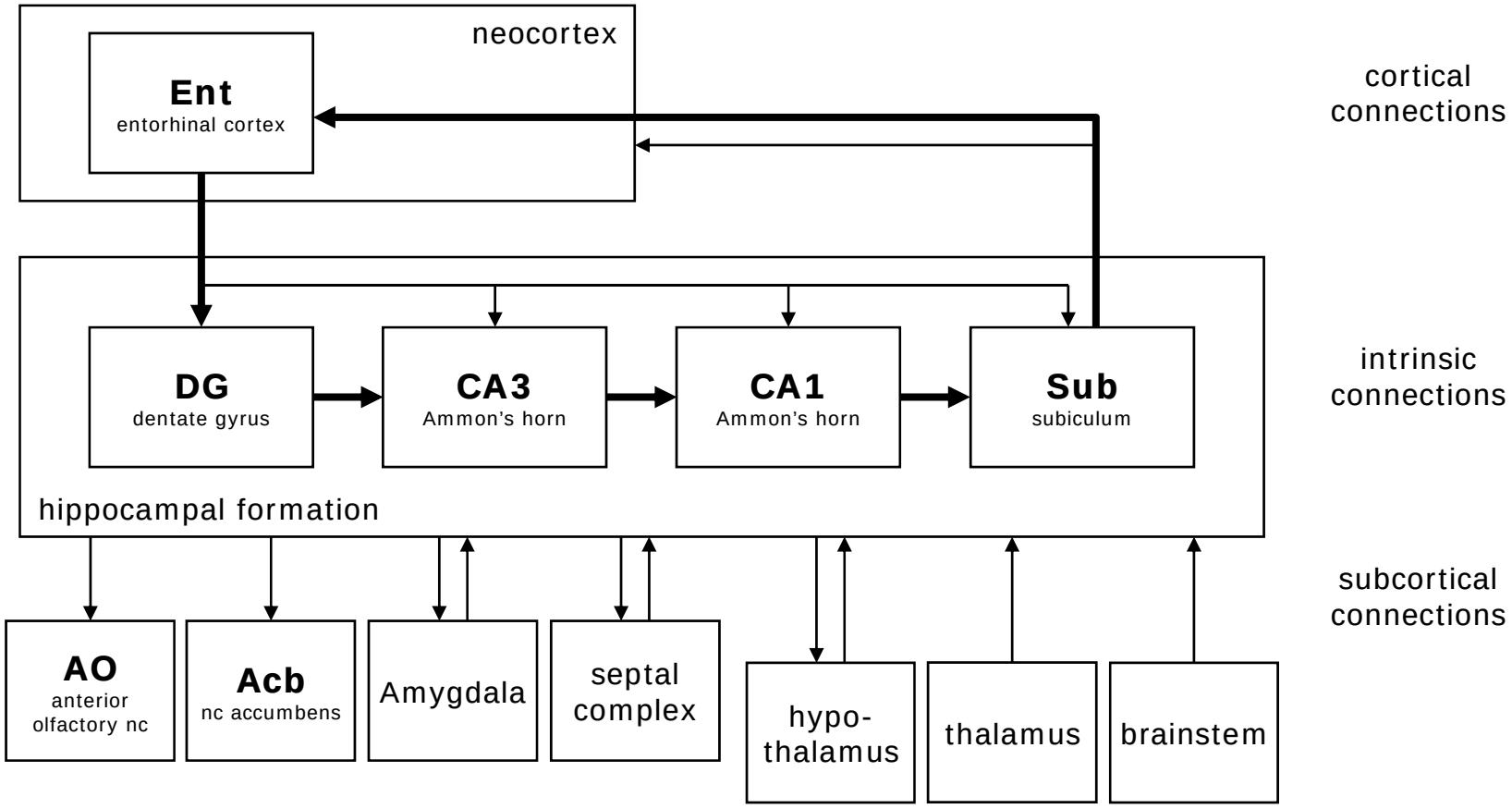
# Limbic system components – history

| | | |
|---|---|---|
| 1878 | P. Broca | anatomical definition: **grand lobe limbique** (limbus = border, seam), structures at border between cerebral hemisphere and diencephalon: cingulate cortex, hippocampus and adjacent cortex, olfactory cortex and bulb |
| 1928<br>1929 | P. Bard<br>W.B. Cannon | hypothalamic theory of emotion: **hypothalamus** -> event evaluation, control of expression and experience of emotions |
| 1937 | J. Papez | **Papez circuit** of emotion: cingulate cortex -> hippocampus –> hypothalamus (mammillary body) -> anterior thalamus -> cingulate cortex |
| 1952 | P. MacLean | **Limbic system** (old mammalian brain) as interface between reptilian brain and new mammalian brain, includes prefrontal cortex and amygdala. |
| 1957 | B. Millner<br>W.B. Scoville | Patient H.M: identification of **medial temporal lobe** structures as substrate of declarative memory -> a core component of the limbic system becomes the major target of cognitive neuroscience. |

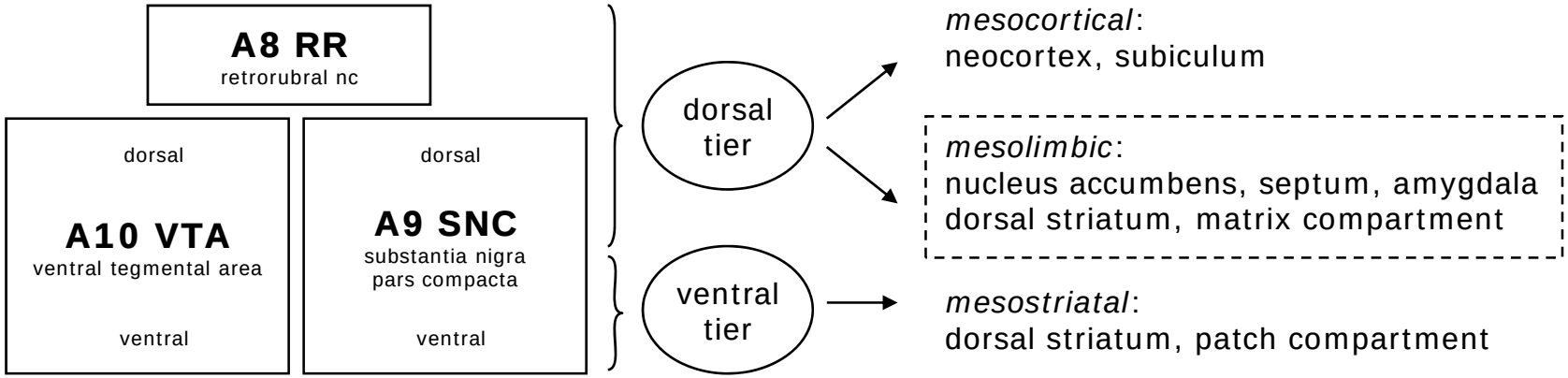
# Components of the limbic system



# Anatomy of the hippocampus - reminder



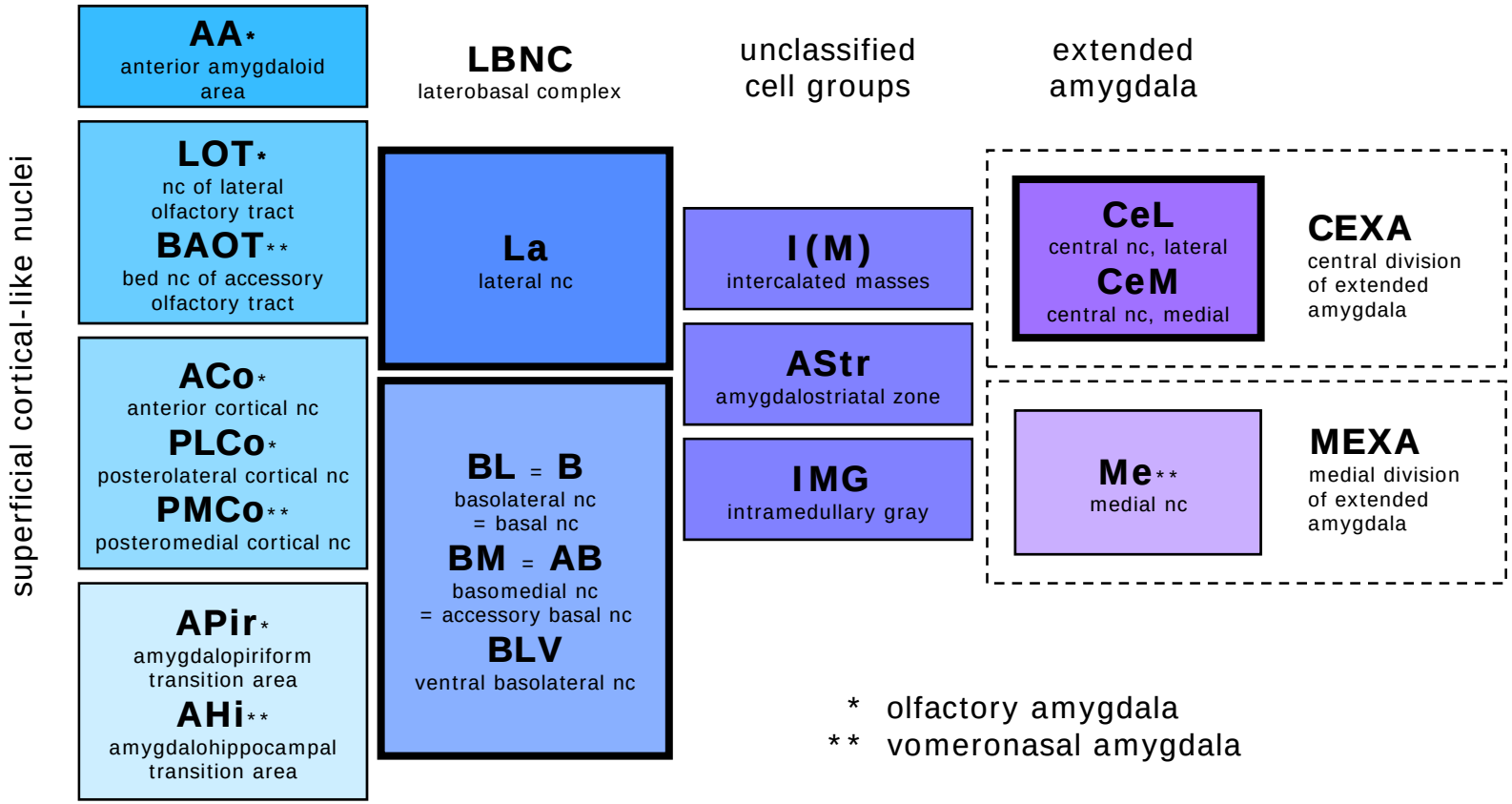
# Mesolimbic dopamine system



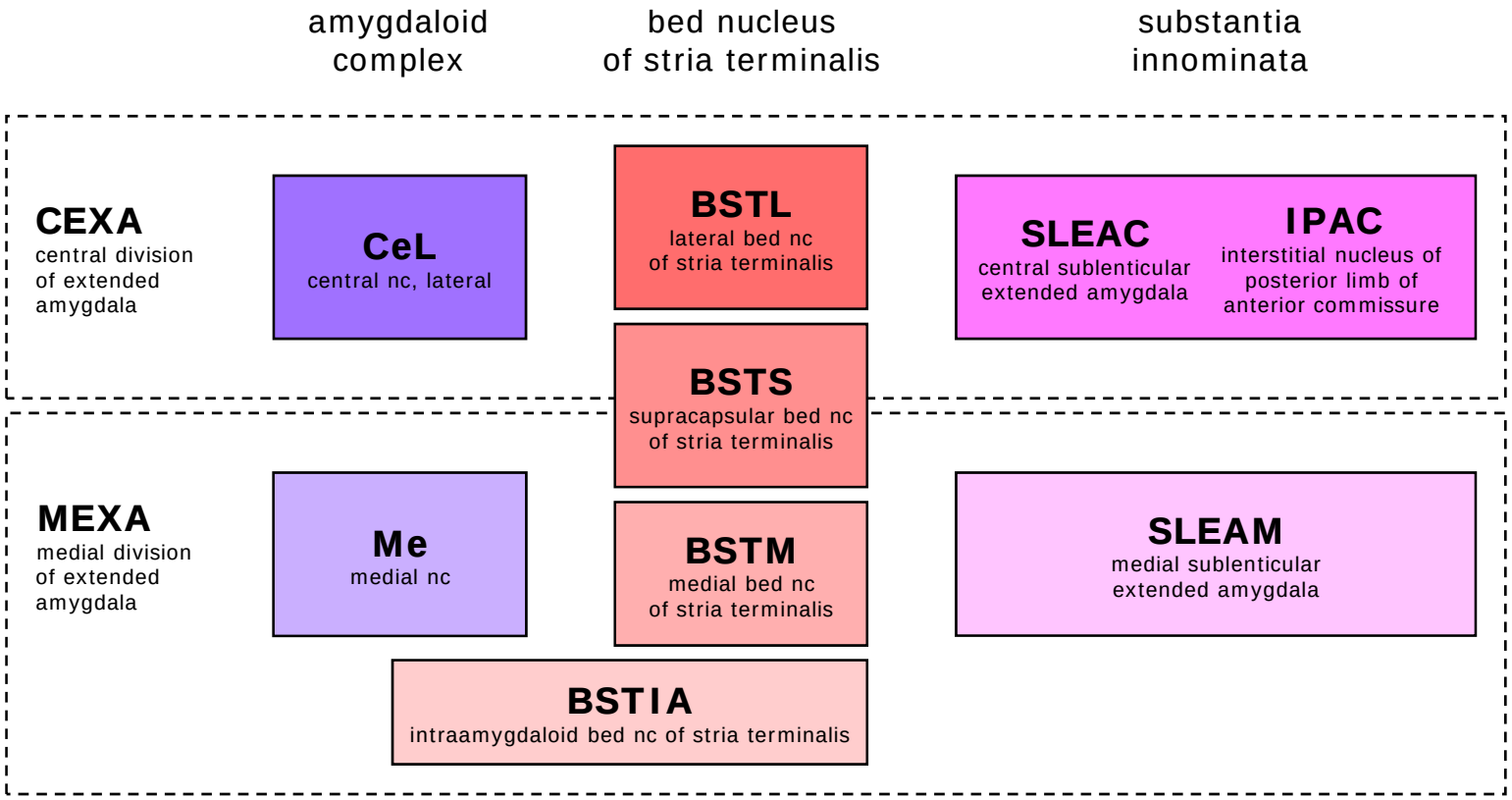

cortical innervation primates: entire cortical mantle

rodents: subiculum, entorhinal cortex, cingulate cortex, frontal cortex

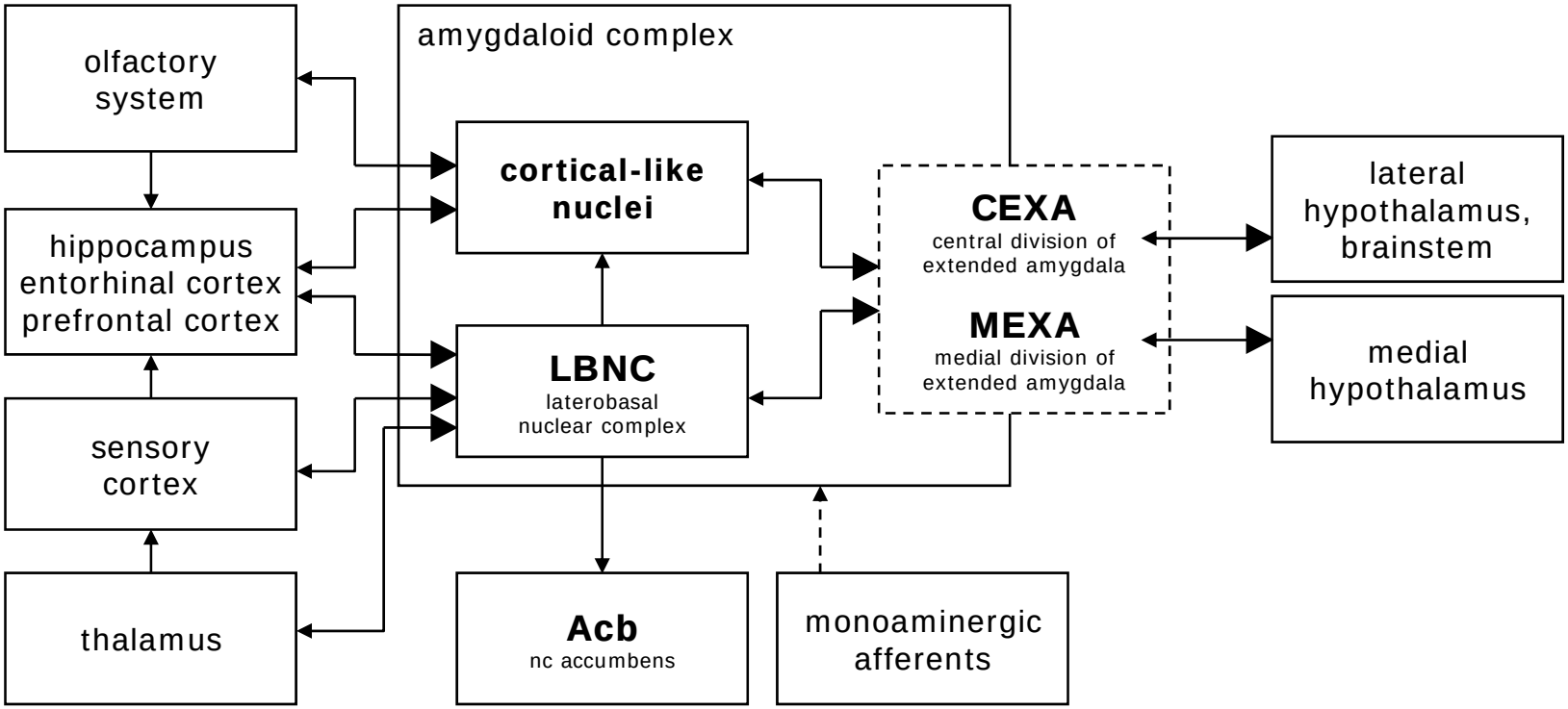
# Amygdaloid complex - components



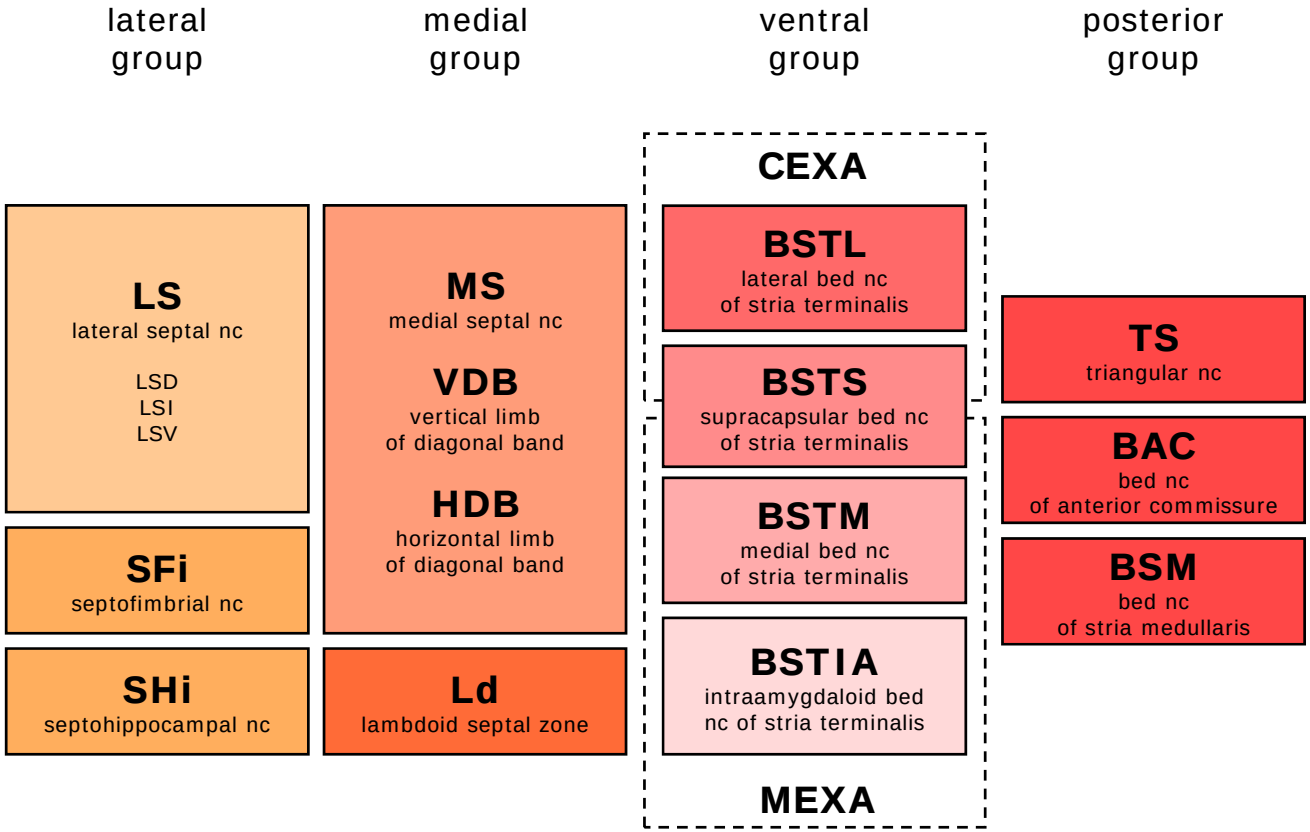
# Extended amygdala



# Amygdaloid complex - connections



# Septal complex - components



# Septal complex - connections

| | |
|---|---|
| **f**<br>fornix | afferents (glutamate) from hippocampal formation to lateral and medial group, efferents (ACh) from medial group to hippocampus and neocortex |
| **st**<br>stria terminalis | afferents (glutamate and GABA) from amygdala to ventral and lateral group |
| **sm**<br>stria medullaris | efferents from posterior group to habenula |
| **mfb**<br>medial forebrain bundle | afferents to all components from hypothalamus, thalamus, brainstem. Efferents from most components to hypothalamus, thalamus, brainstem |