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Eidgenössische Technische Hochschule Zürich
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ZNZ Advanced Course in Neuroscience
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Limbic System I

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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

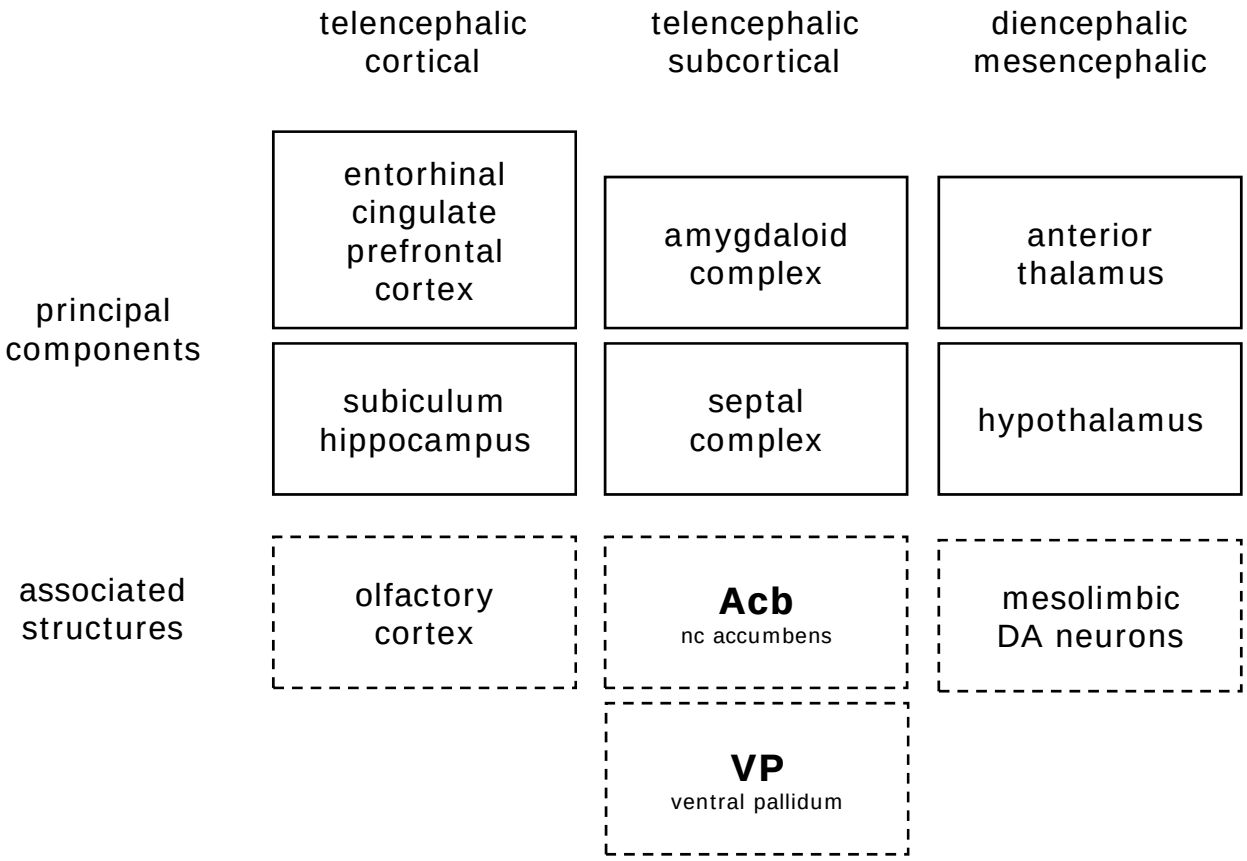
4 *The amygdala and emotion*
- theories of emotion
- fear and fear conditioning

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

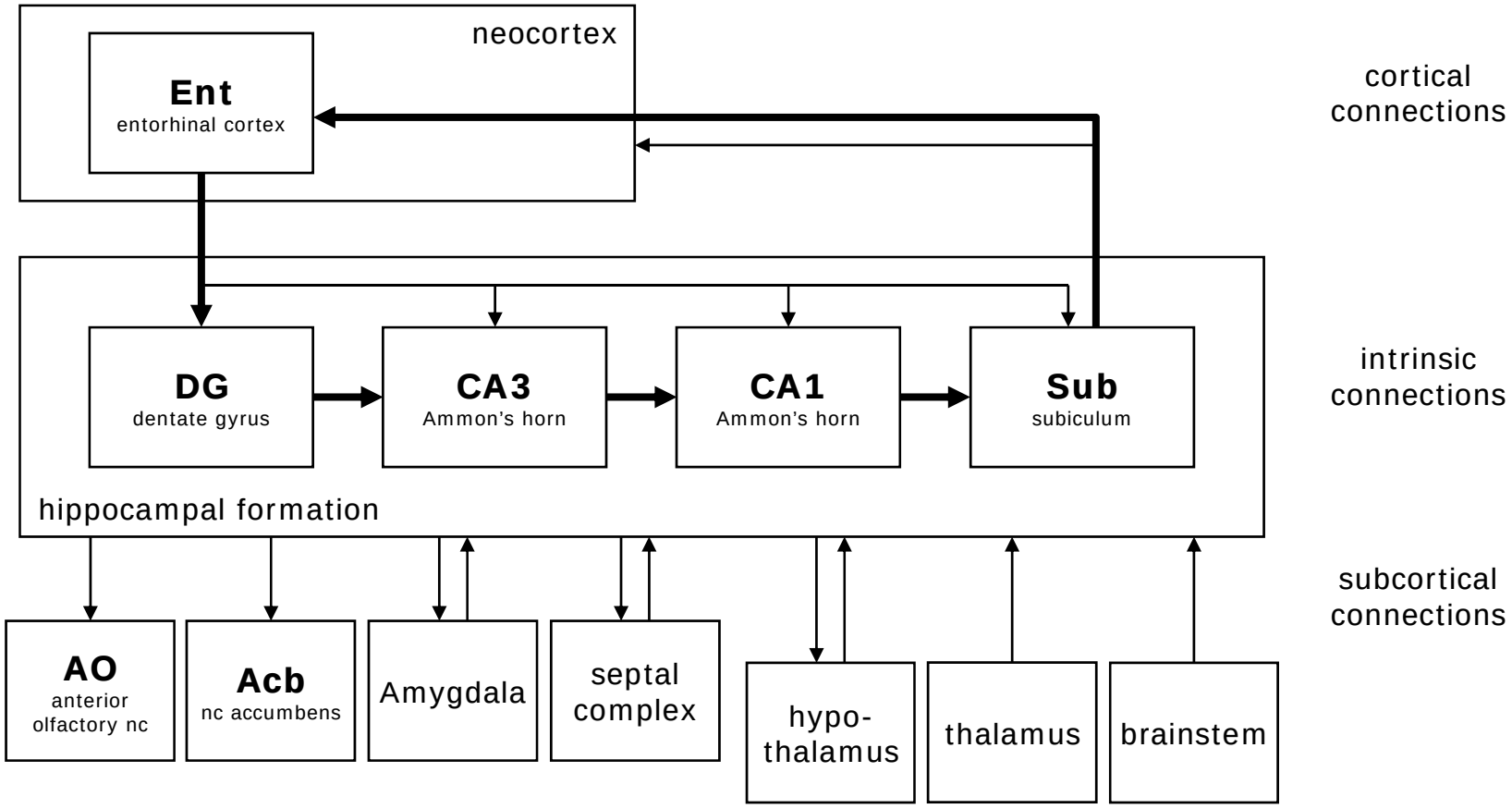
Limbic system components – history

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 1929	P. Bard 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 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.

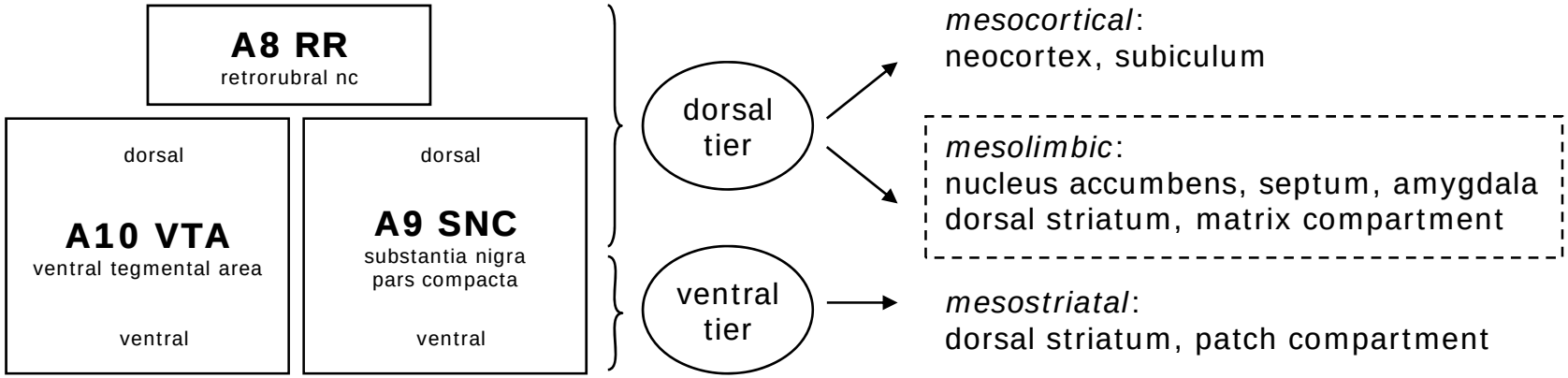
Components of the limbic system



Anatomy of the hippocampus - reminder



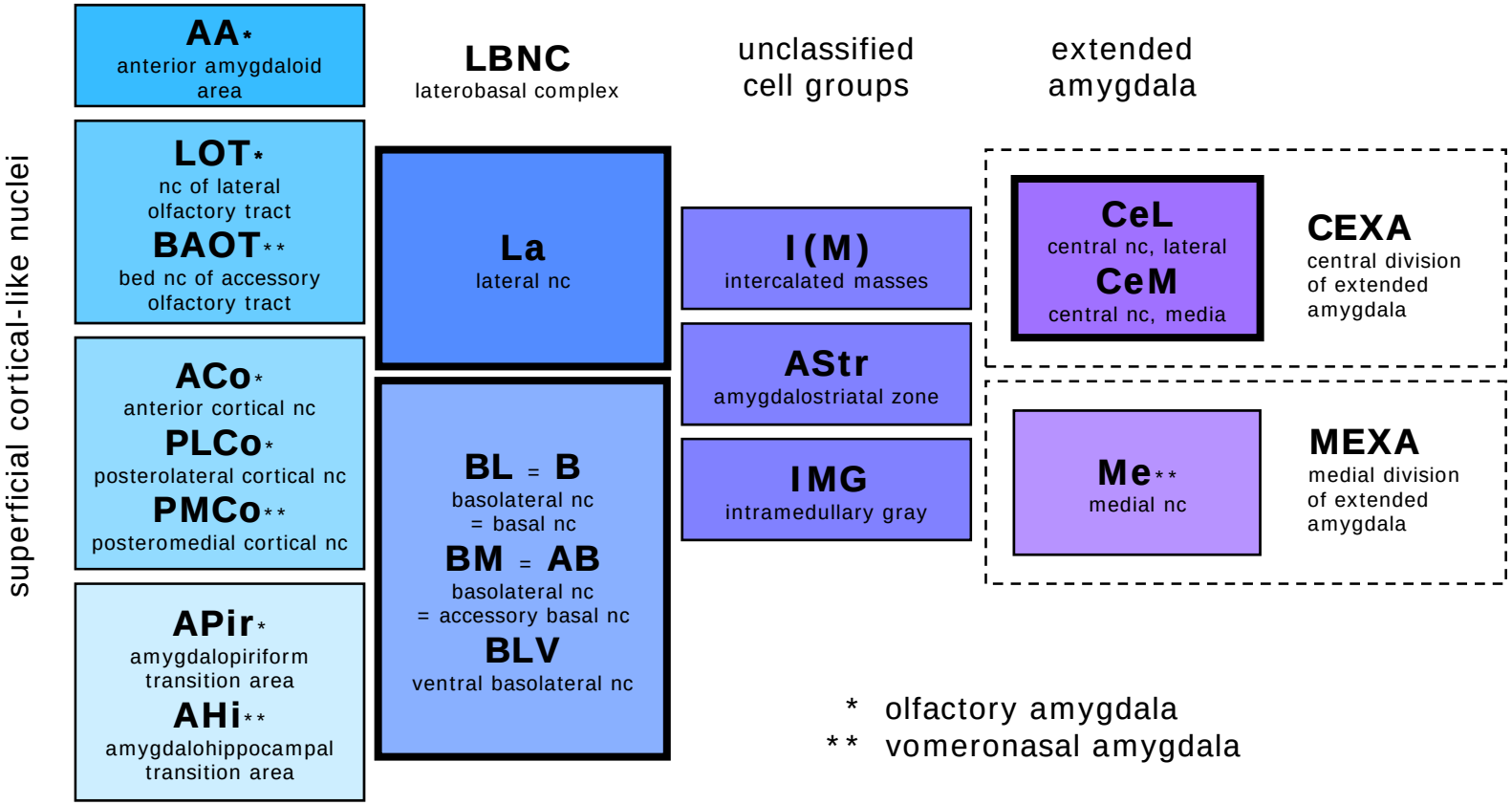
Mesolimbic dopamine system



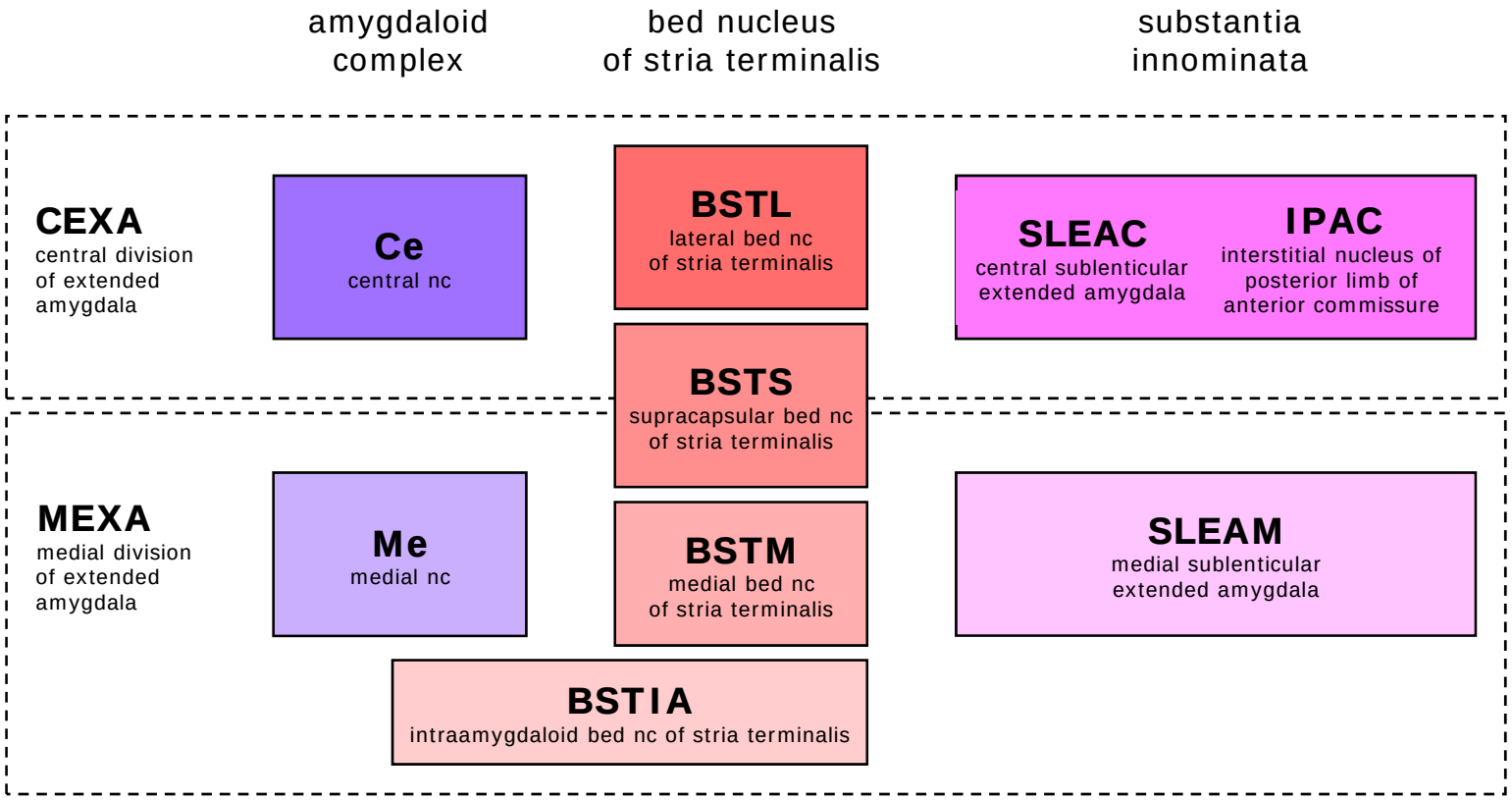
cortical innervation primates: entire cortical mantle

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

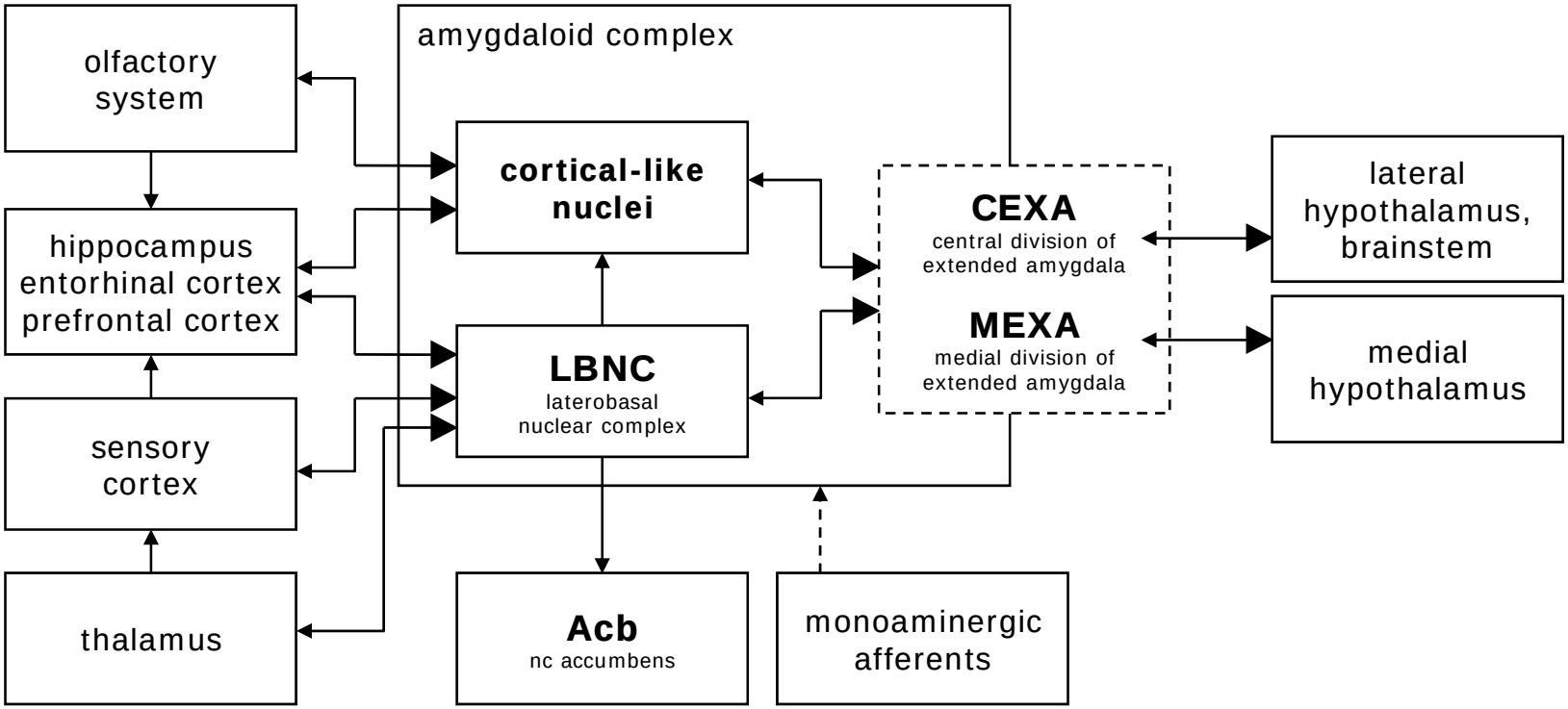
Amygdaloid complex - components



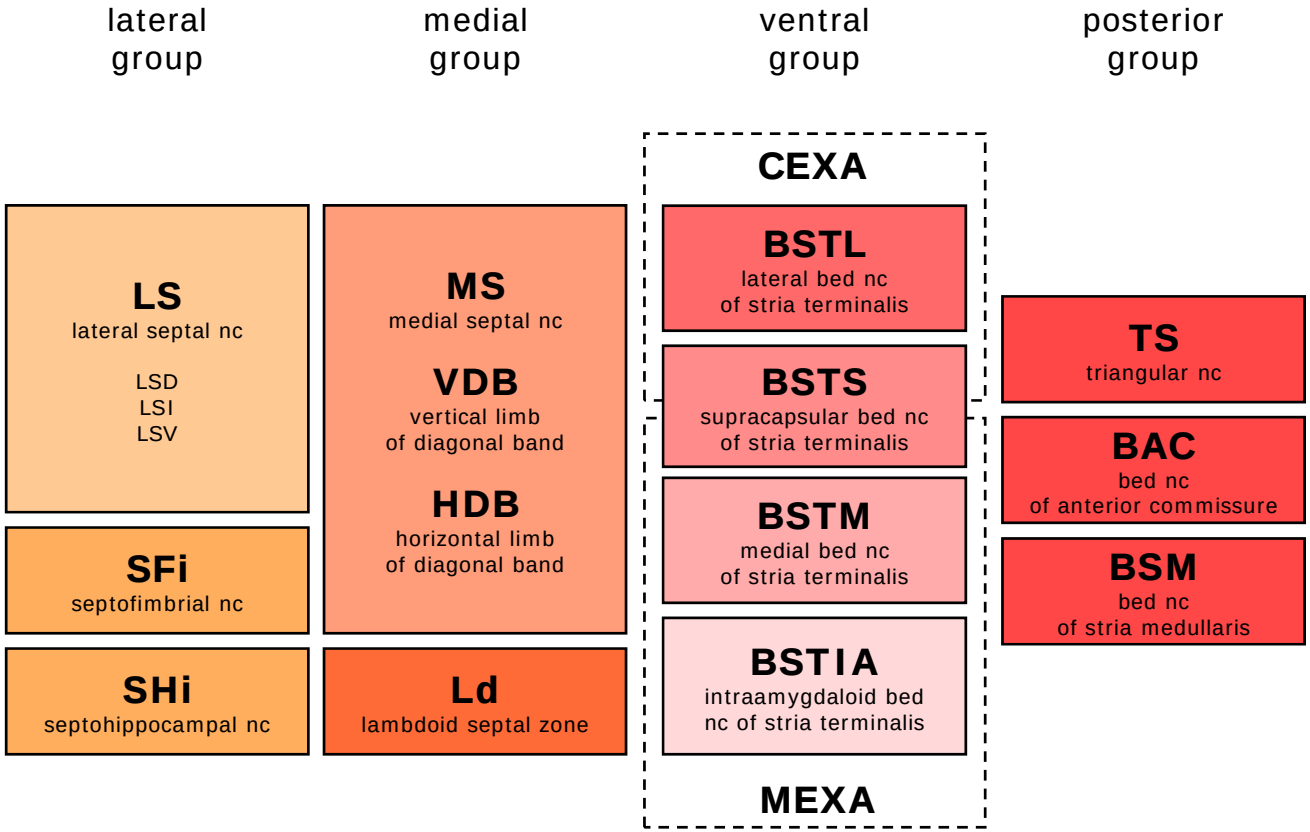
Extended amygdala



Amygdaloid complex - connections



Septal complex - components



Septal complex - connections

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