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Unit 4 – learned fear, Associative learning

1) Read and discuss the paper:

Han, S., Soleiman, M.T., Soden, M.E., Zweifel, L.S., and Palmiter, R.D. (2015). **Elucidating an affective pain circuit that creates a threat memory.** Cell 162, 363-374. (on moodle)

The Figures are relatively small, please be ready to present ALL 7 Figures.

2) Explain the concept of classical conditioning. Use - and explain the terms CS, US, CR in your answer. What is the difference between classical conditioning, and operant conditioning?

3) Name the principal brain areas (see Week 1: telencephalon, diencephalon, mesencephalon, etc.) in which the auditory brain nuclei are localized (see **Slide 22**).
How many synapses are in-between the inner hair cell, and a layer 4 neuron of the primary auditory cortex? (name all synapses; assume that there are obligatory synapses in the superior olive, and in the lateral lemniscus)

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Further questions related to general concepts of the Auditory System.:

4) Explain the primary sensory transduction in inner hair cells for hearing. What is the physical stimulus initiating the primary sensory transduction, and which ion channels are involved? Which neurotransmitter is released from the inner hair cells, and on which nervous structure does it act?

5) Explain how spiral ganglion neurons connect the inner hair cells in the cochlear, to neurons in the cochlear nucleus. Use- and explain the following terms in your answer: AMPA receptors, dendrite of spiral ganglion neuron, action potential, axon of spiral ganglion neurons, auditory nerve, excitatory synapse in the cochlear nucleus.

6) Explain which part of the auditory thalamus connects a) to the primary auditory cortex (A1), b) to the secondary auditory cortex (A2), and c) to the lateral amygdala (LA). Why are these projections also called "long-range synaptic connections"? Which neurotransmitter is released at these long-range synaptic connections?