Sensory Systems II

1. Taste sensing is related to smell. Not all tastes have odors, however. In contrast to smell, we only have 5 primary tastes we detect through taste buds located on distinct areas of the tongue. The five primary tastes are sweet, sour, bitter, salty, and umami.

2. Taste buds contain about 150 cells with microvilli projections that are rich in taste receptors. About 50-100 7TM receptors are involved in taste.

3. Three of the tastes (sweet, bitter, and umami) are activated through 7TM receptors and a G protein called gustducin. Signaling through these receptors involves activation of a G protein called gustducin.

4. Salty tastes are detected by passage of the ions directly through ion channels on the tongue that open when exposed to sodium. These channels are sensitive to amiloride, which obscures the taste of salt.

5. Whereas individual olfactory receptors are uniquely expressed on each olfactory neuron, with direct 'wiring' to distinct areas of the brain, taste receptors are not uniquely expressed on taste buds and the entire set of taste buds for primary tastes link to a single area of the brain. Thus, although we have different receptors for bitter, for example, their signal is mixed and perceived as one signal by the brain - they all "taste" alike.

6. Vision arises from signaling initiating in rod and cone cells of the eye. Rod cells (sense light, but not distinct for color) contain the pigment rhodopsin, which consists of a 7TM protein called opsin linked to a vitamin A derivative called retinal (linked via a lysine bond). Retinal is light sensitive and can flip between the 11-cis form and the all-trans form when exposed to light. This slight change in structure of retinal also changes the rhodopsin protein, ultimately activating a vision-related G protein called transducin.

7. Transducin binds GTP when active and this causes transducin to activate a specific phosphodiesterase to break down cGMP to GMP. Lowering cGMP concentration causes a cation ion channel to stop the movement ions of ions into the cell, starting the nerve signal.

8. Cone cells of humans have pigment-specific receptors for red, green, and blue light. We differ from more closely related organisms by virtue of the fact that we have evolved red receptors from our green receptor. Dogs and rodents, for example do not have red receptors.