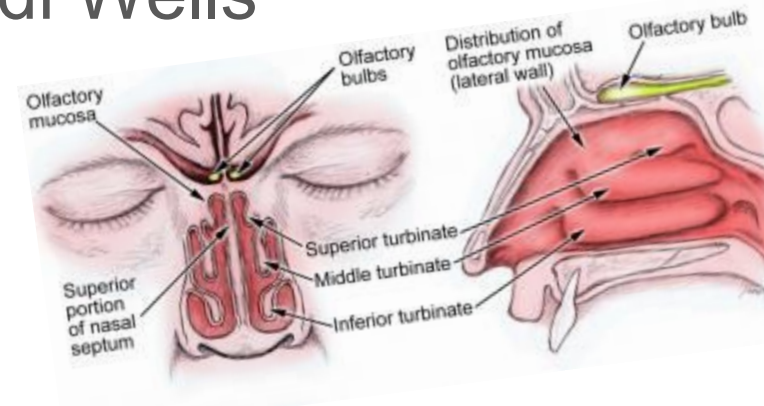




Olfaction

Bella Peetz and Madi Wells



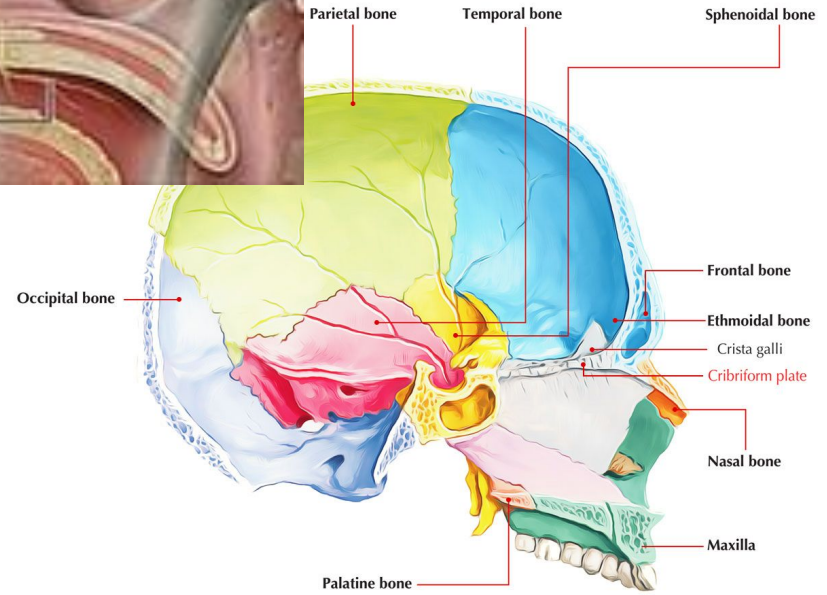
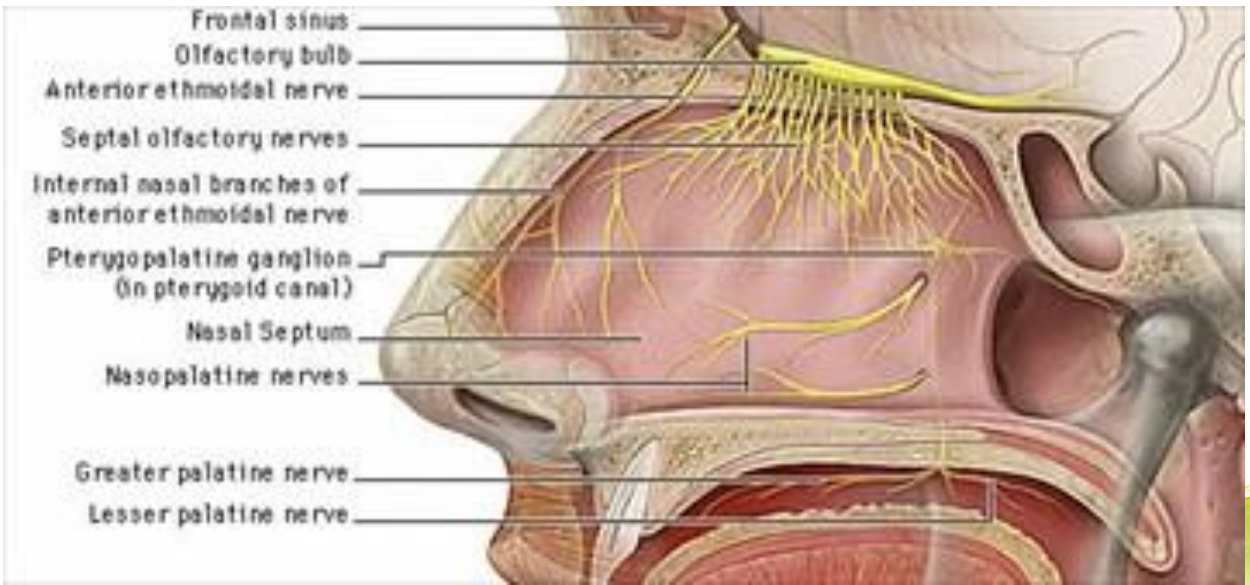
Why is your sense of smell important?

- Warning signal
 - Smoke
 - Gas leak
 - Dangerous fumes
- Helps you taste food



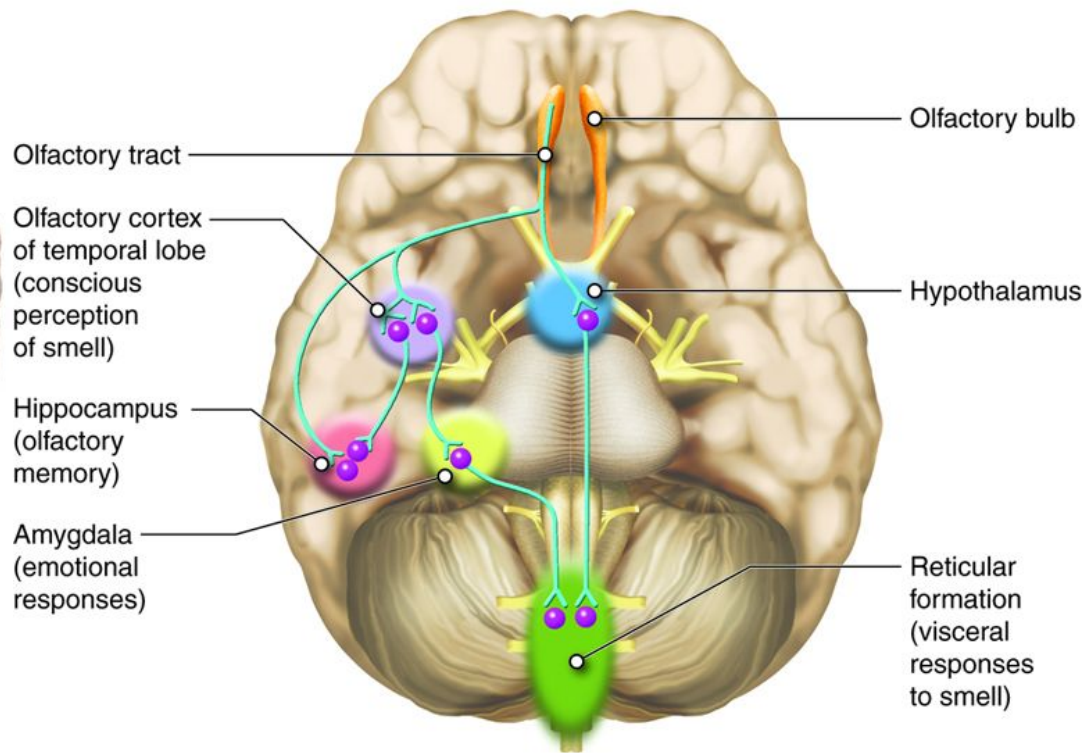
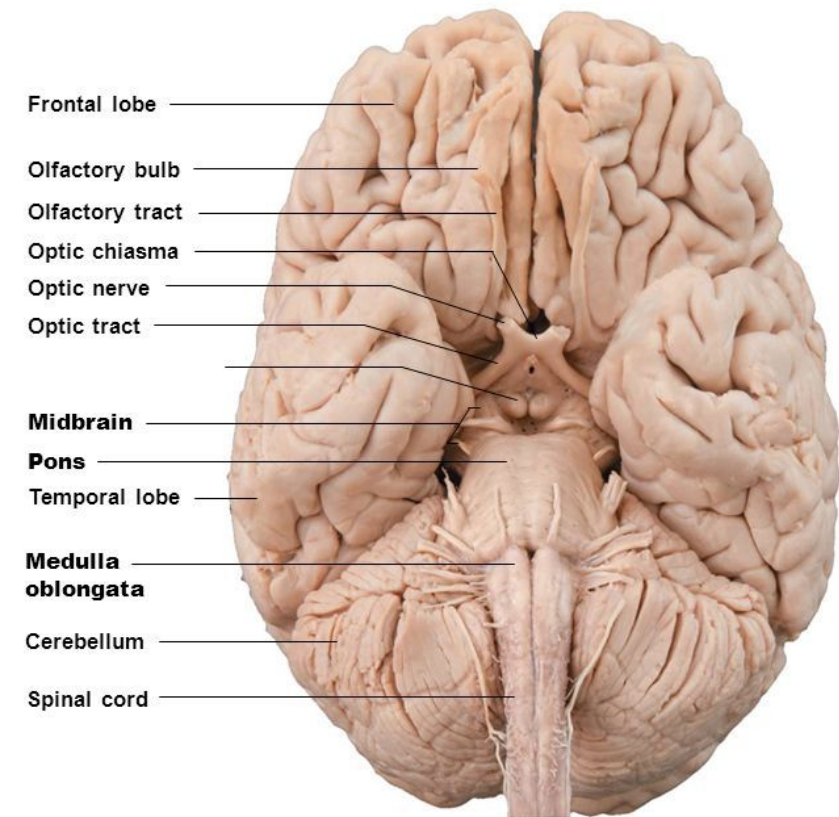
Anatomy

- Nostrils/Nose
- Receptor cells line the upper portion of the nasal cavity
 - Approx. 10-20 million olfactory receptor cells are packed in an area of 5cm^2
 - From olfactory epithelium to olfactory bulb
 - Axons in bundles of about 20
- Olfactory epithelium
- Olfactory bulb of brain
 - Structure in brain that lies beneath the frontal lobe of the cerebellum
 - Bundle of nerves
- Olfactory tract
 - From olfactory bulb to Olfactory cortex, hypothalamus, portions of limbic system
- Olfactory cortex
- Hypothalamus
- Portions of the limbic system
- Lamina propia (areolar tissue)

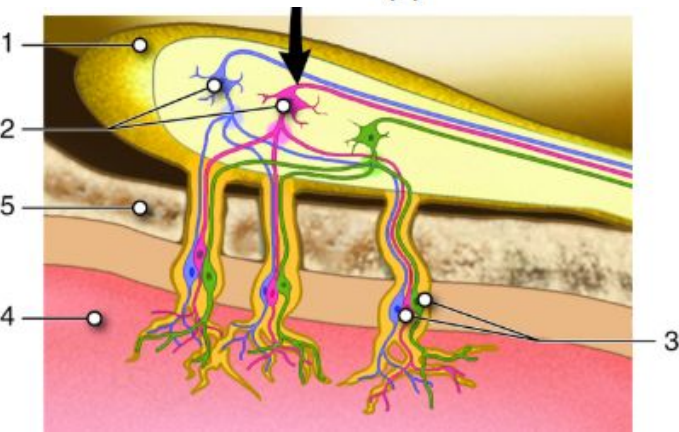
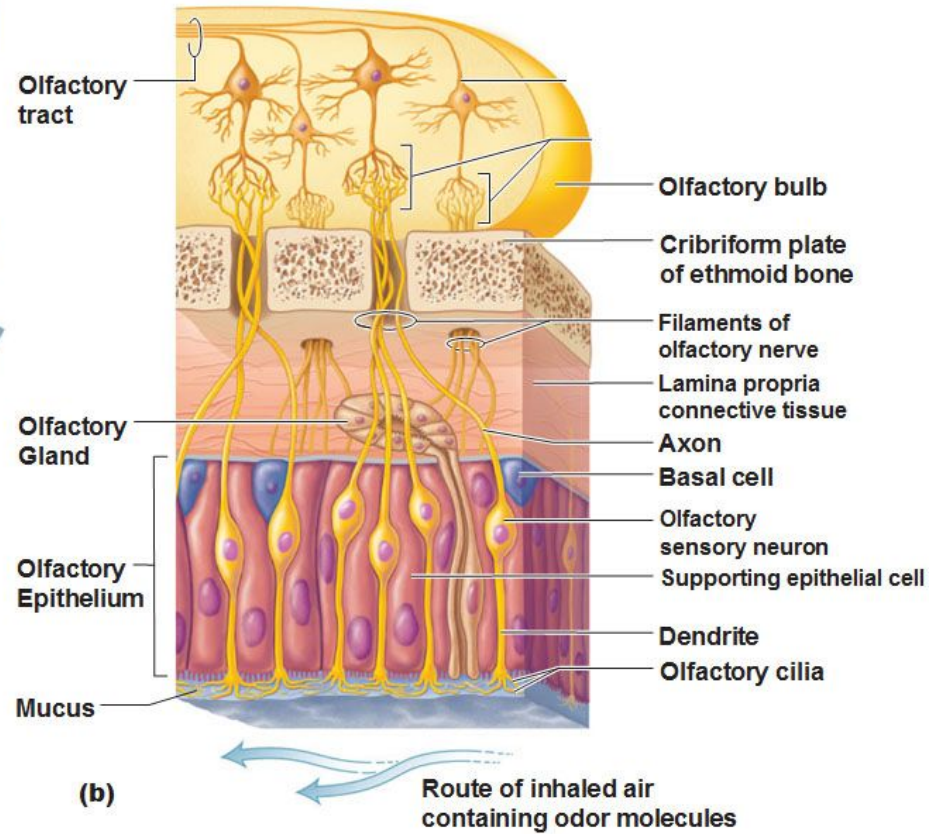
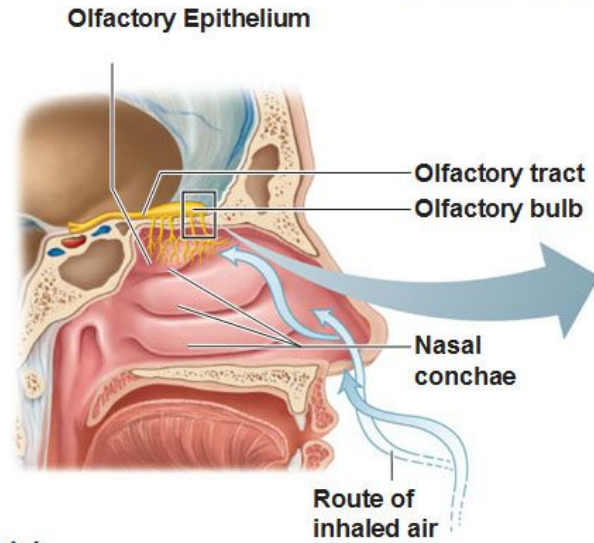


*Cribriform plate

Medial (inferior) aspect of the human brain, showing the three regions of the brain stem. (3 of 3)

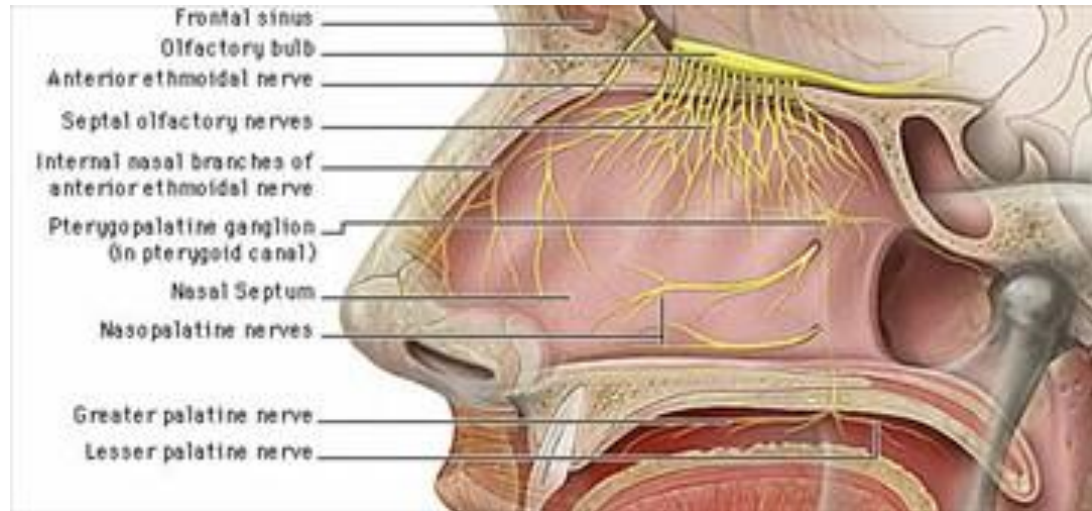


Smell



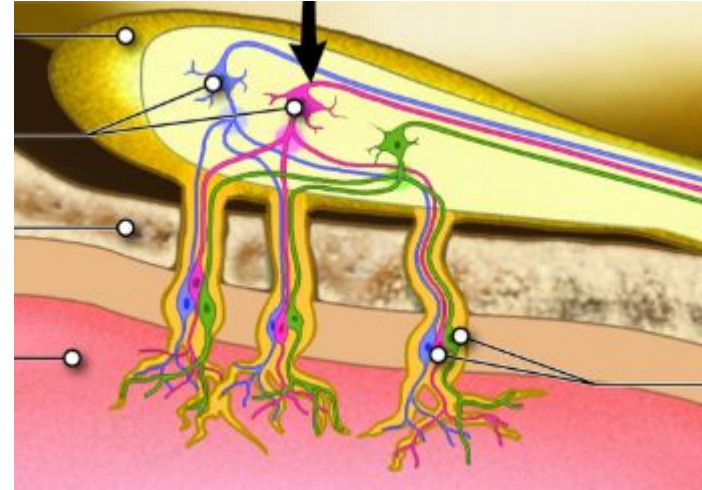
Making Sense of Scents

- If you can't smell something, you can't taste it
 - Compounds are broken up when you chew
- Only special sense that doesn't synapse in thalamus before reaching the cerebral cortex
- Infants
 - Smell mother's breast milk
 - Know the difference

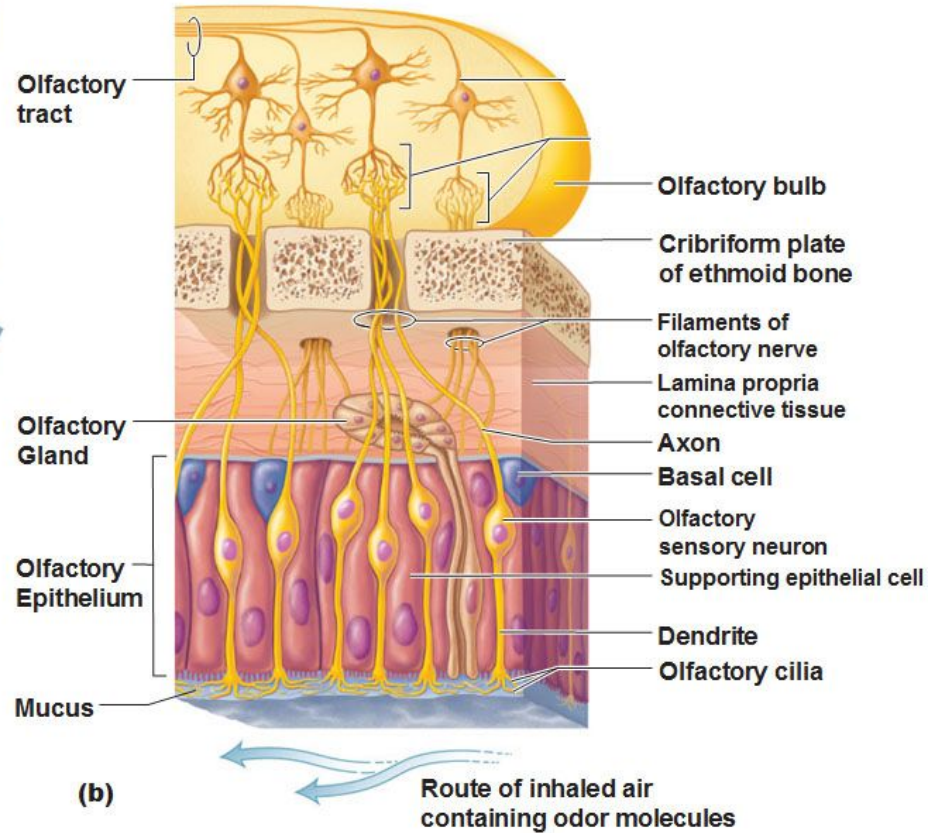
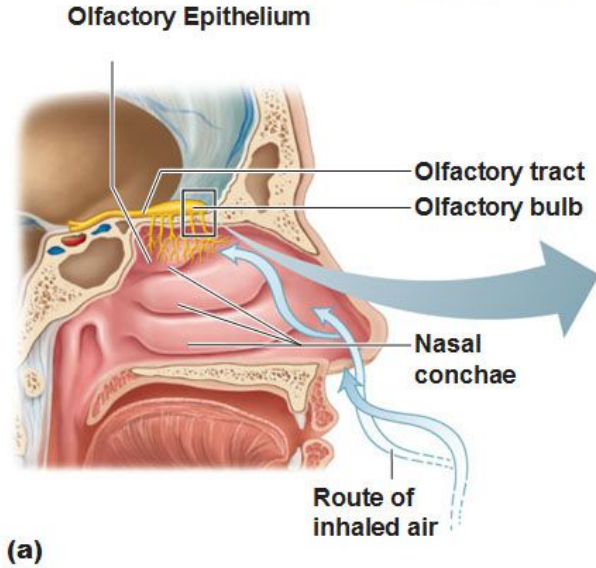


Physiology

- Odorants - chemicals that stimulate olfactory receptors
- Olfactory receptors
 - Surface area of exposed cilia (dendrites)
- Olfactory Epithelium
 - Supports the olfactory receptors
- Olfactory Bulb
 - Where first synapse occurs (glomerulus)
- Olfactory Tract
- Hypothalamus and Portions of Limbic Systems
 - Emotional Response



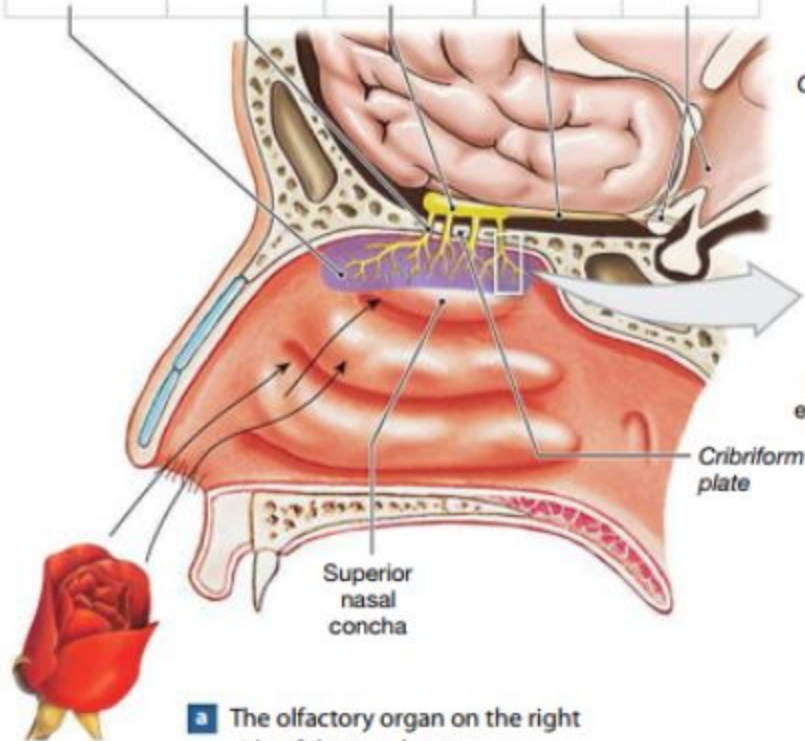
Smell



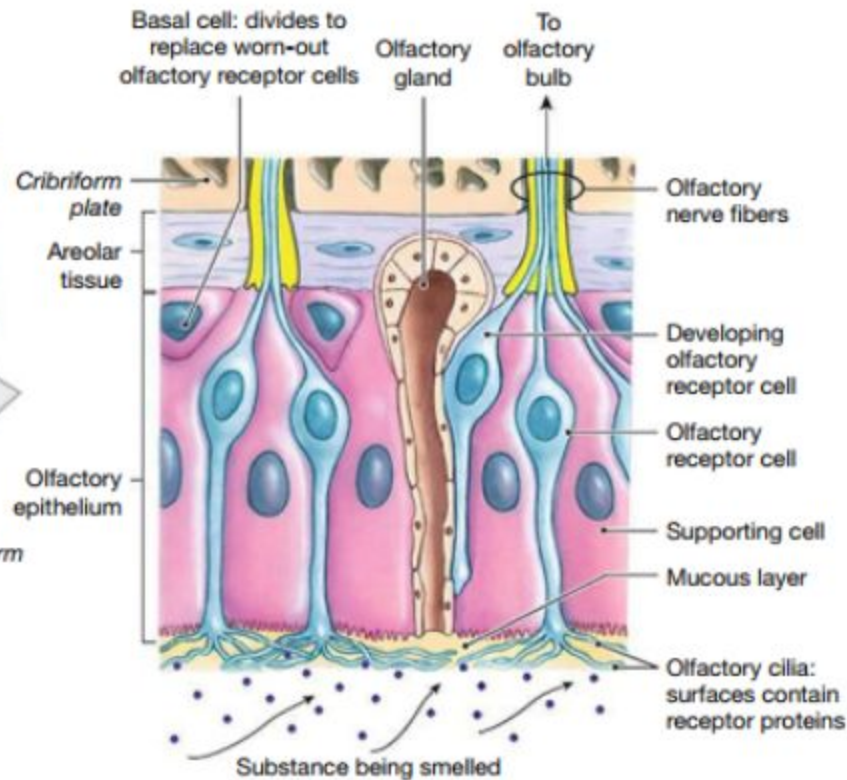
*bipolar neurons

FIGURE 9-6 The Olfactory Organs.

Olfactory Pathway to the Cerebrum				
Olfactory epithelium	Olfactory nerve fibers (N I)	Olfactory bulb	Olfactory tract	Central nervous system



a The olfactory organ on the right side of the nasal septum.

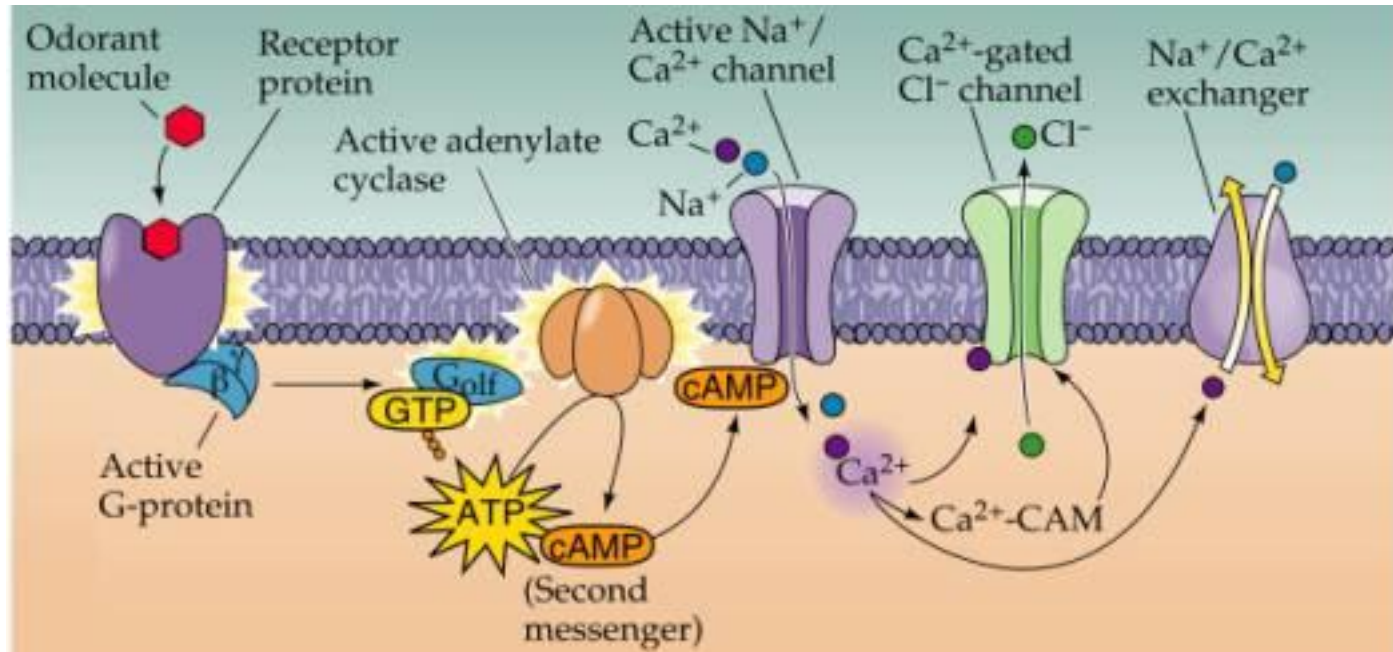


b An olfactory receptor is a modified neuron with multiple cilia extending from its free surface.

Physiology continued

- Breathe in
 - The air swirls within the nasal cavity
- Compounds are brought to the olfactory organs
 - The dendrites of the olfactory receptor cells act as cilia
- The compounds are broken down by the mucus covering the cilia
 - Mucus is produced by the epithelium
 - Once chemicals reach the dendrites, an action potential is generated
- AP goes down axon
- Travels to olfactory bulb
 - Relay info to other areas

Physiology



Homeostatic Imbalances

- Hyposmia-
 - Reduced ability of detecting odors

- Anosmia-
 - Inability of detecting any odors

Causes of Homeostatic Imbalances

- Upper respiratory infections
 - Including Sinuses
- Nasal Cavity Polyps
- Trauma to the frontal region of the head
 - Organs for olfaction are located near here
- Exposure to harsh chemicals
 - Ex: insecticides, cleaners, solvents, etc.
- Age

Activity - The Sense of Scent

- Identify the smell!



Activity

1. Smell different components in order to identify the odor.
2. Put down guesses on what you think the smell is and what the smell reminds you of.

The purpose of this activity is to learn how our sense receptors depict difference odorants and identify what components make up a compound.

You will notice that each of the objects have different odors.

5 True or False

True or False?

1. The dendrites of the neurons connected to the olfactory bulb act as cilia.
2. Compounds are not broken down by mucus, but instead they go straight to the olfactory bulb.
3. The axons do not bundle together, but instead remain separate.
4. Smell is the only special sense that synapses in the thalamus.
5. Smell takes part in the limbic and emotional response system.

5 Matching

6. Is a disorder, either genetic or caused from damage to the olfactory system, where there is no sense of smell.
7. Structure in brain that lies beneath the frontal lobe of the cerebellum.
8. Is a disorder, either genetic or caused from damage to the olfactory system, where sense of smell is decreased.
9. This supports the olfactory receptor cells.
10. Produces mucus.

- Olfactory Bulb
- Olfactory Gland
- Olfactory Epithelium
- Hyposmia
- Anosmia

Free Response

Explain in detail some causes homeostatic imbalances and name 2 homeostatic imbalances in the olfactory system.

Work Cited

Campbell, N.A., & Reece, J.B. (2009). *AP* Edition Biology* (Ninth Edition). San Francisco, CA: Pearson Education, Inc.

Martini, F.H., Bartholomew, E.F., & Ober, W.C. (2013). *Essentials of Anatomy and Physiology* (Sixth Edition). USA: Pearson Education, Inc.

Olfactory System. (n.d.). Retrieved from http://www.rci.rutgers.edu/~uzwiak/AnatPhys/NPSpringLect4_files/?S=D

Physiology of Smell. (n.d.). Retrieved from <https://senseofsmellproject.weebly.com/physiology-of-smell.html>

Sahyouni, R. (n.d.). Retrieved from <https://www.khanacademy.org/science/health-and-medicine/nervous-system-and-sensory-infor/taste-gustation-and-smell-olfaction-topic/v/olfaction-structure-and-function>

Yale School of Medicine. (n.d.). Olfactory Nerve. Retrieved from <https://medicine.yale.edu/cranialnerves/nerves/olfactory.aspx>

Learning, L. (n.d.). Anatomy and Physiology I. Retrieved from <https://courses.lumenlearning.com/austincc-ap1/chapter/special-senses-smell-olfaction/>