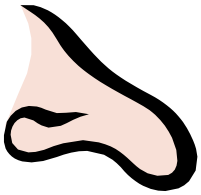
The Sense of Smell

Smell



- Flavor comes from both taste and smell
- Most of what we "taste" is actually being sensed by our olfactory cells within the nasal canal.
  - Remember: taste is only sweet, sour, bitter, umami, and salty.
  - In contrast to taste, humans can smell hundreds of compounds
  - Have 5-10 million olfactory cells that sense smells in our nose
  - Can only detect airborne molecules
  - Limited to "small" molecules (less than 100 atoms)

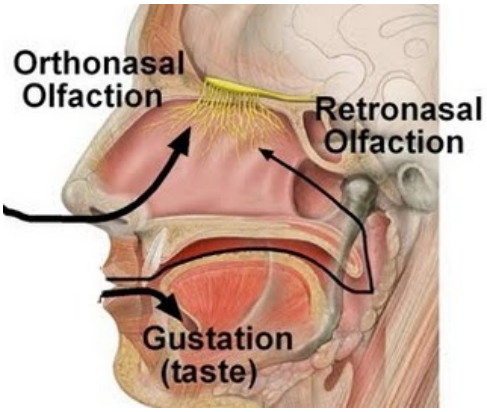
The Science of Smell

- Temperature and odor senses add to flavor as part of the chemosensory system
  - When food is chewed, or heated small molecules are released into the air
  - Receptors for odor molecules are found in nose and back of the throat

How do we smell?

Odorants can reach the olfactory nerves via two routes:

- **Orthonasal olfaction:**
  - The detection of an odor through the nostrils by sniffing or inhalation.
- **Retronasal olfaction:**
  - The detection of an odorant when it is released from food in your mouth during chewing, exhalation, or swallowing.

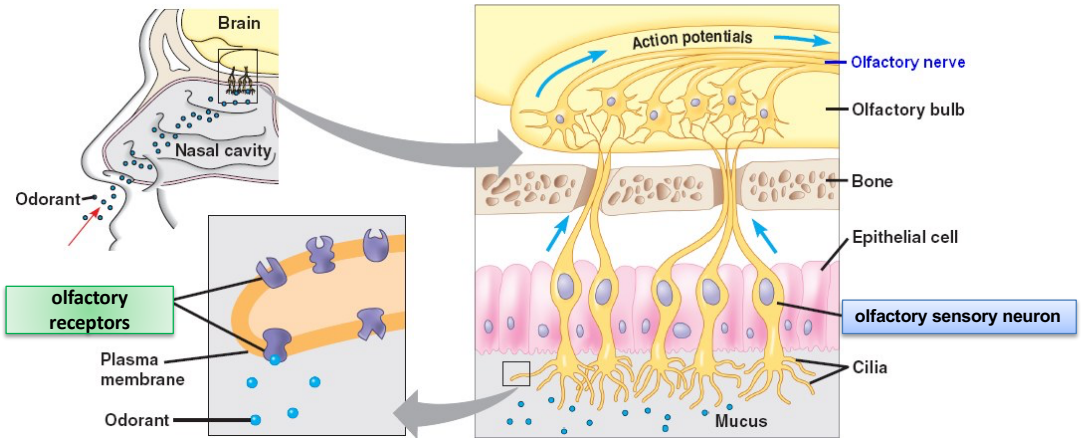


How do we smell?

Odor molecules bond to olfactory receptors (ORs) which are on the olfactory sensory neurons (OSNs) in the nose.

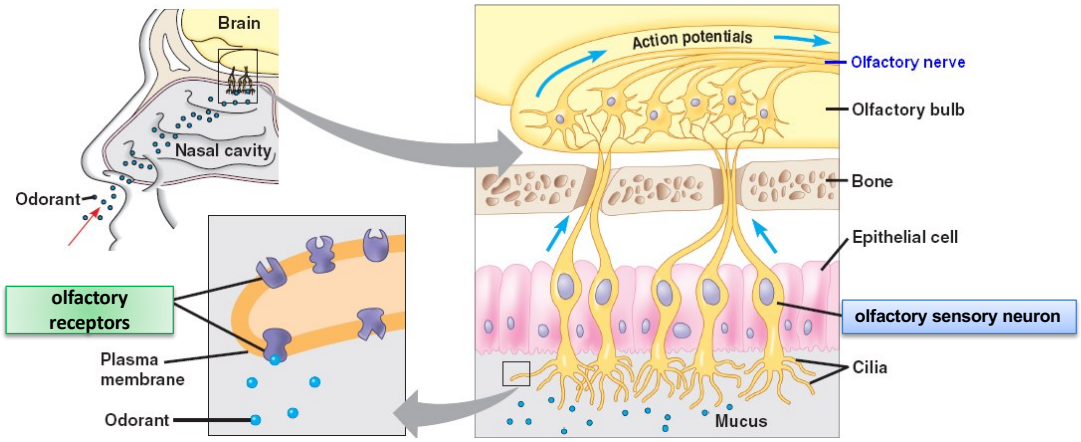
Each odorant bonds to a unique combination of ORs.

- There are about 400 different OR types
- Different people express different OR types.



How do we smell?

- Axon extensions from the olfactory sensory neurons (OSNs) converge in the brain's olfactory bulb.
- Odor information is then relayed to many regions throughout the brain.



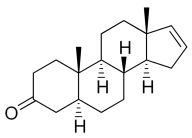
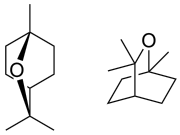
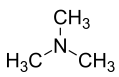
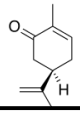
Some Interesting Things About Smell: Individual Differences

anosmia

- lack or lose of the ability to smell
- condition may be temporary or permanent
- causes can range from a cold to a brain injury

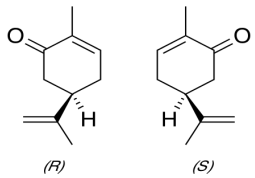
specific anosmia

- inability to smell certain compounds
- individual differences in the expression of the several hundred olfactory receptor proteins has been used to explain the variation.

Compound		Odor Quality	Anosmia Frequency
cyanide	NC^-		
androstenone • hormone found in urine and sweat			
isobutyraldehyde			
1,8-cineole • dominant portion of Eucalyptus globulus oil			
trimethyl amine			
L-carvone • essential oils			

The amazing accuracy of smell…..

Two substances can smell differently based on chemical structure.



(R)-(-)-carvone smells like spearmint oil
(S)-(+)-carvone smells like caraway seed (dill).

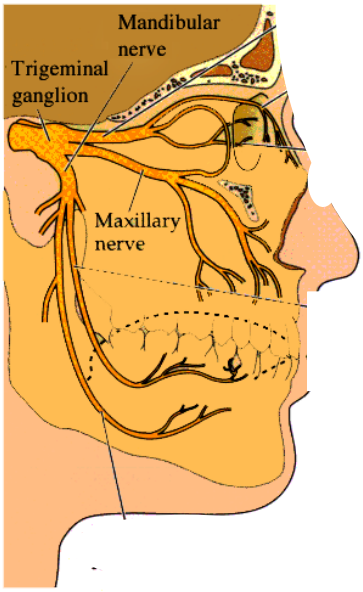
Some Cool Things About Smell Adaptation

- Adaptation or a decrease in response under conditions of constant stimulation occurs with smell as well as taste.
  - Example:
    - Ever go into a smelly room and realize later you don't smell it anymore?
    - Or ever wonder why you can't smell perfume on yourself?

Some Cool Things About Taste and Smell: The Trigeminal Sense

A combination of taste and smell that detects chemical irritants in the mouth/throat area, recognizing them as flavor.

- The nose and mouth are vastly innervated by the trigeminal nerve
- Many food components stimulate these nerve endings and have irritable aspects:
  - *Sting* from horseradish and mustards
  - *Burn* of chili peppers
  - *Tingle* from carbon dioxide
  - *Numbing* from menthol



Time to Check-In