OLFACTION (SENSE OF SMELL)

**Important sense for many animals**
Social communication, esp. of sex, emotion, health

**Pheromones**
Synchronization of reproductive cycles, births
“Copulin”, sexual identity

**Bonding** of mother and neonate
What is safe to eat
“Food imprinting”

Who is a good mating partner
“smells like mom” (rats)

The “Bruce Effect”

Close neurological ties to emotion and memory via **Limbic System** structures
Could there be changes in ability to **smell and mood**? And memory?

**Sensory system:**

**Olfactory receptors** (1000+ different receptor proteins so far identified,
Randomly scattered, each maximally sensitive to one chemical/odor
Located in nasal olfactory mucosa/olfactory epithelium
Cilia on receptors
10 million receptors in human; 50-100 million in rabbit; 1 billion in dog
**Replaced** every 30-60 days

**Pathway:**
Receptors --- axons pass through **Cribiform Plate/bone** --- synapse with
**Mitral cells** in **Olfactory Bulb** --- Olfactory Tract --- medial temporal lobe
**(piriform cortex= hippocampus, amygdala)** --- **medial dorsal nucleus of thalamus** and to **orbitofrontal cortex** (“anterior perforated substance”)

**emotional responses** to smells – medial temporal lobe structures
**conscious appreciation** of smell – thalamus + orbitofrontal cortex
Other Interesting Information:

Can be “smell blind”

Anosmia – complete loss of ability to smell

6% of head trauma patients
olfactory axons sheared off as brain slides across cribiform bone
May be unable to smell a specific odor, this may be inherited

Can get better a perceiving a given smell with repeated exposures,
A kind of “learning to smell” effect…why?

Seizures (which often start with abnormal firing in temporal lobe structures) are often preceded with a “warning” (“aura”) sensory “hallucination”, which is often a “bad smell”

Are age-related changes in ability to smell, gets worse as get older
Why? No replacement of receptor proteins?
For women, ability falls off esp. after menopause (HRT reverses)

UPSIT (University of Penn. Smell Identification Test)

Persons with Major Depressive Disorder also have poorer sense of smell; antidepressant drug therapy may improve

Smokers have impaired sense of smell; which is reversible if stops smoking

Prior to onset of memory problems in future Alzheimer’s patients,
They begin to lose their sense of smell (especially for the ability to identify smells or recall smells) although their sensitivity to a smell remains the same

Future role for “room odorizers”