Taste & Smell

both are **chemoreceptors:**

taste → detects certain chemicals in foods and drink
- short range
- must be water soluble
  - eg. starch powder in insoluble → has no taste

smell → detects airborne chemicals that enter nasal cavity
- long range
- mostly small, volatile molecules

Taste

taste receptors located in **tastebuds**
- →10,000 taste buds
- →most on tongue → on papillae
  - each papilla contains up to 200 taste buds
- some on soft palate and in throat

each taste bud is a cluster of 50-150 spindle shaped taste cells
- taste buds are modified epithelial cells connected to neurons via synapse
- each cell has fingerlike microvilli that project through a **taste pore** at the top of the bud

cells are replaced every 7-10 days
- →continually replaced throughout life

each taste bud acts as a chemoreceptor
- → presence of specific chemical initiates nerve impulse
- → most taste buds respond to 2-4 taste modalities

several different kinds of chemoreceptors:

sweet	-	respond to sugars, some amino acids
sour	-	respond to acids
bitter	-	respond to alkaloids (eg. quinine, nicotine, caffeine, strychnine)
salty	-	respond to inorganic salts and metal ions
umami (='meaty, savory')	-	respond to meaty flavor, MSG

the tongue is not equally sensitive to each kind of "flavor",
- eg. sucrose must be present in 1 pt in 200 to be detected
- eg. saltiness can be detected in 1:400
- eg. quinine can be detected in 1:2,000,000

in spite of "**taste maps**" of the tongue:
there is no evidence of any spatial separation of sensitivities
if any it is apparently slight

taste also involves additional receptor types:
thermoreceptors (spicy hot, menthol)
mechanoreceptors (texture)
nocioceptors (spicy)

our sense of taste also involves sense of smell
→ taste is up to 80% smell

hold nose to take medicine

interaction of all these kinds of receptors produces all the flavors of food and drink

Smell

receptors located in roof and walls of nasal passages and nasal septum

a chemical can be smelled only if it is volatile
(=ie. able to become airborne)

actual receptors are dendrites of bipolar neurons

up to 5 million olfactory receptor cells

neurons pass through **cribiform plate** and connect to
olfactory bulb on anterior ventral surface of brain

we are able to detect >10,000 different chemicals
→ seem to be grouped into 15 – 30 "families" of odors

at least 1000 smell genes that encode "odorant binding proteins"

extremely sensitive
→ sometimes can detect a single molecule
eg can smell mercaptans (skunks) 1pt in 30 Billion

though sensitive, they adapt quickly

since they are neurons, they are replaced only very slowly and not as quickly as they are lost
→ some replacement ~ every 60 days

→ but overall, we loose ~1%/yr
→ loose sense of smell as we get older

Taste	Smell
short range	long range
need greater concentrations	some can smell 1 molecule
fewer kinds of chemoreceptors	many kinds of chemoreceptors
4-5 major types	1000's of different types

Morning Sickness

during pregnancy sense of smell becomes much more acute due to action of estrogen which increases during pregnancy
→ may lead to morning sickness

almost all stimuli for nausea are odors

esp smell of cooking foods, esp meats and bacon

sometimes also coffee, perfumes, cigarette smoke, petroleum products, etc