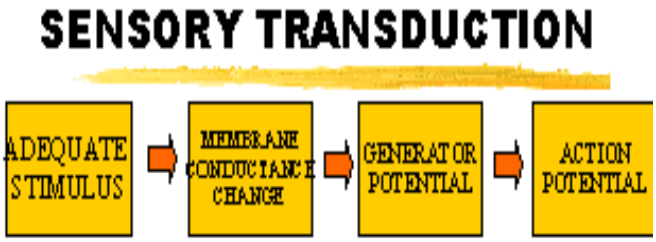
OLFACTION AND TASTE

Revised 17Jan16
Martini 6th: pp 565-569, 7th: 550-554, 8th: 562-, 9th: 549-555, 10th:566-570



SPECIAL SENSES: senses requiring **special organ: Sensory Apparatus**

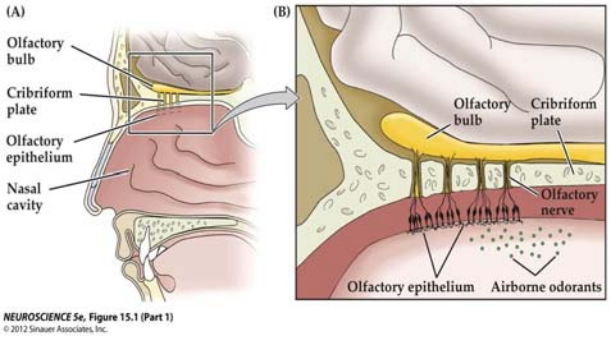
Receptors: Sense organs are **transducers**, receive info from environment, transduce to electrochemical nerve impulse, send message to particular part of brain

Quality of sensation is determined by the **area of brain stimulated**

If given area of brain stimulated, sensation is felt appropriate and sense to area felt.
I.e., olfactory nerve discharge yields smell sensation. This explains phantom-limb, referred pain,

Three main type of receptors:

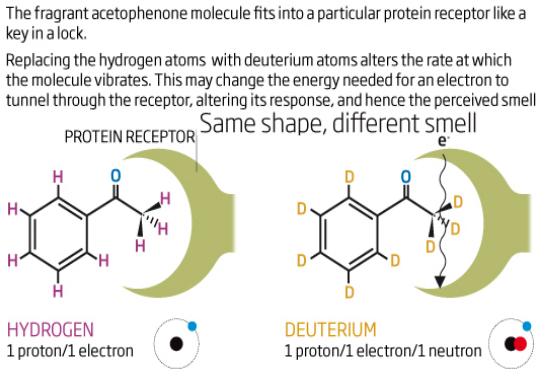
chemical	1: taste and 2: smell
mechanical	3: auditory and 4: balance
photo	5: vision (infrared on skin).



CHEMICAL: TASTE AND SMELL (chemoreception)

SMELL: Olfactory organs (p 565)
Olfactory epithelium with **stereocilia** embedded in **mucus** (from Bowman's glands) in roof of nasal cavity
Efferent nerve fibers pass through **cribriform plate** of the ethmoid bone.
Sniffing directs air flow over this epithelium.
Conchae direct away, stopped up nose prevents smelling
as few as four molecules can activate receptor.
Olfactory cortex on **inferior surface of temporal lobes**, reaches without going to thalamus
limbic system connections, hypothalamus lead to **profound emotions** and memories associated. (**Including sex**)

Mechanism poorly understood, but can detect $1/5x10^{10}$, far more sensitive than taste
Perception of smell: **Stereochemical hypothesis**: size, shape, functional groups and molecular vibration.
(50 primary smells, but can distinguish 400,000 different odorants)
Most smell detects only **volatile chemicals.** These **dissolve in mucus** secretions. (Some animals smell liquids)



Ciliary proteins bind chemical, these trigger cAMP synthesis. cAMP opens Na channels, impulse ensues, initial processing in glomeruli of olfactory bulb

Accommodation: sense of smell easily fatigued. Strong at first, unnoticed soon.
Some male moths can smell a female several miles away.

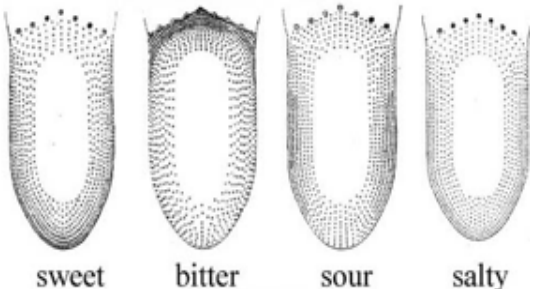
TASTE: gustation: All "taste buds" identical in structure. (p 569)

papillae on the tongue, (NOT "Taste buds") may have taste buds located on sides

tip of tongue	**filiform**:	hair shaped	do not have taste buds
side of tongue	fungiform	fungus shaped	has about five taste buds
back of tongue	**circumvallate**	around wall	has as many as 100 taste buds

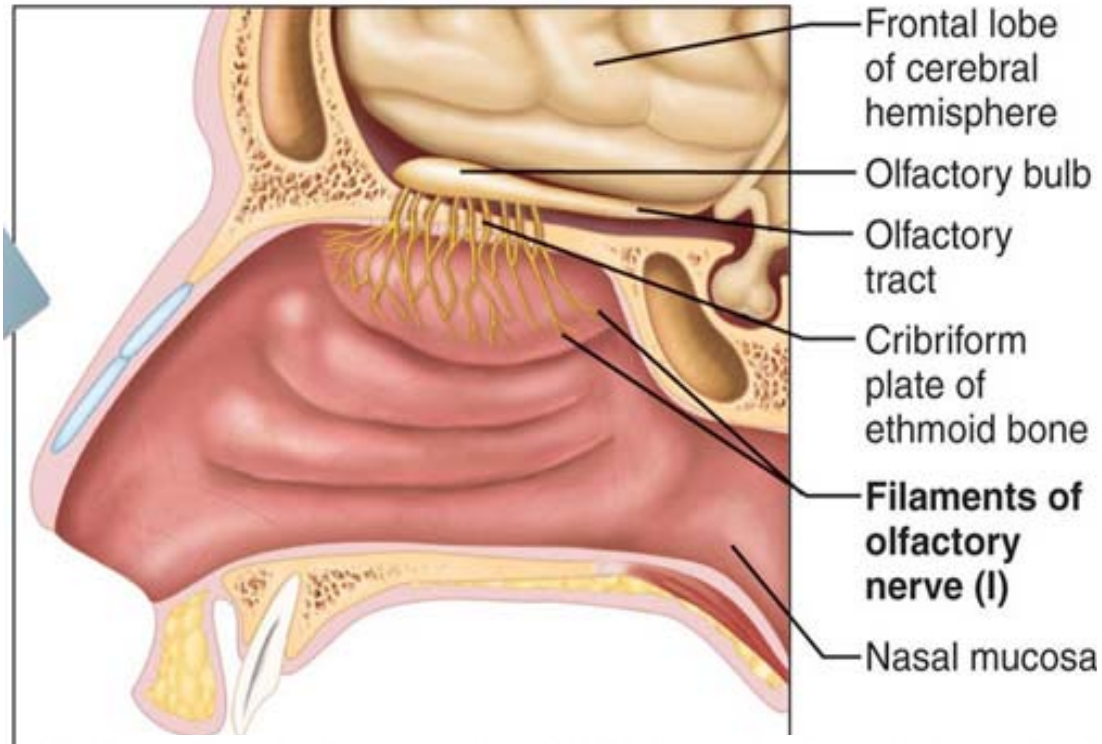
Four basic tastes: sweet, salty, sour, bitter. (also **umami**, glutamate (MSG), pleasant amino acids, and **water**)
Map is controversial, but different taste buds for each, *look* essentially alike, mostly fungiform.

CN IX	**glossopharyngeal**	bitterness	back of tongue	$1/2x10^8$, (1 oz/122,300 gal swim. pool) (Read: Jennifer McLagan's "Bitter")
CN VII	**facial**	sour:	side of tongue	$1/3x10^5$
		salty:	anterior border	1/400
		sweet:	anterior tip	1/200



Fibers lead to to medulla oblongata nucleus solitarius.

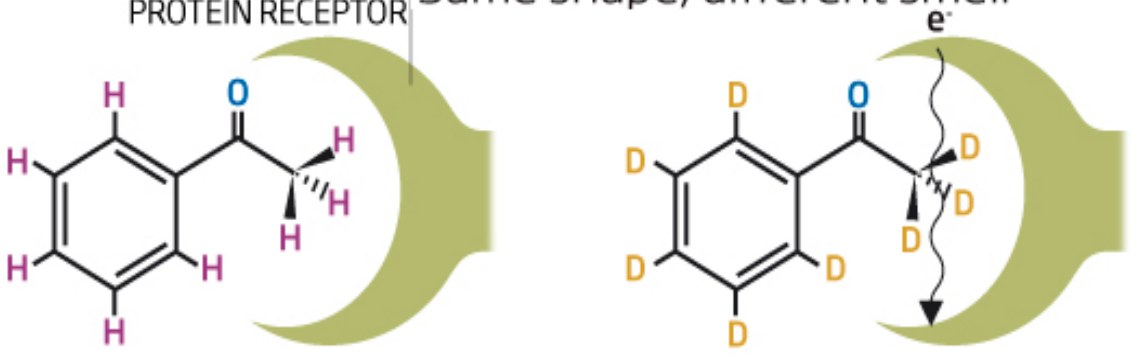
Note that "flavor" is a combination of taste and smell.



The fragrant acetophenone molecule fits into a particular protein receptor like a key in a lock.

Replacing the hydrogen atoms with deuterium atoms alters the rate at which the molecule vibrates. This may change the energy needed for an electron to tunnel through the receptor, altering its response, and hence the perceived smell

Same shape, different smell



HYDROGEN
1 proton/1 electron

DEUTERIUM
1 proton/1 electron/1 neutron