



Sensory Evaluation & Brewing

Tony Aiken/Gary Spedding and the
American Brewers Guild

**PRINCIPLES OF THE SENSORY
EVALUATION OF BEER**

Some Principles of the Sensory Evaluation of Beer

The Everyday World of Sensory



Stimulus



Sensation



Perception



Response

Principles of Sensory Evaluation

- ❑ **Sensory Evaluation defined: the examination of the sensory attributes of a product by assessors. Sensory attributes are commonly referred to as:**

appearance

odor / aroma / fragrance

tactile or trigeminal sensations

taste

Principles of Sensory Evaluation

Use sensory evaluation as:

- ❑ A quality control tool to help define a products' attributes, to monitor and maintain a products' consistency, and to identify any off-tastes that might present themselves over time.
- ❑ Tool of evaluation to formulate new products and to compare existing products with those of competitors.

Principles of Sensory Evaluation

Sensory Analyst

- ❑ measures with the senses
- ❑ uses exact methods
- ❑ evaluates data statistically
- ❑ receives training
- ❑ receives periodic retraining

Organoleptic Taster

- ❑ comprehends with the senses
- ❑ uses feeling / emotions to analyze impressions
- ❑ colors evaluations with own preferences
- ❑ discusses with others during sessions
- ❑ untrained

Principles of Sensory Evaluation

Five Senses

Smell

Taste

Touch

Sight

Sound

Olfaction

Gustation

Trigeminal
sensation

Visual sensation

Auditory sensation

Principles of Sensory Evaluation

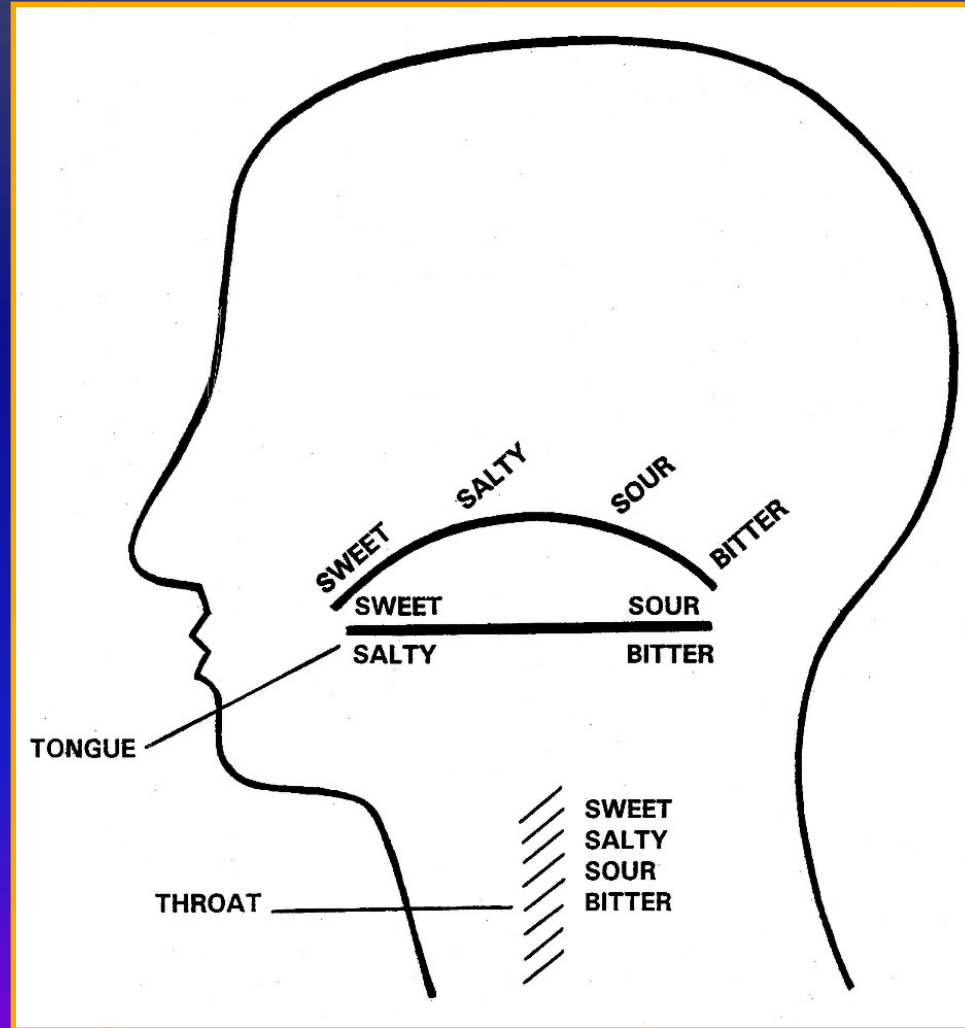
- ❑ **Basic taste: salty, sour, sweet, bitter (Umami*)**
- ❑ **What has fat got to do with it?**
- ❑ **2000-5000 taste buds located in mouth**
taste molecules (tastants) stimulate
receptors which in turn stimulate nerve
endings inside the tongue

***Umami = “Delicious taste”**

Focus on Flavor

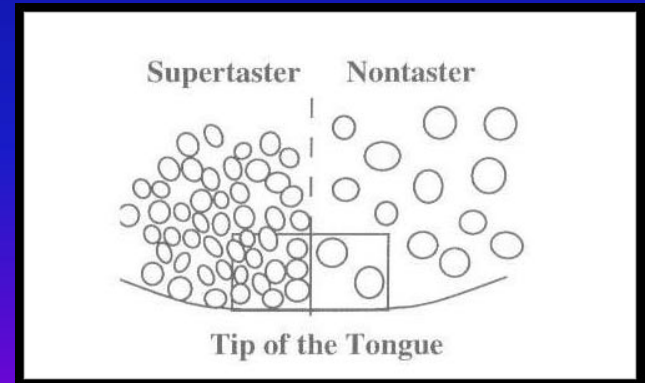
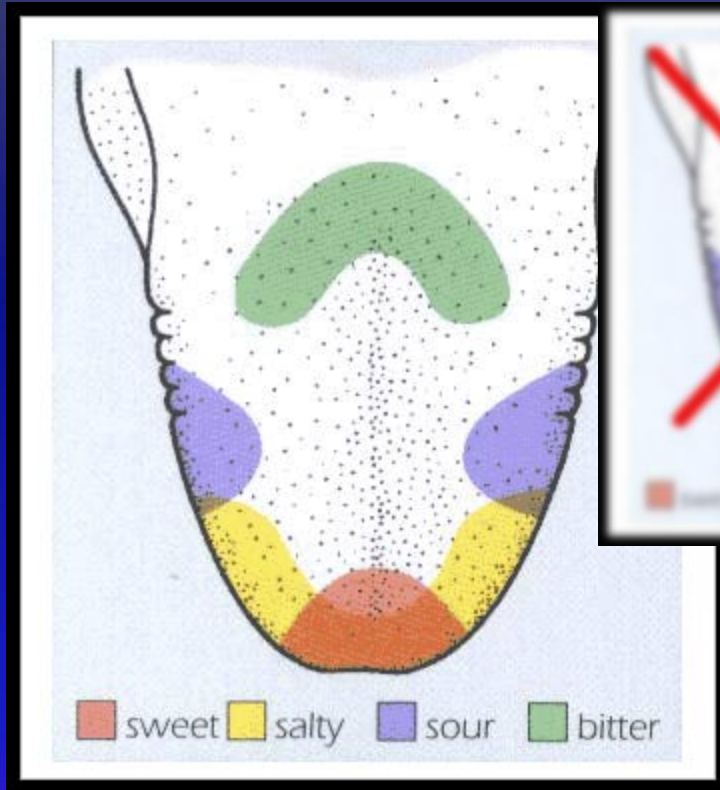
- ❑ Flavor is a complex mixture of sensory input composed of taste (GUSTATION), smell, (OLFACTION) and the tactile sensation of food as it is being munched > “MOUTHFEEL”
- ❑ We often use “Taste” to mean “Flavor”
- ❑ Strictly > taste arises from specialized taste cells in the mouth.

Anatomy of the gustatory system



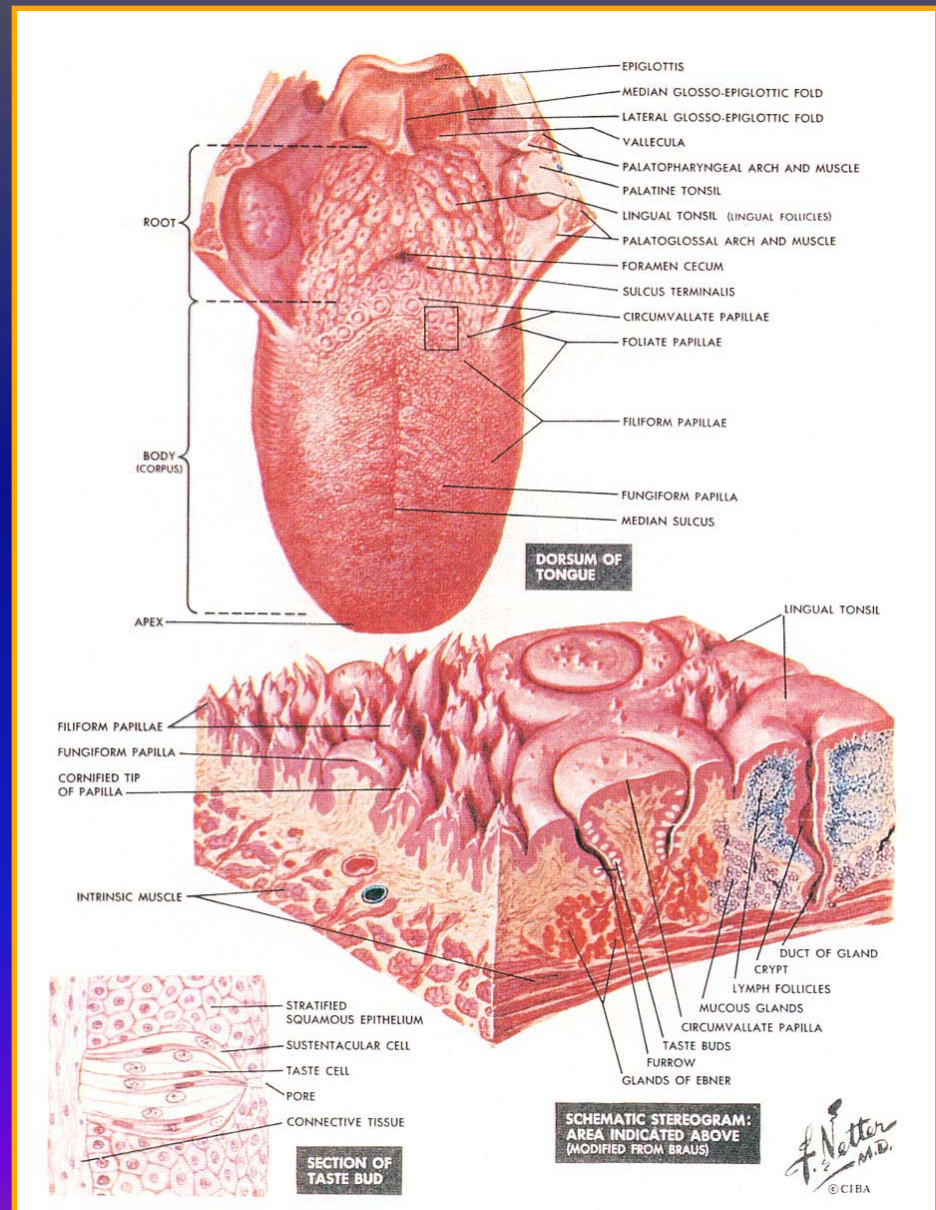
G. Jellinek, 1981

The Tongue

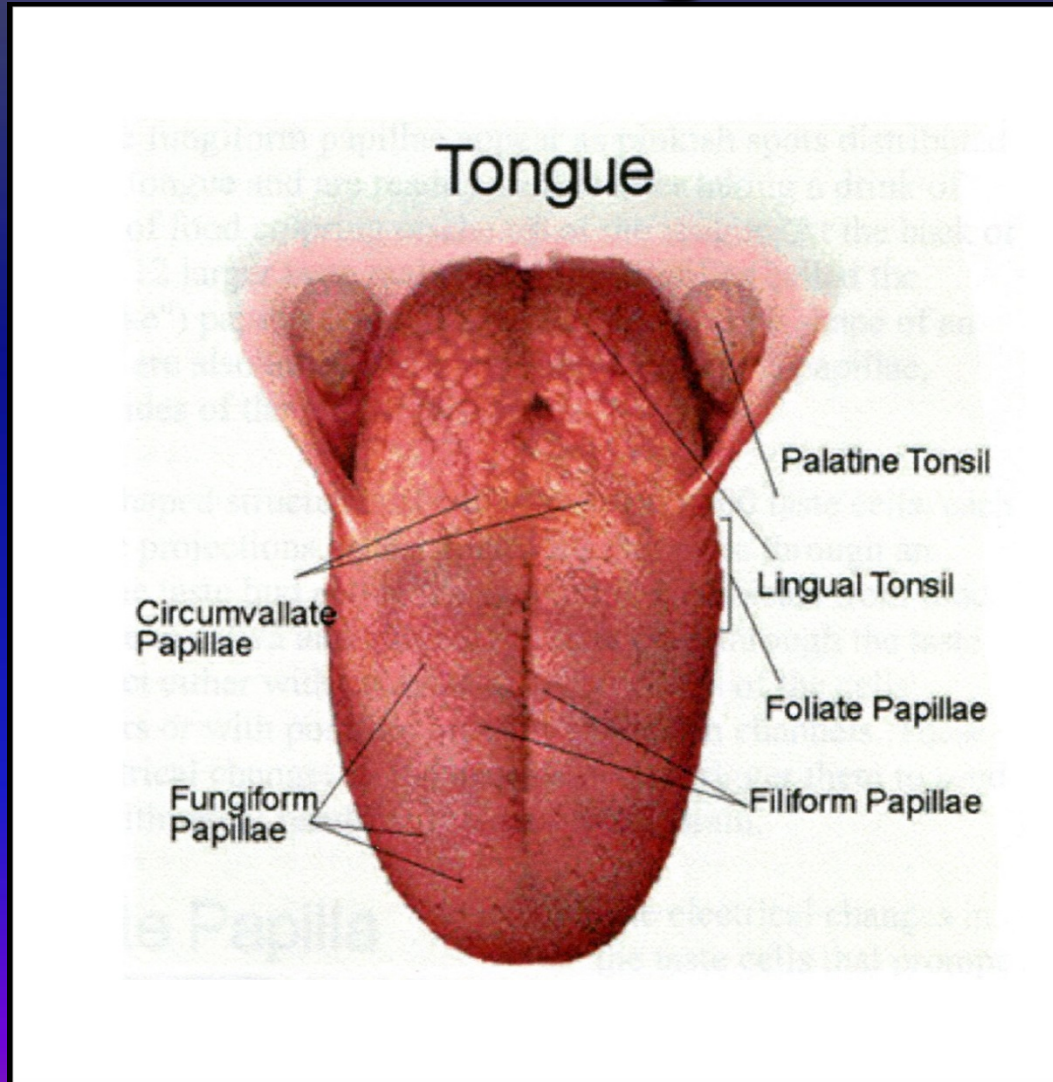


Anatomy of the tongue showing the three types of taste papillae and the organization of taste receptor cells into a taste bud.

(From Netter, F.H., *The CIBA Collection of Medical Illustrations*, CIBA Pharmaceutical Company, 1983 (with permission).



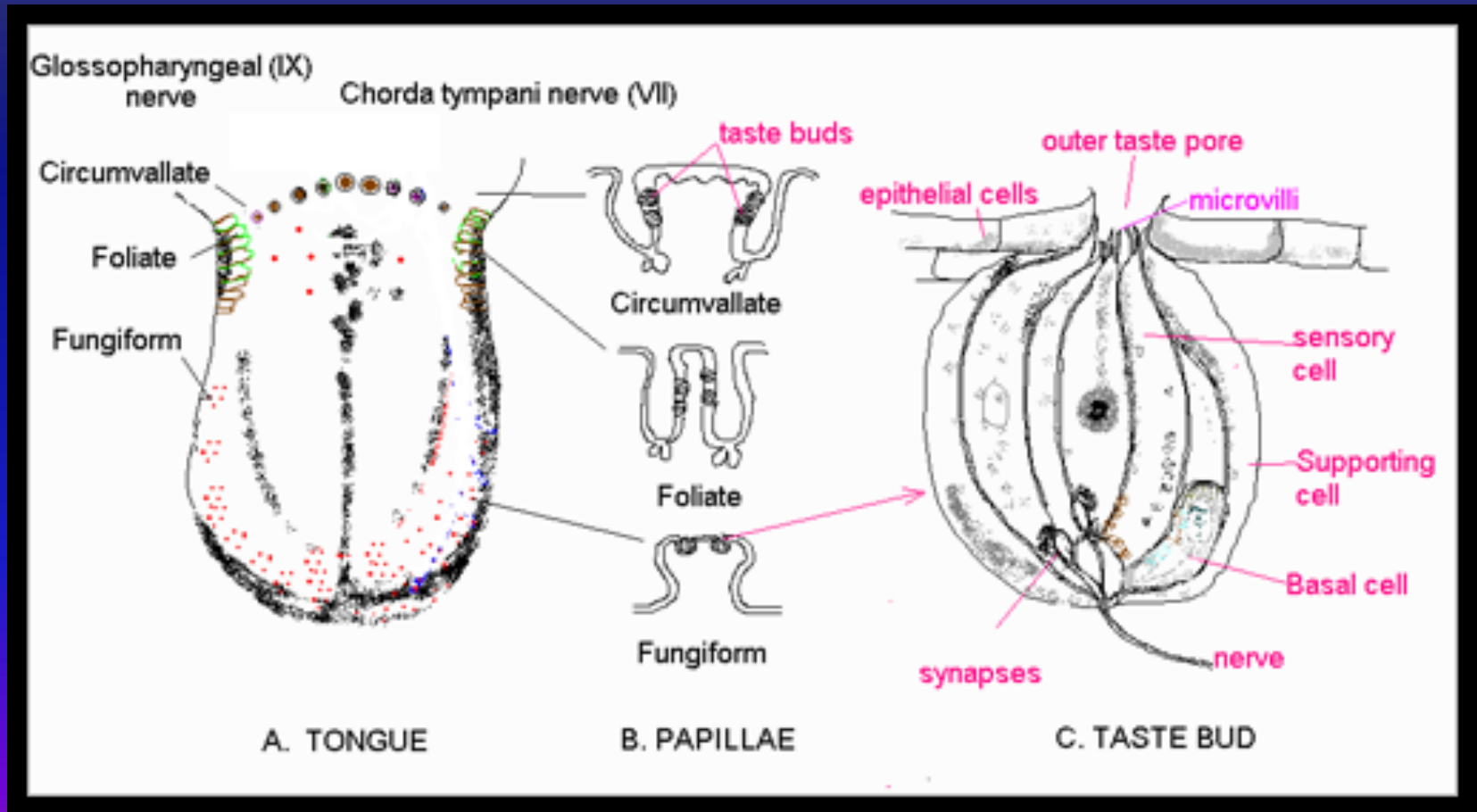
The Tongue



Taste buds!



Anatomy of the tongue and taste buds

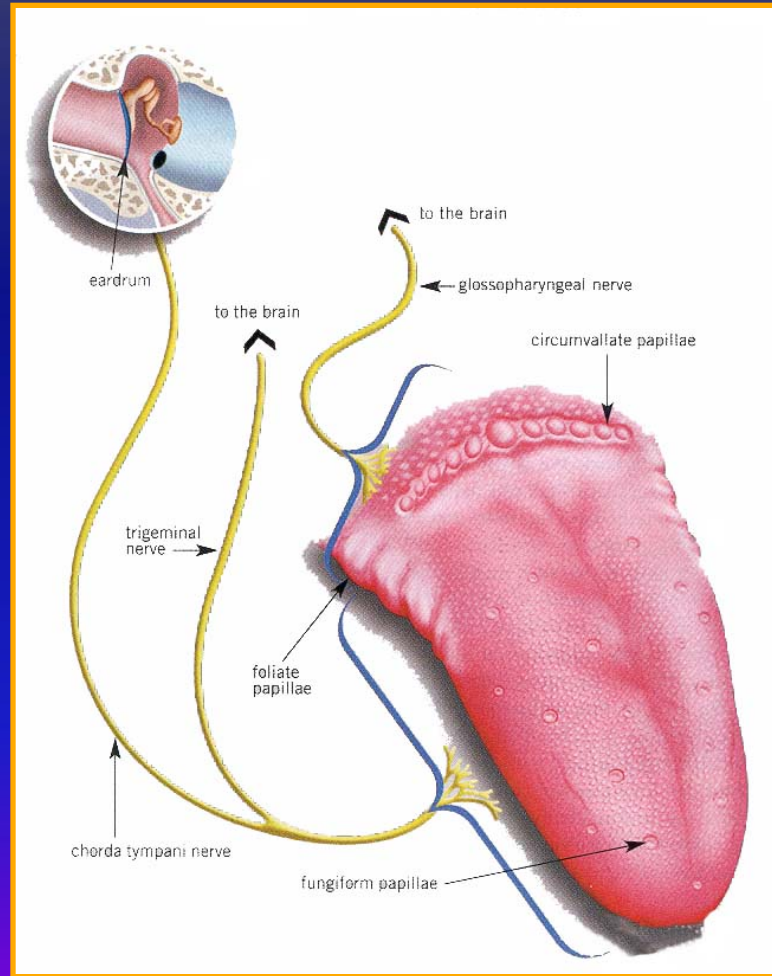


Principles of Sensory Evaluation

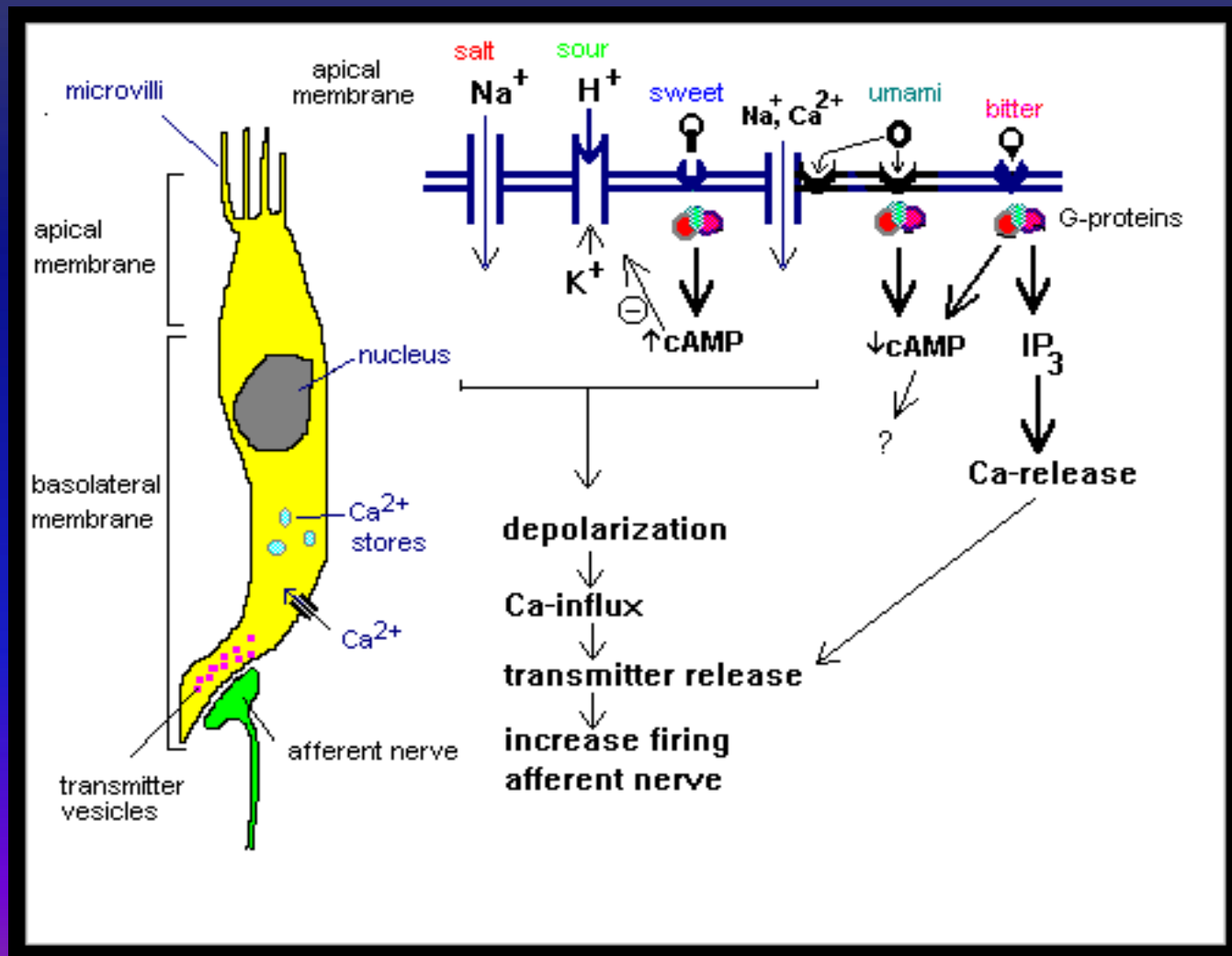
Papillae look like bumps on tongue

- ❑ fungiform located on front of tongue, look like button mushrooms
- ❑ foliates, supposedly leaf-like, show up as a reddish series of folds on each edge near the back of the tongue
- ❑ circumvallates are way on the back, practically down the throat, stand like round moated towers across the tongue's surface in an inverted "V" pattern

Gustatory Nerves



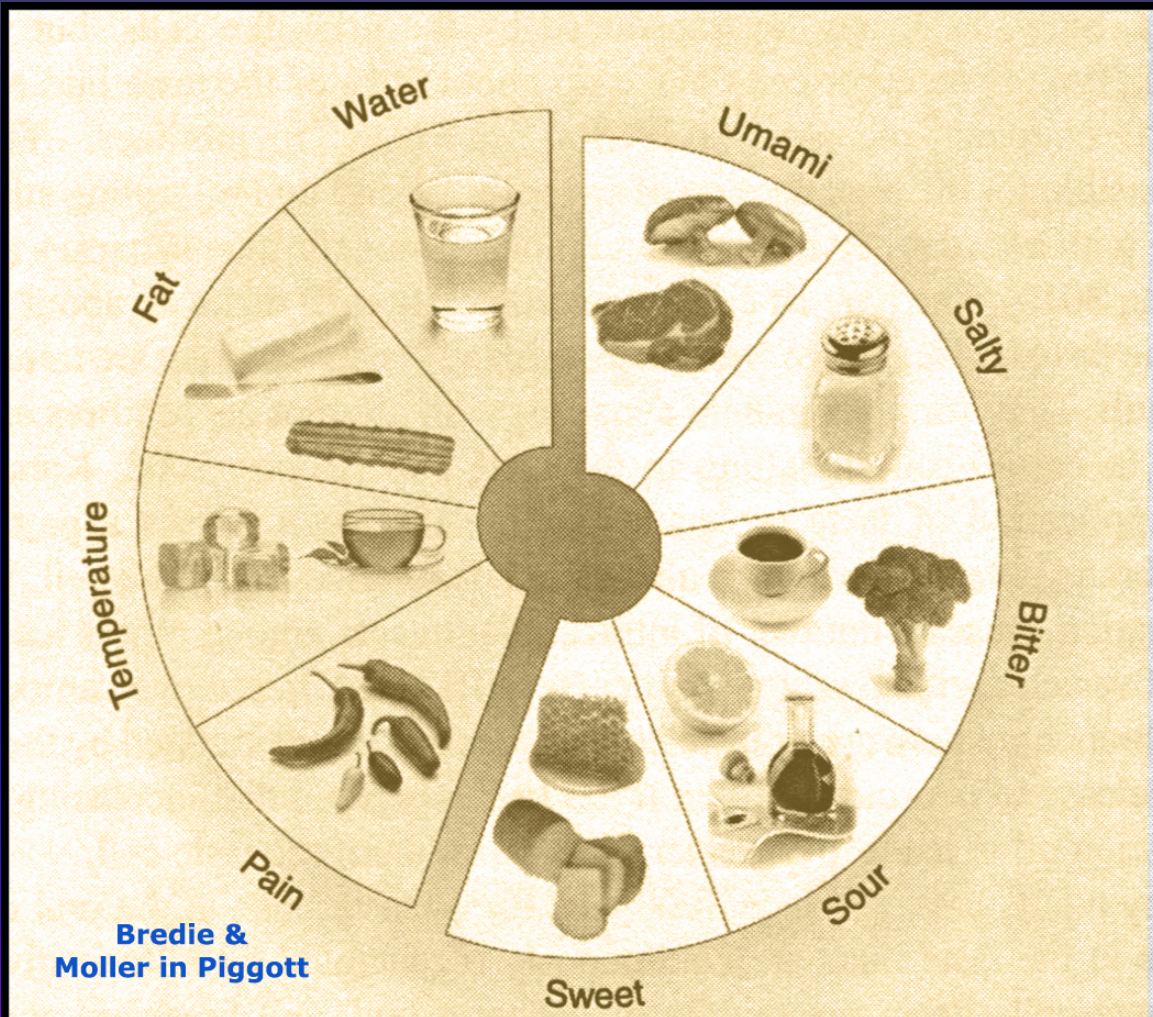
Taste Receptors



Principles of Sensory Evaluation

- ❑ Certain proteins on surface of mouth act as receptor sites for specific molecules
- ❑ this is done by virtue of particular shape molecule attached
 - protein changes configuration becoming permeable to certain ions
 - gives rise to small electrical charge
 - charge is picked up by nerve fibers
- ❑ nature and overall pattern of currents produced by tongue thought to be info brain uses to determine taste

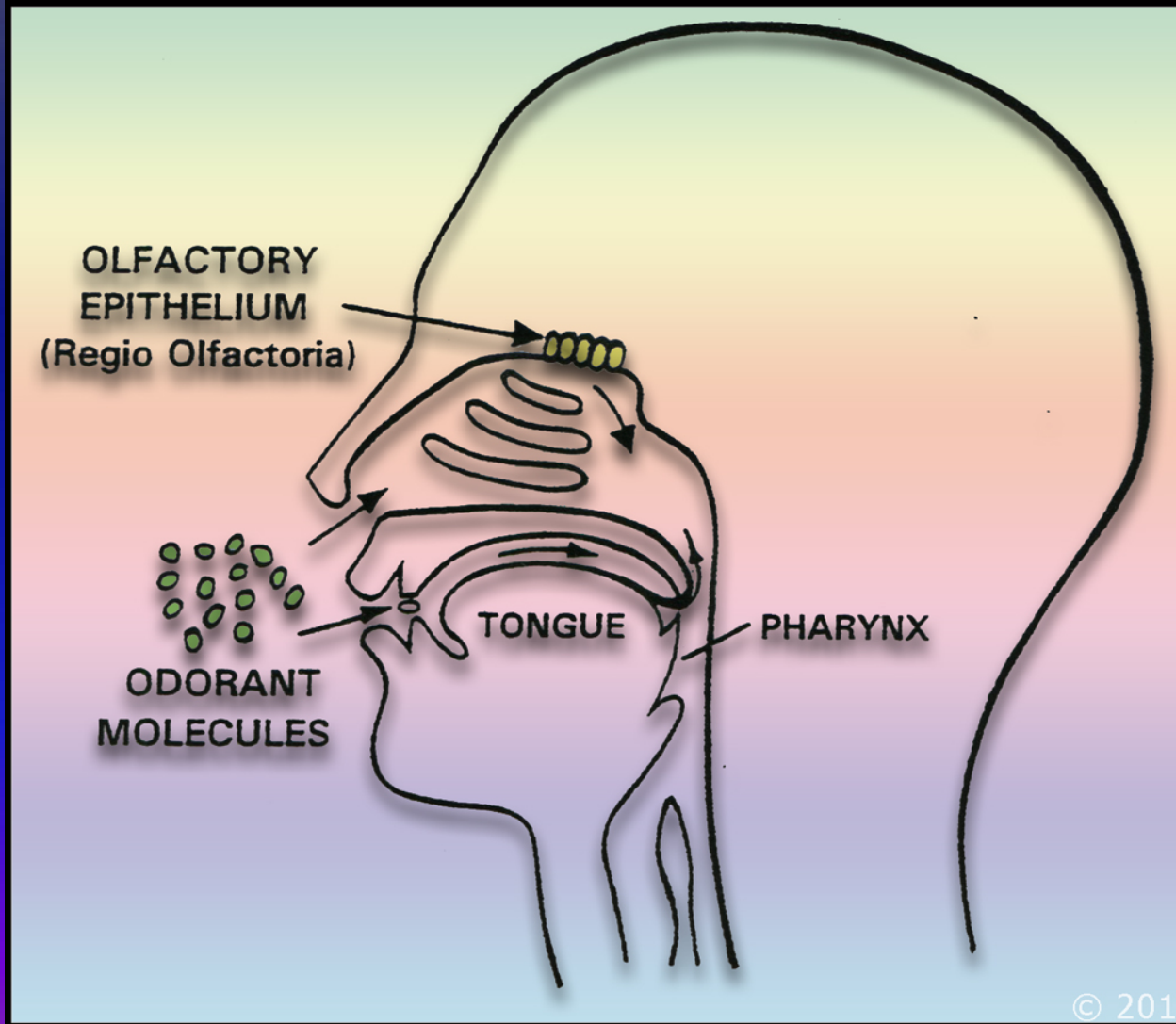
Summary – Reception in the Mouth



Bredie & Moller in Piggott

Chemo- and thermo receptors in the mouth. More than the five basic tastes - other receptors believed to be important for overall taste quality of foods/beverages

Principles of Sensory: Olfaction



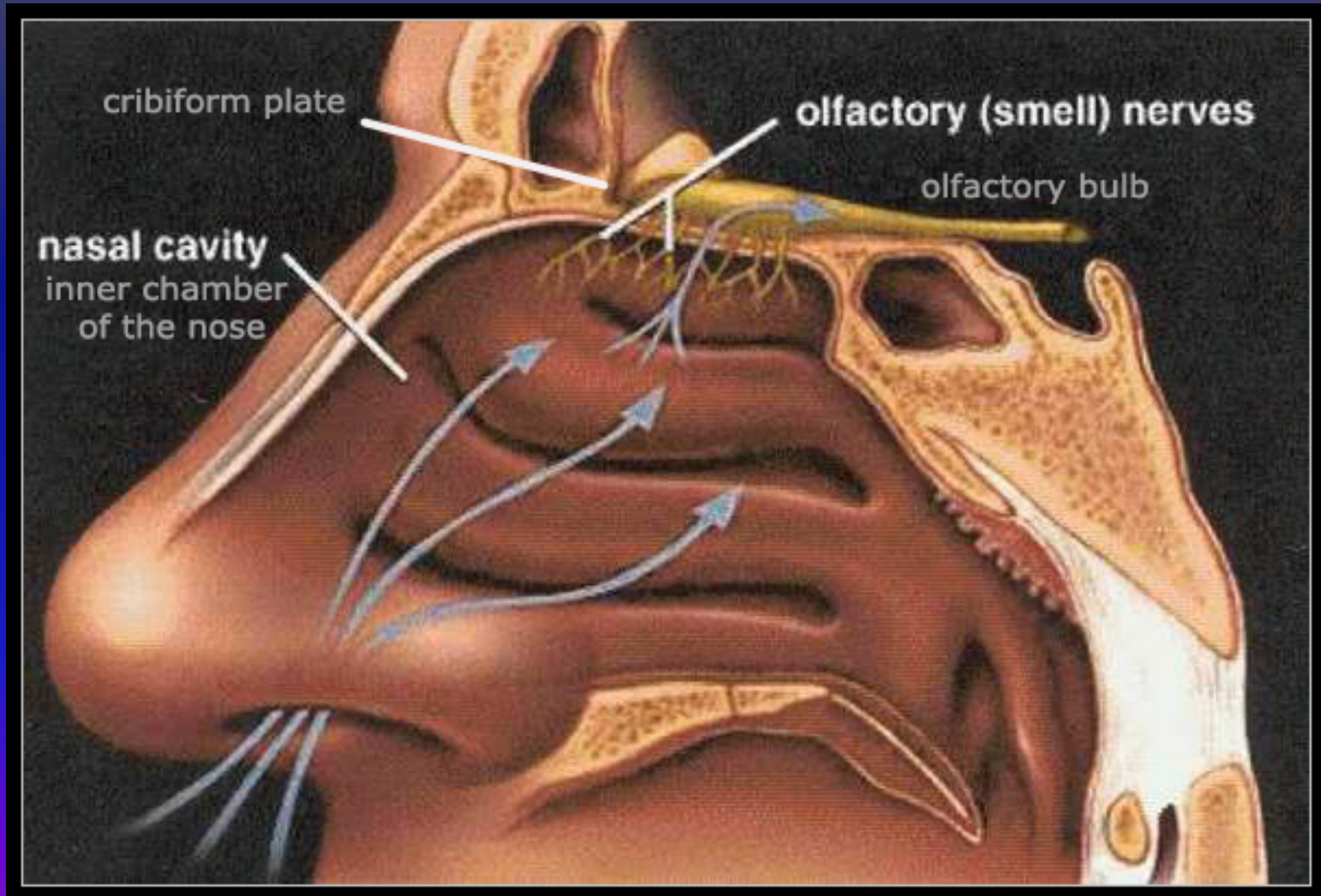
Principles of Sensory Evaluation

- ❑ Most of what we perceive as flavor is detected via the olfactory sense
- ❑ Humans can discriminate between thousands of odors [10,000 + & down at very low concns!]
- ❑ From childhood we establish odor memory:
 - can elicit vivid memories - Grandma's house
 - can elicit reactions - chocolate / onions
- ❑ Odors commonly classified by object that produce them
 - fruity, grassy, woody, papery

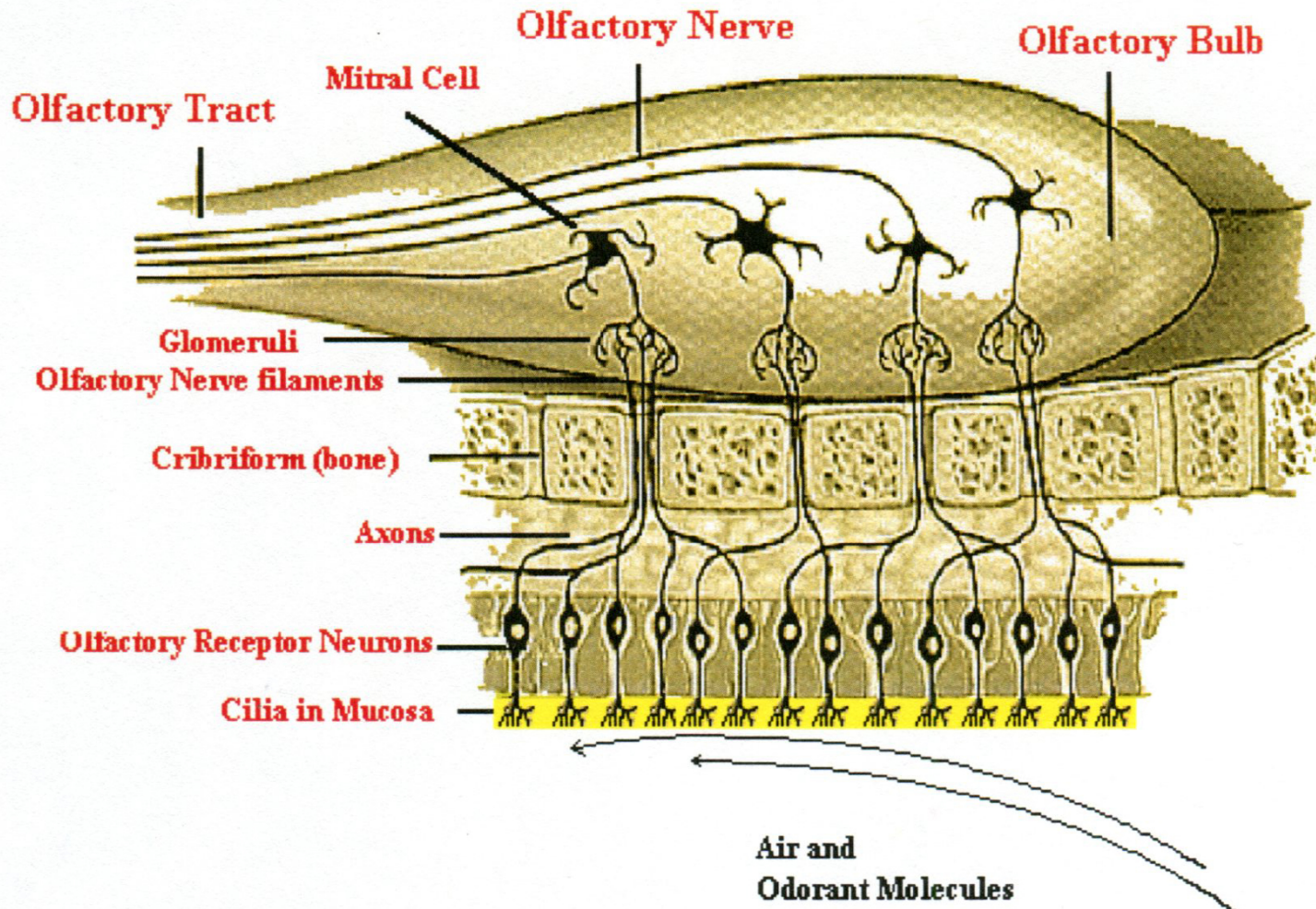
Principles of Sensory Evaluation

- ❑ Odor molecules detected by olfactory epithelium located on roof of nasal cavity
- ❑ Receptor cells have millions of hair-like cilia which project into mucous layer covering epithelium
- ❑ Mucous layer serves to collect and concentrate molecules from air flowing over it

Anatomy of the olfactory system



Anatomy of the olfactory system



Anatomy of the olfactory system

Typical nerves paths:

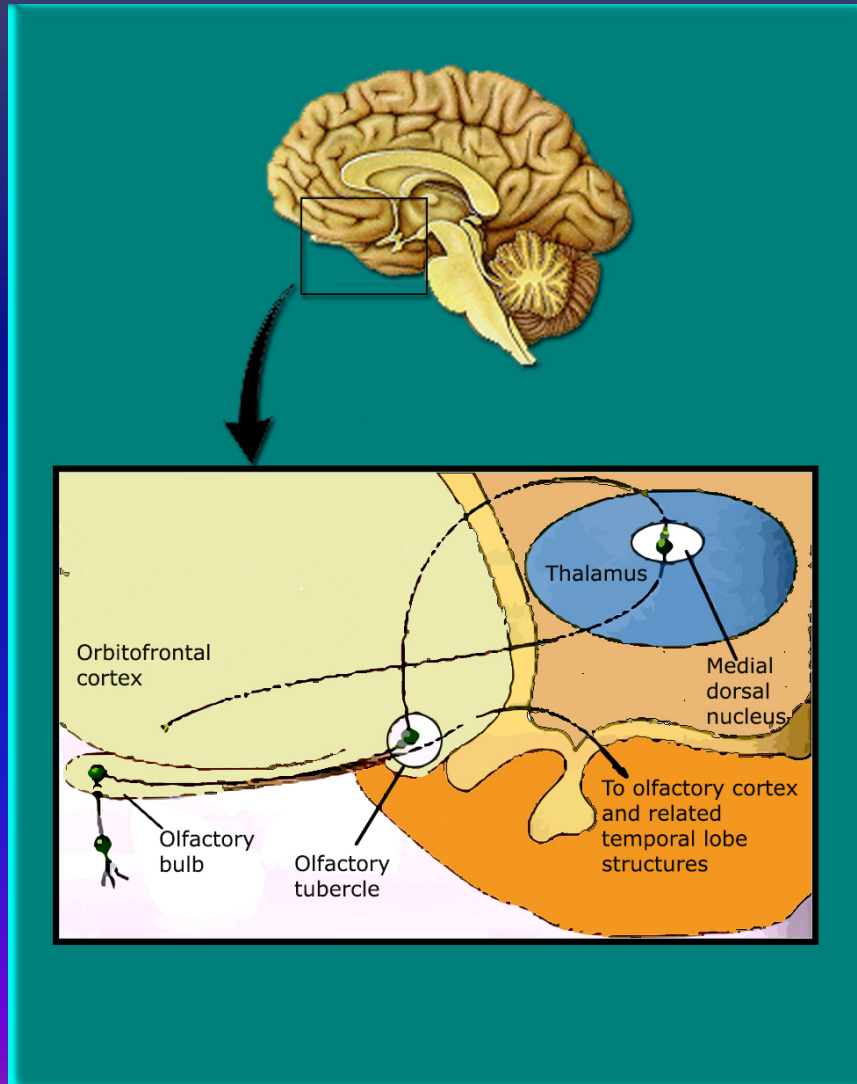
- ❑ Most neuronal connections of the sensory system involve the thalamus which relays the sensory experience to the primary center in the cortex
- ❑ For example, mouth feel is an instance of the sense of touch detected by the trigeminal nerve (CN V) and conveyed to thalamus which relays it to cortex
- ❑ Another circuits in the thalamus is involved with the Papez circuit which describes the connections between parts of the brain that link emotions and memory

Anatomy of the olfactory system

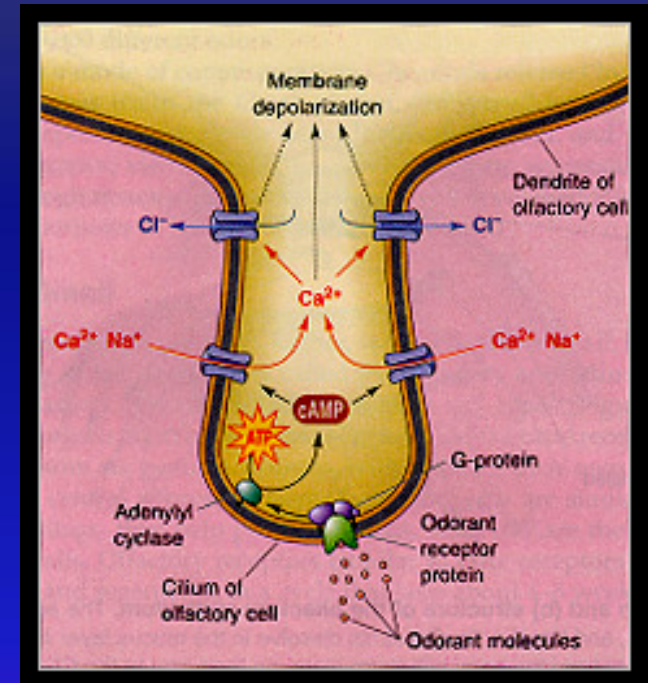
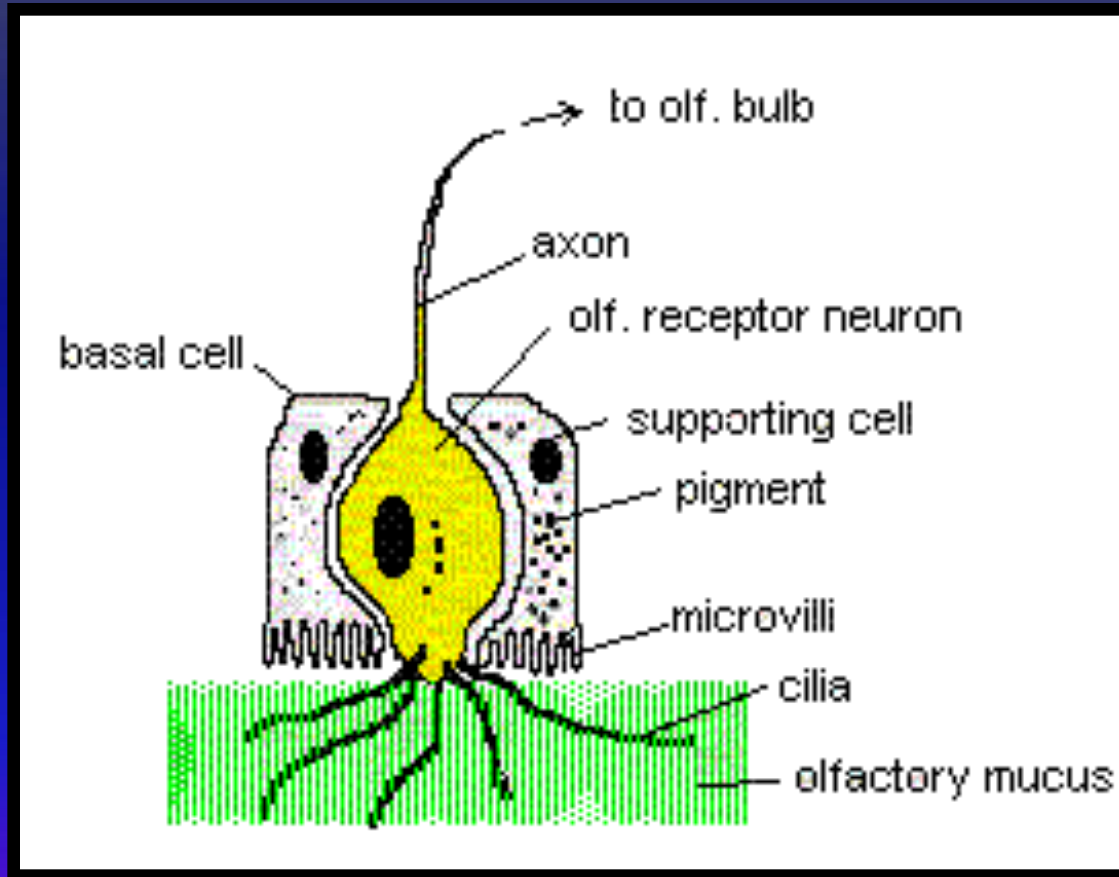
Smell:

- ❑ Smell is unique because unlike the other senses its nerve paths don't go directly to thalamus
- ❑ The olfactory receptor neurons (CN I) convey signals representing the aromas sensed to the olfactory bulb
- ❑ The neurons exiting the olfactory bulb first enter the Papez circuit by targeting the areas involved in memory and emotion on their way to the thalamus, where all the information is interpreted
- ❑ This path seems to give smell a disproportionate affect on memory and emotion formation

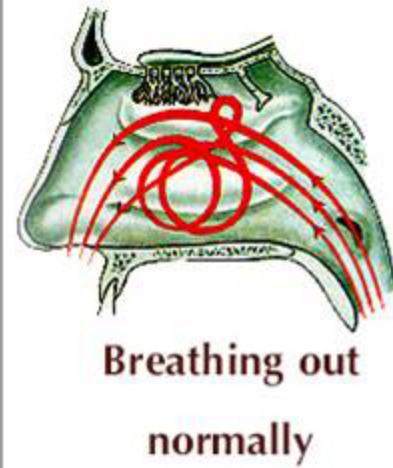
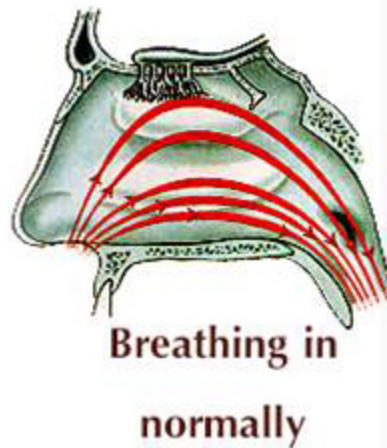
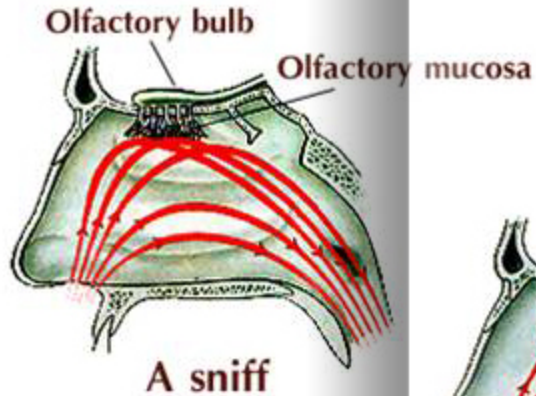
Anatomy of the olfactory system



Anatomy of the olfactory system



So how do we smell our beer?



The Nasal Cavity, Breathing
& Olfaction

Sensory Blindness

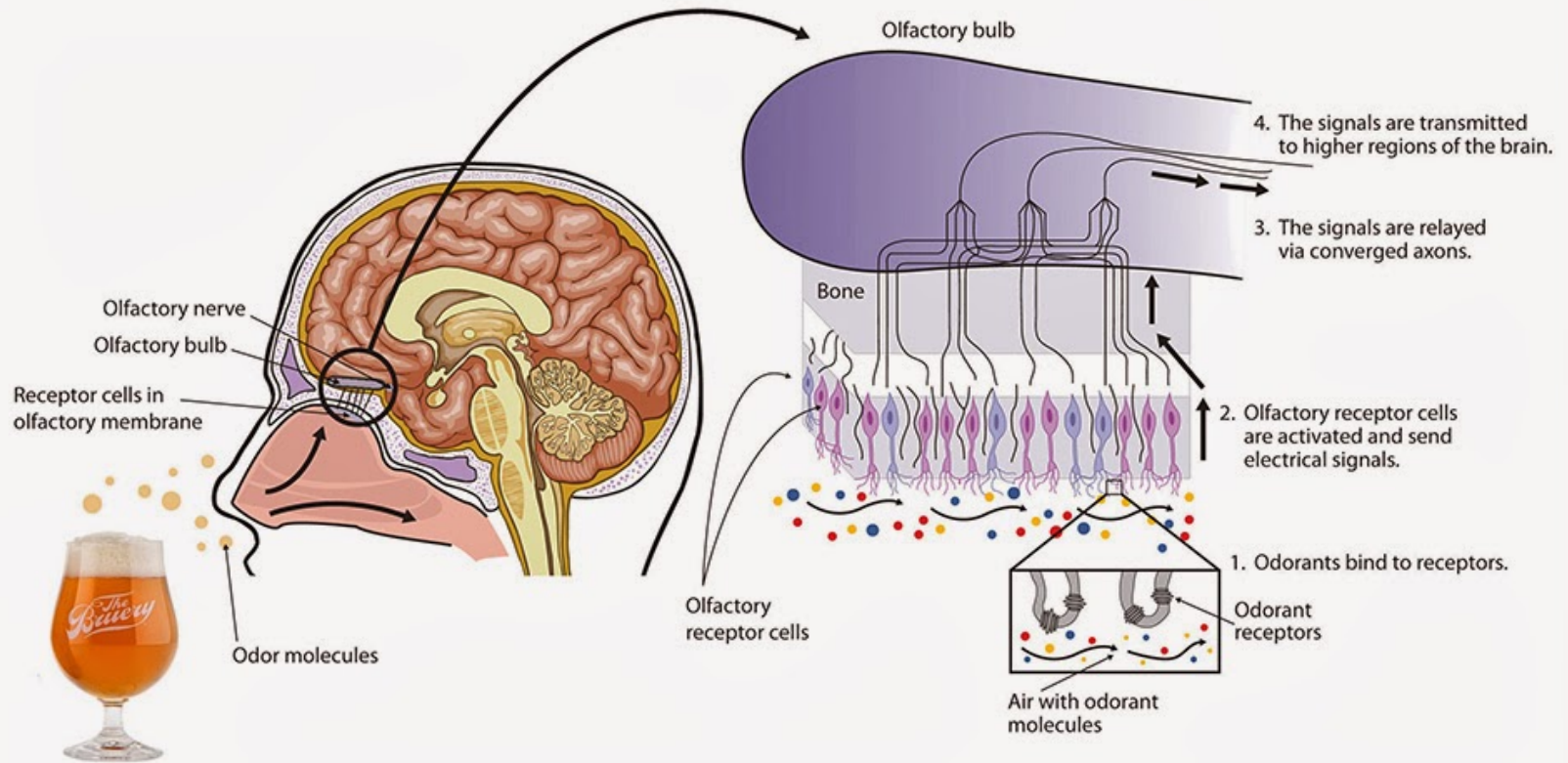
Olfactory disorders

ANOSMIA	a complete loss of smell
HYPOSMIA	partial loss of smell
HYPEROSMIA	enhanced smell sensitivity
DYSOSMIA	distortion in odour perception (includes parosmia & phantosmia)
PAROSMIA	distortion of perception of external stimulus
PHANTOSMIA	smell perception with no external stimulus

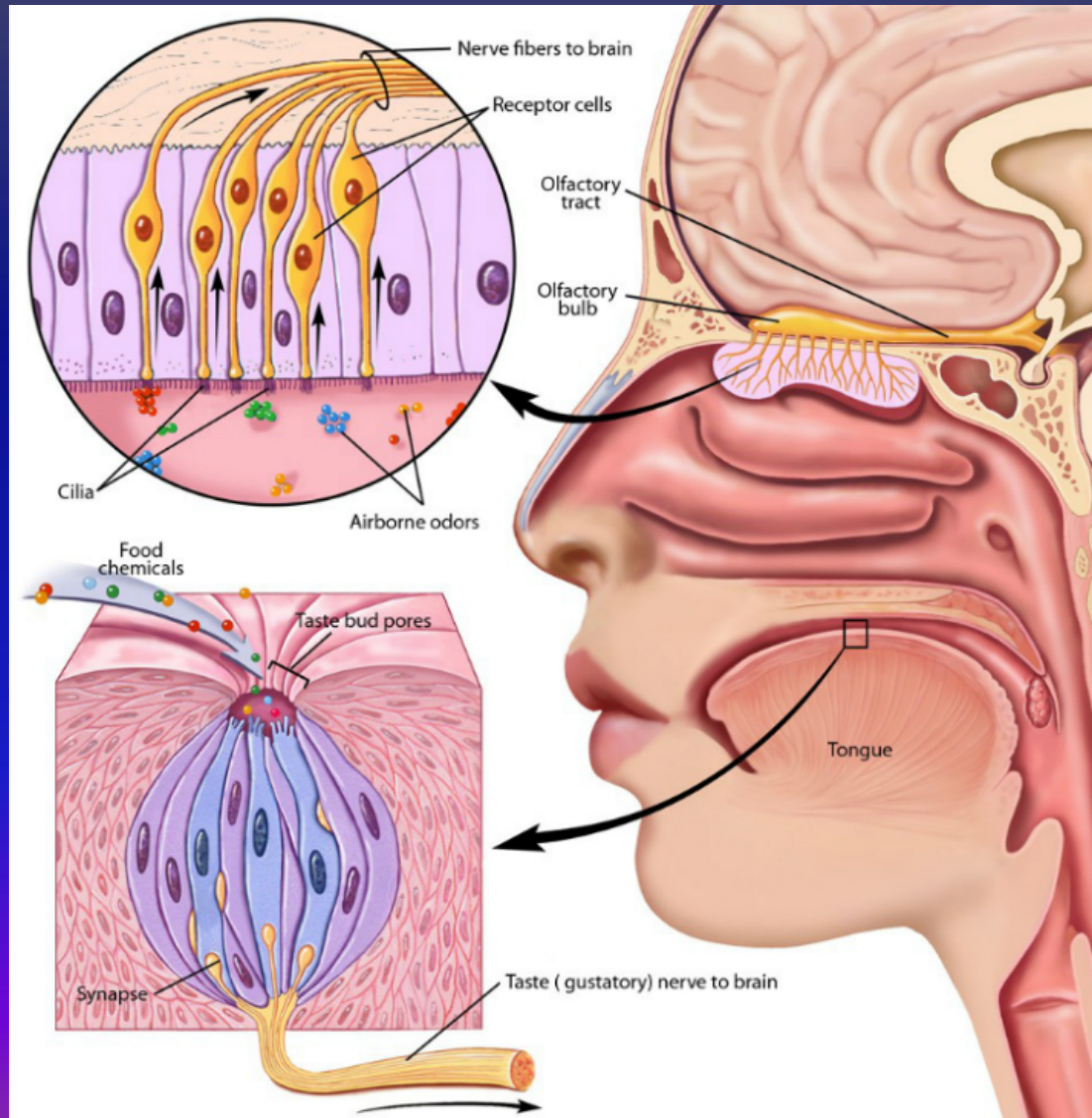
Synesthesia

- ❑ **What is synesthesia – how frequent?**
- ❑ **1:2000 People**
- ❑ **An issue where an associated sense is coming from another. A number, date person or object will relate to you as a color for example.**

Summary Olfaction



Summary Taste/Olfaction



Principles of Sensory Evaluation

Complications can arise

- ❑ many terms can be ascribed to a single compound

thymol = herb-like, green, rubber-like

- ❑ multiple terms used to describe the same compound at varying concentrations

DMS = malty, veggie-like, tomato juice, oysters

- ❑ many compounds can be associated with a single term

- ❑ lemon = alpha-pinene, citral, linalool, alpha-terpeneol

Principles of Sensory Evaluation

- ❑ **First principles: GET EVERYONE ON THE SAME PAGE!** Train your panelists so that all comprehend flavor notes using the same or very similar descriptors so that you know what each panel member refers to when they describe (an) attribute(s).
- ❑ **We consider in this seminar thresholds.** Panelists must appreciate first of all what they will be looking for (with common terminology) as you determine their (individual) and the group threshold data.

Principles of Sensory Evaluation

Chemical sense associated with irritation

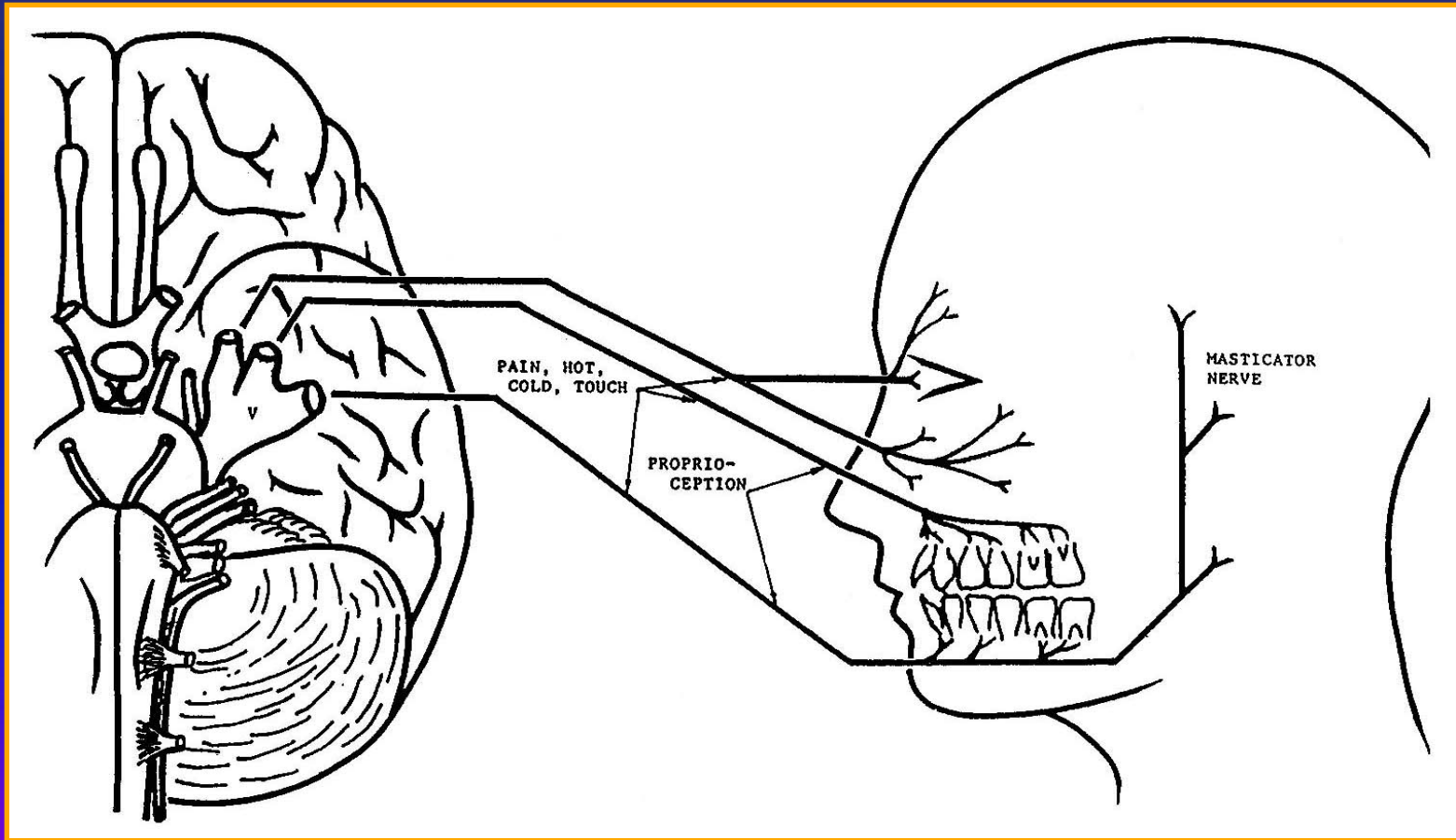
- pain referred to as Trigeminal Sensations
 - Trigeminal nerve - mediates perceptions of
 - burning, tingling, cooling

Trigeminal stimulants horseradish, ginger, vinegar

Trigeminal nerve splits > several branches > innervates the tongue, oral mucosa, nasal mucosa, throat, and other areas of the face.

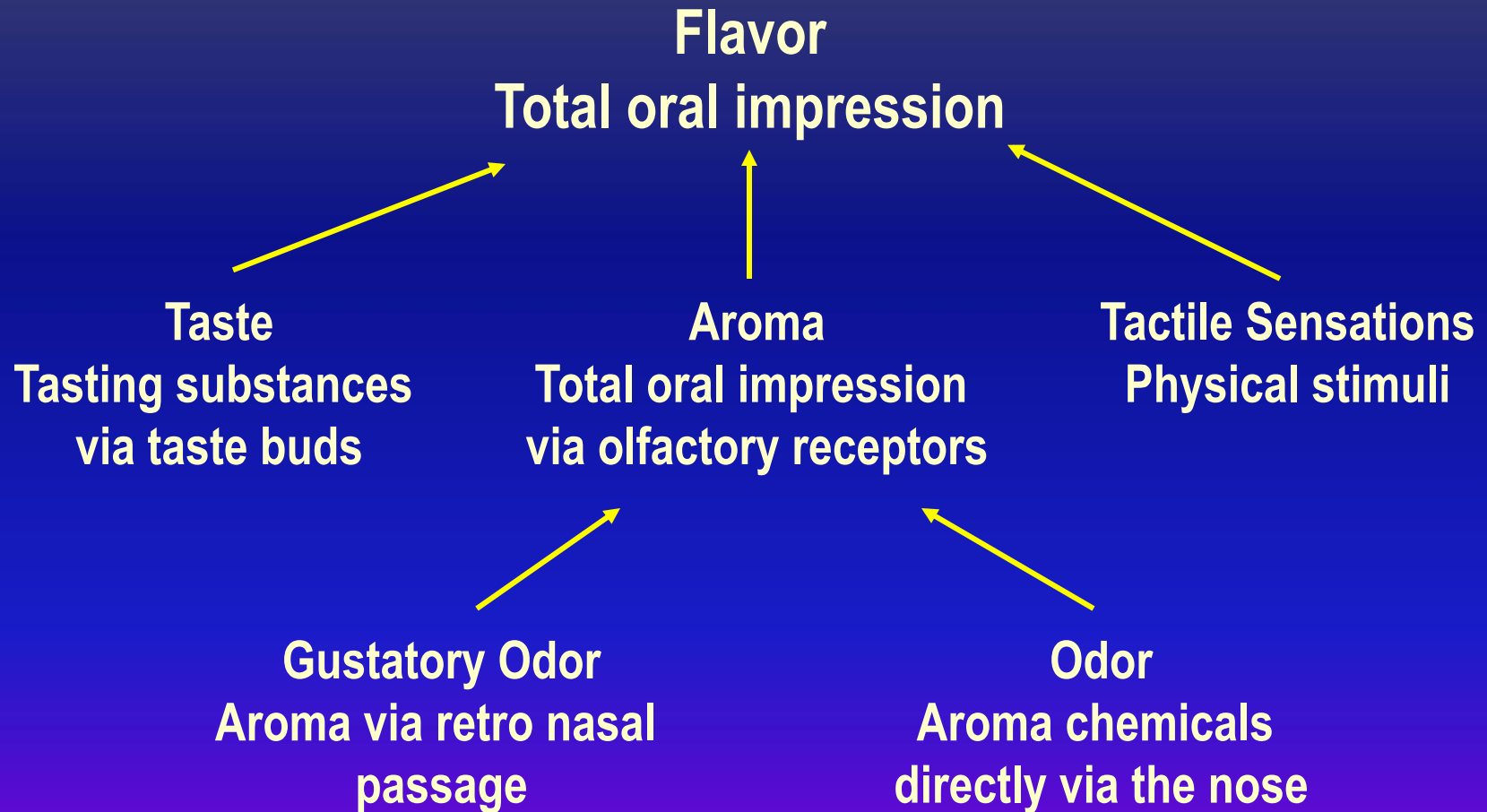
Reflex responses to trigeminal stimuli serve to reduce exposure to irritants and include sneezing, increased salivary flow, sweating.

Pathway of the trigeminal (V) nerve



(Redrawn from Netter, F.H., *CIBA Collection of Medical Illustrations*, Vols. 1 and 3, Ciba-Geigy Corporation, Summit, NJ, 1973)

Principles of Sensory Evaluation



Principles of Sensory Evaluation

□ Analytical Process

The taster

Perceives

Detects

Compares & Remembers

Stores

Describes

Evaluates

The Everyday World of Sensory



Stimulus



Sensation



Perception



Response

Principles of Sensory Evaluation

Myths & Misconceptions - I

“Taste is static”

- ❑ Taste is dynamic, not static.
- ❑ Environment and personal experiences affect sensitivity
- ❑ Physical as well as mental well being have been linked to sensitivity
- ❑ Senses must be exercised

Principles of Sensory Evaluation

Myths & Misconceptions - II

“Temperature of sample is not critical”

- ❑ For reproducibility, temperature control is essential**
- ❑ Flavors are enhanced at warmer temperatures**
 - cooler temperatures reduce spicy notes**
 - warmer temperatures enhance spicy notes**

Principles of Sensory Evaluation

Myths & Misconceptions – III

“Once a bad taster, always a bad taster”

- ❑ With proper training and practice one can learn and improve sensory acuity**
- ❑ Even those who are adverse to a product, in many cases, are the most sensitive tasters**
- ❑ Smokers can be as sensitive as non-smokers**

Principles of Sensory Evaluation

Rules of Tasting - I

- ❑ Clean, quiet room with no competing stimuli
- ❑ No eating, drinking, smoking 1 hr. before tasting
- ❑ Be prompt
- ❑ Gently swirl sample taking short sniffs to record aroma impression first
- ❑ Take small sips swirling with tongue throughout mouth
- ❑ To avoid oversaturation, allow 15 - 60 seconds for re-adaptation

Principles of Sensory Evaluation

Rules of Tasting - II

- ❑ Panelists should be familiar with the ballot and what is required of them
- ❑ Taste samples from left to right
- ❑ Arrange samples from lighter to heavier
 - Consider putting high hopped beers at the end
- ❑ Judge similar samples at the same time
- ❑ Panelists may be asked to remain in room until all ballots are turned in for review

Sensory Test Facilities - I



Sensory Test Facilities - II

❑ Panel Room

Separate clean room

Odor free – temp controlled and quiet

Individual booths

Serve beer “blind” – no visual cues

Red light?

Computers?

❑ Separate Entrance/Prep area/Conference room

Sensory Test Facilities - III

❑ Serving samples

Correct or randomized order

Served in ruby-red glasses?

Served at the right temperature (e.g.. 45+/- 2 °F)

Shape and quality of glass

Beer clean glasses or plastic

With full ballot instructions known

Without overhearing/seeing other panelists?

End

Additional information can be supplied upon request

- ❑ **Gary @ 859-278-2533**
- ❑ **gspedding@alcbvtesting.com**
- ❑ **www.alcbvtesting.com**
- ❑ **Tony @ 859-229-4707**
- ❑ **tony@datcolsol.com**

Gary Spedding and Tony Aiken
for the
American Brewers Guild
Brewing School - 2014