Chapter 4
Sensory Properties of Food

How Baking Works

Words, Phrases, and Concepts

- Sensory perception
- Sensory evaluation
- Hue
- Opacity
- Sheen
- Flavor
- Umami
- Chemoreceptor
- Orthonasal/retronasal
- Astringency
- Trigeminal effect
- Mouthfeel

Introduction

Sensory perception:

- Receptors on sense organs detect stimuli.

  Examples of receptors:

  - Taste cells on taste buds in mouth.
  - Olfactory cells at top of nasal cavity.
  - Rods and cones in eyes.
  - Hair cells in inner ear.

- Brain interprets signals.

Introduction

Sensory properties:

- Appearance
- Flavor
- Texture

Introduction

Sensory evaluation:

- Systematic and objective evaluation of the sensory properties of foods.
- Different from eating for enjoyment.
- People vary in their abilities.

  Example: supertasters and nontasters
- Takes practice and concentration.

Appearance

We do “eat with our eyes.”

- Sight is highly developed in humans.

Different aspects of appearance:

- Color; also called hue

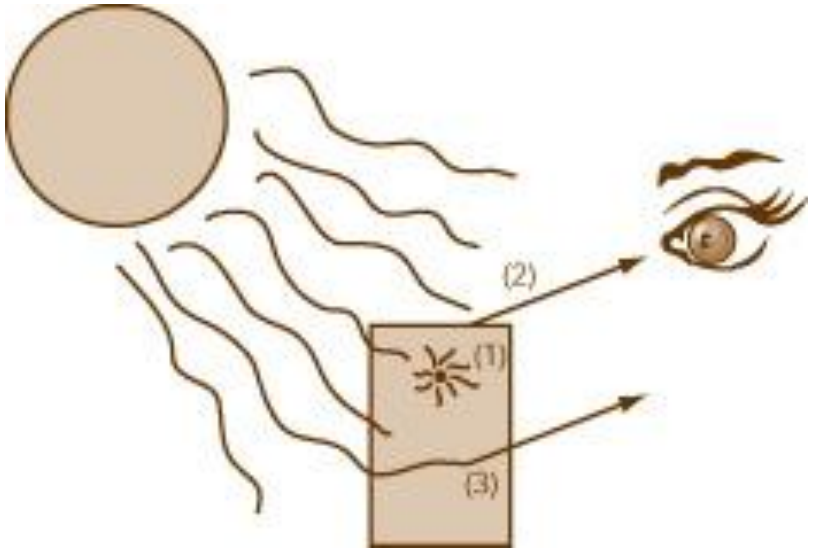
  Examples: red, blue, green

- Opacity; also called cloudiness
  - Contrasts with clarity or translucency
- Sheen; also called gloss
  - Contrasts with matte or dull.

Appearance

Perception of appearance is based on light that is:

- Reflected (bounces off)
- Transmitted (passes through)



Appearance

Our perception of appearance is affected by:

- The light source.
- The object itself.
- The surroundings.

Appearance

The light source:

- If light source changes, appearance changes.
  - Includes differences in the type of lighting and its intensity.

Example: bakeshop vs. dining room lighting.

Appearance

The object:

- Different objects absorb, reflect, and transmit light differently.
  - Some differences are chemical in nature.
    - Ingredient or formula differences.

      Example: cake made with darker yolks.
    - Bake time or temperature differences.
      - Chemical changes occur during baking.

      Example: higher heat causes more browning.

Appearance

The object:

- Different objects absorb, reflect, and transmit light differently.
  - Some differences are physical in nature.
    - Differences in air incorporation

      Examples: batters and egg whites.
    - Differences in surface smoothness

      Example: sugar crystal size in fondant.

Appearance

The surroundings:

- Can influence our perception of an object.
- A type of optical illusion.

  Example: white cake on white plate and on black cake.

Flavor

- More important than appearance and texture to customers.
- Also called taste.
- Three components:
  - Basic tastes
  - Smell
  - Trigeminal effects.
- Chemical in nature.
  - Flavor molecules must interact with and excite *chemoreceptors* on sense organs.

Flavor

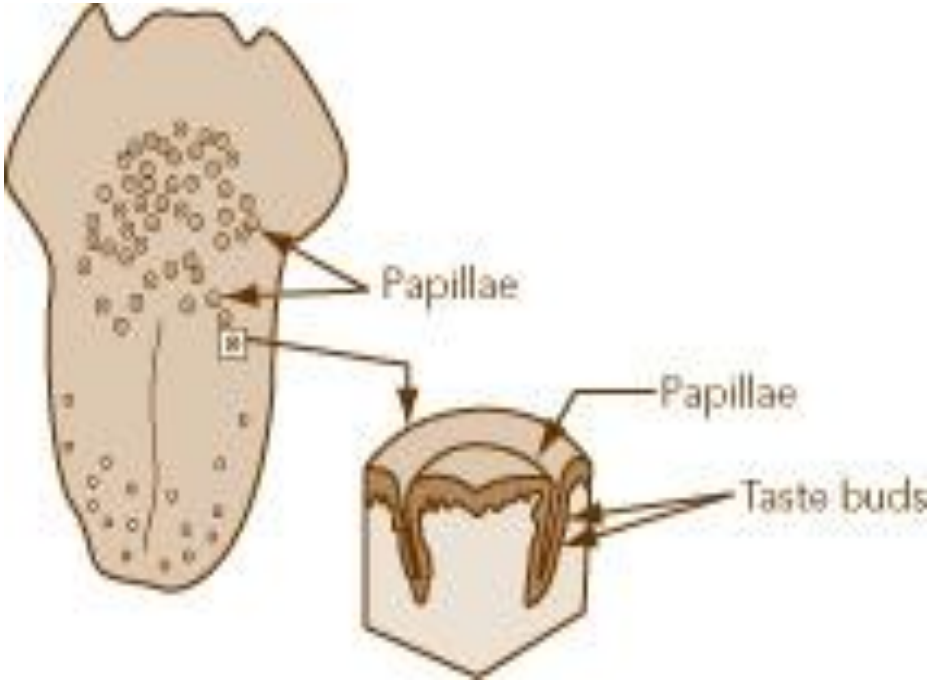
Basic tastes:

- Sweet, salty, sour, bitter, *umami*.
- Perception of certain flavor molecules: sugars, salts, acids, caffeine, etc.
- Perceived by chemoreceptors: taste cells on taste buds.

Flavor

Basic tastes:

- Requires saliva to carry flavor molecules to taste cells in crevices in mouth.



Flavor

Do not confuse sourness with bitterness or astringency.

- Sourness is immediate and causes salivation.

  Examples: pickles, yogurt, buttermilk

- Bitterness is often delayed and lingers.

  Examples: unsweetened chocolate, black coffee

- Astringency is often delayed and causes drying; makes tongue feel rough.

  Examples: strong black tea and grape skins

Flavor

Umami:

- Fifth basic taste.
- Means tastiness or savoriness in Japanese.
- Important in savory items only: quiche, focaccia, pizza.

Flavor

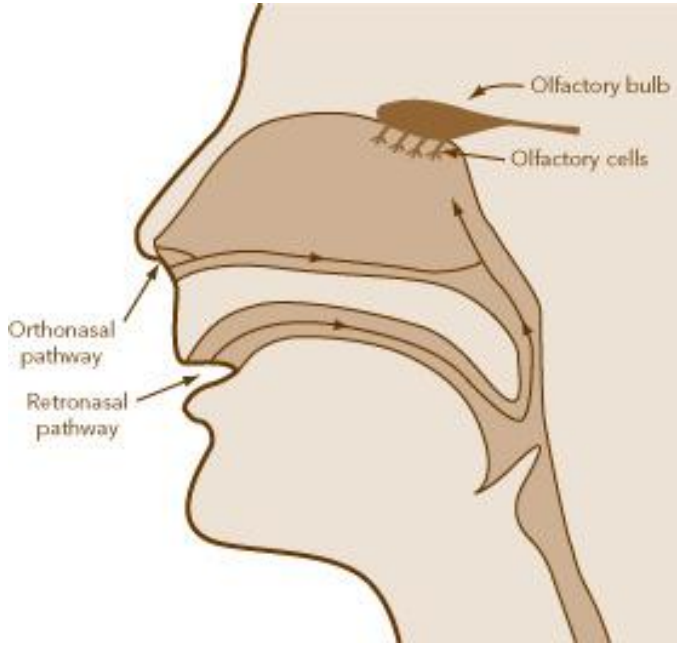
Smell:

- Also called aroma or olfaction.
- More complex than basic tastes.
  - Humans can differentiate thousands of different smells.
  - Most smells consist of hundreds of separate chemicals.
- Chemoreceptors: olfactory cells at top of nasal cavity.

Flavor

Smell:

- Aroma molecules must evaporate to reach the olfactory cells.
- Two pathways: orthonasal and retronasal.



Flavor

Trigeminal effects:

- Pungency of ginger
- Burn of cinnamon
- Cooling of mint
- Heat of hot peppers
- Tingling of carbon dioxide
- Sting of alcohol

Flavor

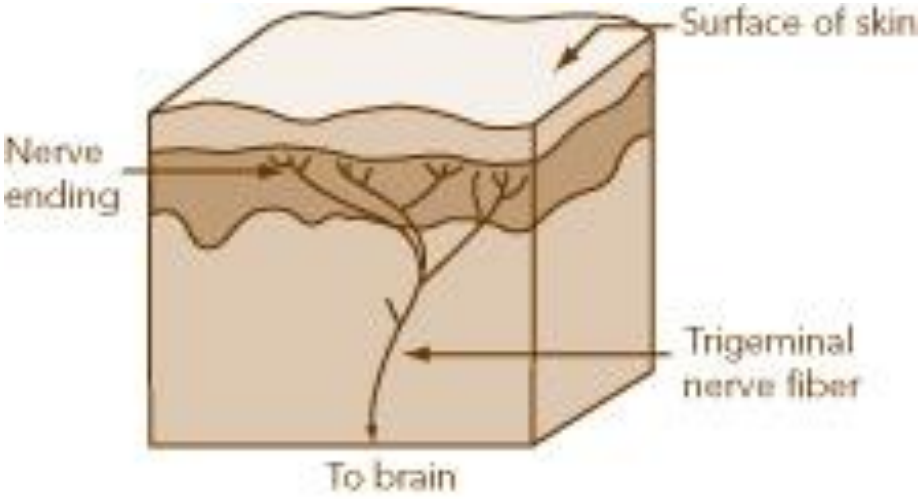
Trigeminal effects are also called:

- Chemical feeling factors
- Pungency
- Chemical irritation
- Chemosensory irritation
- Chemesthesis

Flavor

Trigeminal effects:

- Chemoreceptors: free nerve endings just beneath surface of skin.
- Flavor molecule must be absorbed through skin.



Flavor

Factors affecting flavor:

- Nature of ingredient.

  Example: sugar and high-intensity sweeteners

- Product temperature.

  Example: sweetness, saltiness and temperature

- Product texture and consistency.

  Example: thin vs. thick liquids.

Flavor

Factors affecting flavor (cont.):

- Presence of other flavors.

  Example: sugar and acid

- Fat content.

  Example: low-fat and fat-free foods

Texture

Examples of texture terms:

- Hard
- Tough
- Chewy
- Crumbly, short, or mealy
- Thick
- Springy
- Chalky
- Moist
- Dry
- Soft
- Tender
- Gummy
- Brittle
- Thin
- Spongy
- Gritty
- Pulpy
- Smooth

Texture

- Like flavor, is complex.
- Appearance hints at texture
- Evaluated by tasting and determining how food:
  - Feels against the soft tissues of the mouth.
    - Typically called *mouthfeel*
  - Responds to squeezing, biting, chewing, etc.
  - Responds to heat of mouth
  - Sounds