Culinary Institute of America

Introduction to Taste, Flavor, & Global Flavor Profiles

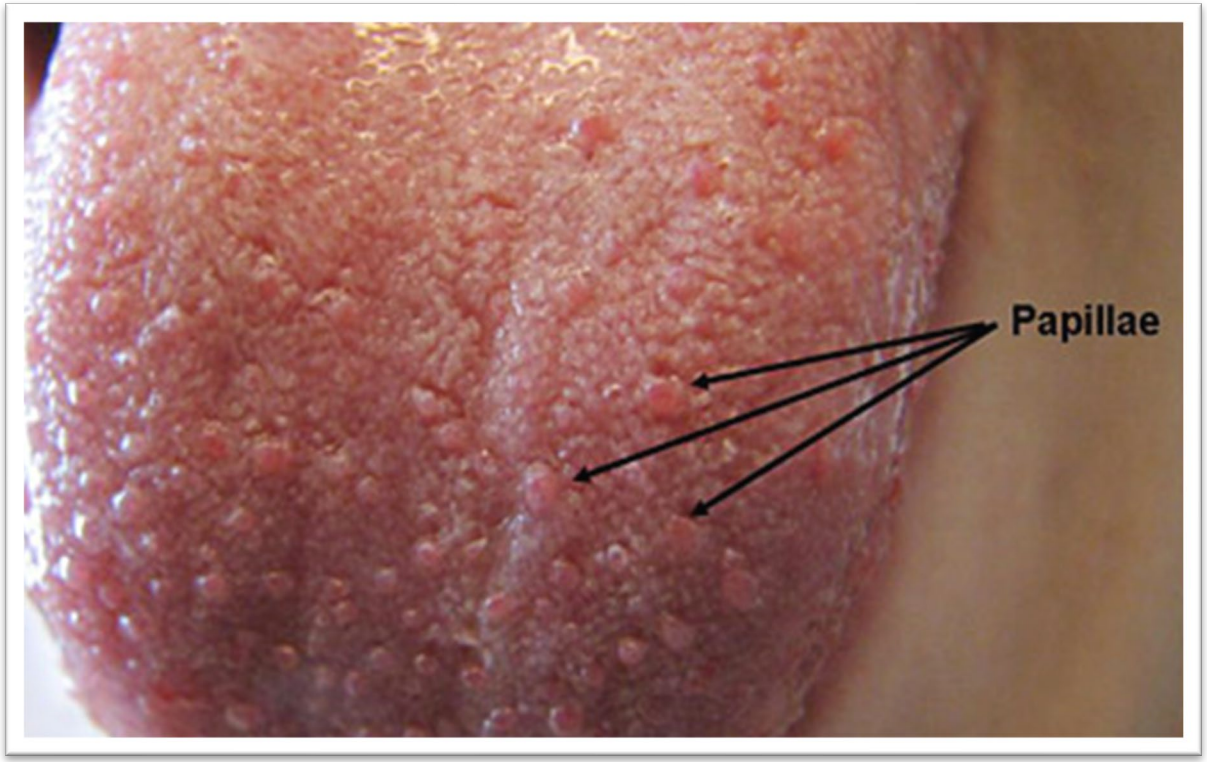
Learning Objectives

- Define the physiology of taste.
- Describe the role papillae, taste buds, and saliva play in taste.
- Identify the five basic tastes and their culinary and physiological significance.
- Differentiate between true tastes and trigeminal sensations such as spiciness, astringency, and alkaloid bitterness.
- Explain what and how senses influence flavor.
- Define sensory fatigue and how it can be avoided.
- List different global flavor profiles.

The Study of Taste

- **Physiology:** scientific study of the bodily functions of living organisms and their counterparts
- **Taste:** one of the special senses which perceives and distinguishes the sweet, sour, bitter or salty quality of a dissolved substance and is mediated by taste buds on the tongue
  - Source of pleasure in most lives
  - Complexly provides physiological/ emotional satisfaction

The Human Tongue



Papillae

- Contain 1 to 300 taste buds
- About 6,000 per mouth
- Amount varies dramatically among individuals
- Amount varies with age
  - Few when born
  - Increase steadily
  - Declines around age 40
- Life expectancy of a taste bud is 10 days

What Type of Taster Are You?

Non-tasters

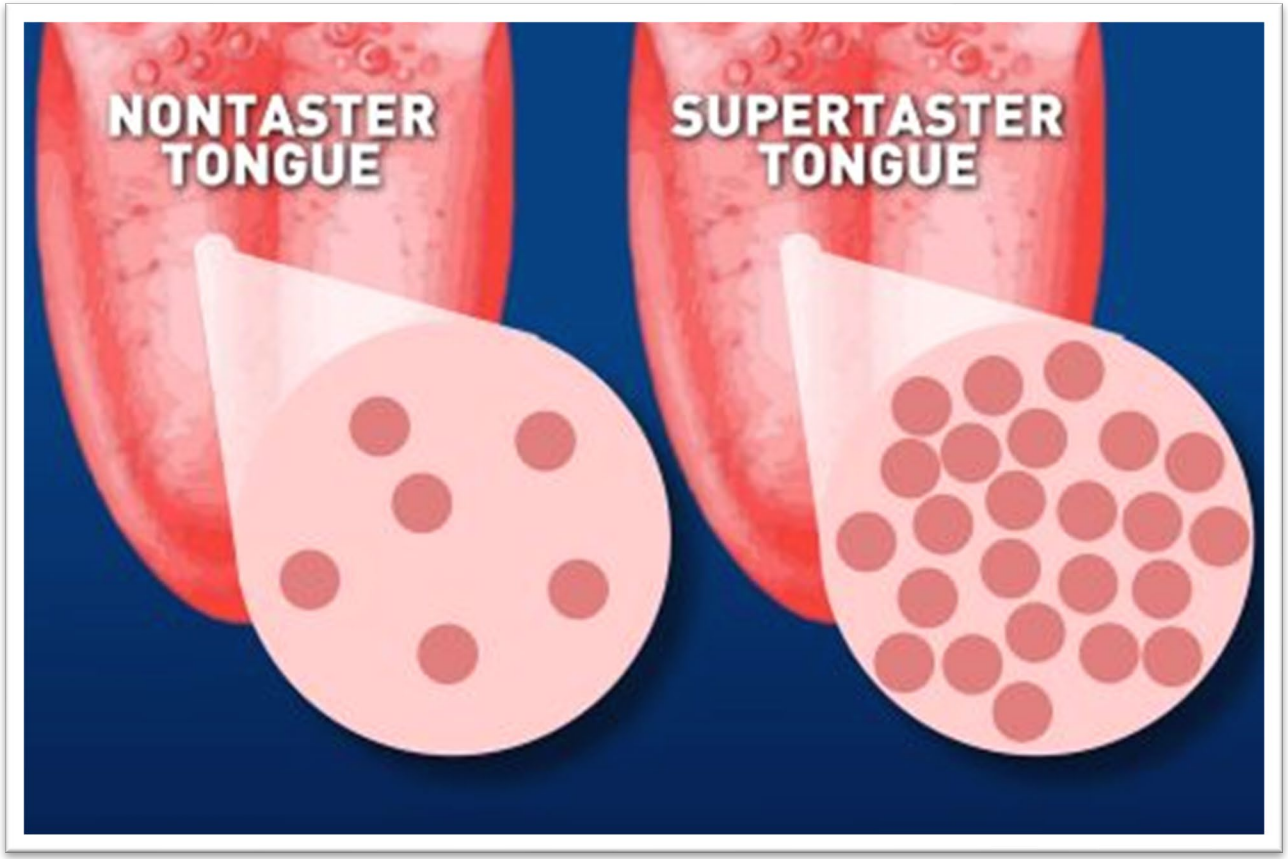
- 2000 taste buds
- 25% of the population

Taster

- 5,000 taste buds
- 50% of the population

Super-taster

- 8,000 taste buds
- 25% of the population
- ⅔ are women



A Taste Bud and Its Receptor Cells

Bitter

Salty

Sweet

Umami

Sour

Saliva

- A clean, tasteless, odorless, slightly acidic, viscous fluid
- Produced by salivary and mucus glands
- Has anti-bacterial properties
- Lifetime output about 6,000 gallons

What does it do?

- Lubricates food for digestive passage
- Maintains pH balance
- Initiates digestion
- Helps us taste by dissolving salt, sugar, etc.

Classification of Tastes

Sweet

Salty

Umami

Bitter

Sour

Sweet

- Humans have a high tolerance for sugar
- Recognition threshold is 1 part per 200
- Sugar and sweetness is usually perceived as pleasant
- Newborns naturally prefer sweetness, showing a biological tendency
- Sweetness signals simple carbohydrates; a quick energy source
- In excess, sugar contributes to obesity, diabetes, and heart disease

Sour

- Recognition threshold is 1 part per 130,000
- Causes enhanced saliva flow
- Potentially corrosive to tooth enamel

Indicates

- Potential spoilage
- Fermentation
- Presence of vitamins
- Presence of acid (pH < 7)

Culinary uses

- Preservation
- Flavor enhancement
- Fresh appeal

Salt (Sodium Chloride)

- An essential nutrient
- Recognition threshold is 1 part per 400

Physiological tasks

- Intercellular fluid balance
- Minimum intake varies per person

Culinary uses

- Flavor and color enhancement
- Food preservation
- Sausage making
- Muting bitterness

Bitter

- Human have a very high sensitivity
- Recognition threshold is 1 part per 2,000,000

Indicates

- Presence of toxins/ alkaloids
- Potentially harmful to health

Most preferences for bitter are acquired tastes

- Coffee
- Beer
- Bitter vegetables

Umami

- *Umami* = *Umai* (delicious) + *Mi* (taste)
- Coined by Professor Kikunae Ikeda
- Recognized in 1985 as the fifth basic taste (not universally accepted)
- Caused by glutamic acid
- Glutamic acid is the base for MSG
- MSG is added to processed foods for flavor
- Umami being a taste is controversial due to MSG concerns

Umami Forms

Glutamates

- Glutamic acid in vegetables
  - Kombu, tomatoes

Inosinates

- Inosinic acid in animal proteins
  - Fish – bonito

Guanylate

- Gualylaic acid in fungi
  - Mushrooms, cheese

Synergistic flavor enhancement

- When different forms are mixed, they amplify each other
- Example: Dashi = Bonito Flakes (Inosinates) + Kombu seaweed (Glutamates)

Umami-Rich Foods

- Aged cheese
- Seafood
- Vegetables
- Aged, fermented, cured meats
- Green tea
- Mushrooms
- Tomatoes
- Grapefruit
- Soy products
- Seaweed

Trigeminal Sensations Misidentified as Taste

Astringency

- Dry, puckering, or chalky mouthfeel
- Caused by tannins (bind to salivary proteins)
- Found in unripe fruits, green tea, red wine

Spiciness (Pungency)

- Burning or irritating sensation, reduces with exposure
- Caused by capsaicin or piperidine
- Activates pain receptors, not taste buds
- Found in peppers, chiles, peppercorns

Alkaloid Sensations

- Bitter, metallic, or scratchy mouthfeel
- Caused by plant alkaloids such as piperine
- Detected via trigeminal nerve
- Found in spices, herbs, nightshades

Flavor Sensory Perception Analysis

- Hold your nose closed.
- Slowly and thoroughly chew on the jellybean.
- Analyze what you can taste.
- On my mark, gently inhale through your mouth.
- Release your nose and gently exhale through your nose.
- What do you taste?

What Creates Flavor?

Taste + **Aroma** = **Flavor**

The detection of the five basic qualities from dissolved substances by receptors on the tongue

The smell of food, sensed through receptors in the nose, which accounts for 80% of what we perceive as flavor

The overall sensory perception of a food

Flavor

Created through a multi-sensory interaction:

Taste:
the five basic tastes detected by the tongue

Sound:
affects our sense of texture, freshness, appeal

Touch:
the texture and feel of food in the mouth

Trigeminal Sensations:
physical reactions to chemical irritants

Smell:
aromas shape our recognition of flavor

Sight:
visual cues that influence how we expect food to taste

Temperature:
affects how flavors are released, perceived

Physiological Impacts on Flavor Perception

Medication:
some drugs can alter taste or reduce saliva, dulling flavor perception

Age:
taste and smell sensitivity often decline with age, reducing flavor intensity

Pregnancy:
hormonal changes can heighten or distort taste and smell

Injury:
damage to the mouth, nose, or nerves can interfere with flavor detection

Illness:
conditions like colds or infections can block smell and alter taste

Seeing Flavor

Bright colors indicate freshness/proper doneness

Steaming foods imply hot foods

Juicy looking foods hint at succulence

Hearing Flavor

- The sounds a food makes influences the perception of its flavor
- Think of:
  - A sizzling platter of fajitas
  - The fizzle of champagne
  - Crunching potato chips
  - Biting a crisp apples

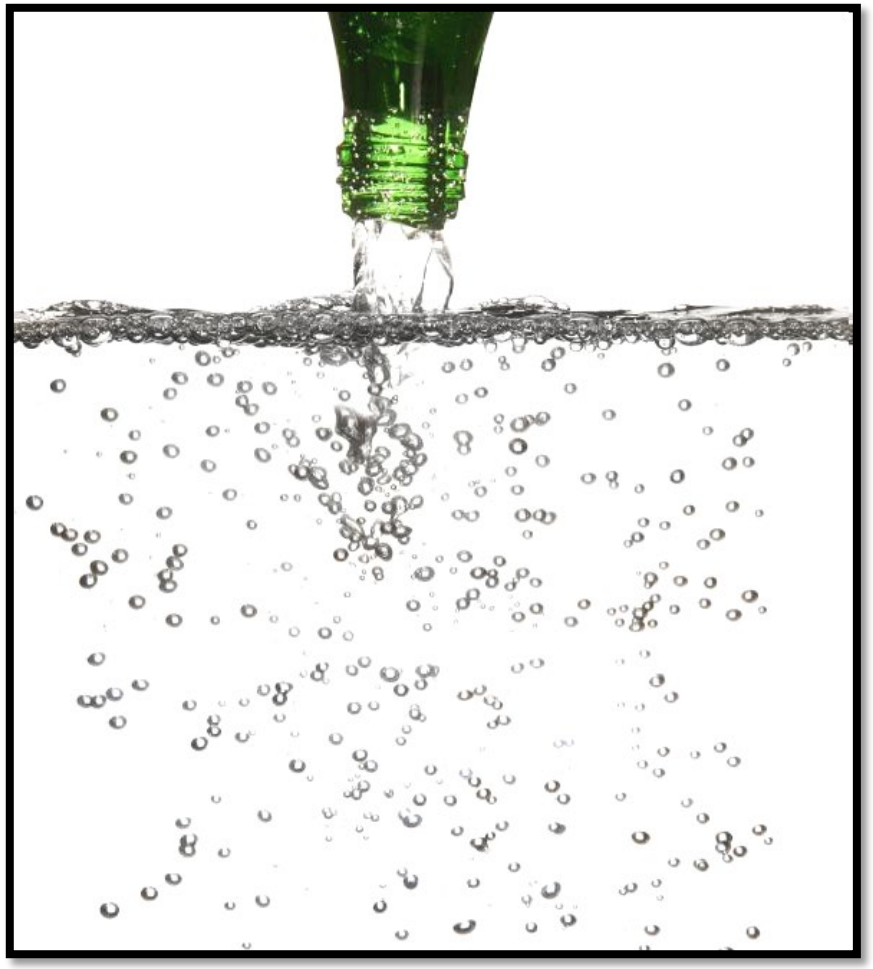
Smelling Flavor

- **Very** important role in flavor
- Accounts for 80% of what we perceive as flavor
- Often your first impression of food
- Hundreds of aromas recognized
- Often aromas stimulate memories
- Loss of sense of smell limits flavor depth

Feeling Flavor

Flavor can be felt in a variety of different ways:

- Fingers or utensils: resistance, slipperiness, crunch
- Tongue and mouth: teeth, interior surface, lips
- “Spicy/hot” pain: from exposed nerve endings via Trigeminal nerve
- Other sensations: carbonation, “coolth”



Temperature and Flavor

- Optimal tasting temperatures: between 72°F and 105°F
- We lose our ability to taste below 32°F and above 170°F
- Tastes such as sweetness, bitterness and umami are more intensely perceived at lukewarm temperatures
- Saltiness is more pronounced at colder temperatures

Perception and Presentation

Presentation shapes what we expect to eat:

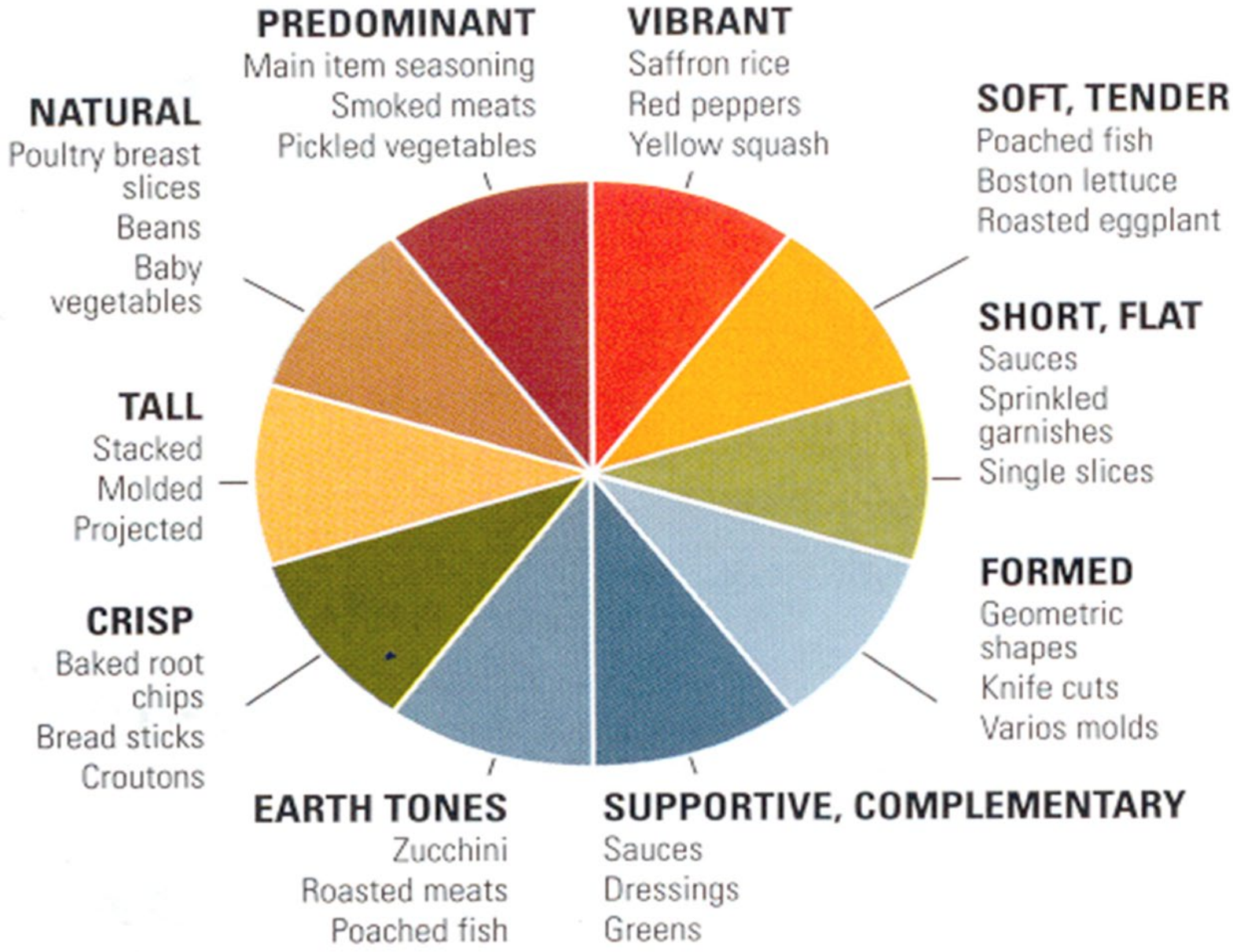
- **Color & Contrast:** bright sauces and vibrant garnishes suggest freshness and intensity
- **Plating Style:** clean lines and balance signal care and quality
- **Texture Cues:** glossy, crisp, or smooth elements hint at mouthfeel
- **Aromatics:** visual hints like herbs or flowers suggest complex flavors
- **Emotion:** presentation evokes season, culture, or luxury

Sensory Fatigue

- Too much information results in reduced sensitivity
- How to avoid:
  - Contrast and balances
  - Keep your food varied
  - Keep it interesting

"The sensory system reacts to ever-present stimulus by reacting less to it."

--Harold McGee, On Food and Cooking



Global Flavor Profiles

Country	Flavor Profile
Greece	Lemon + parsley; lemon + oregano
Southern Italy	Olive oil + tomato + garlic; mixed herbs
Spain	Saffron
Southern France	Mixed herbs
France	Wine + herb Wine vinegar Garlic
Middle East/Balkans	Cinnamon and/or lemon
Mexico	Lime + chile + cilantro + cumin + chocolate
China	Soy sauce + ginger + garlic + scallion
Vietnam	Nuoc Mam + lime + chile + cilantro/mint/basil + (salad)
Thailand	Nam Pla/shrimp paste + ginger/galangal + cilantro + chile + Makrut lime + coconut

Food for Thought

When the meal you have ordered (or the dish you have made) misses the mark, is it a case of...

- Good concept, deficient cooking?
- Good concept, good cooking technique, but bad ingredients?
- Good concept, good cooking technique, good ingredients, but the seasonings miss the mark?
- Fabulous ingredients, great cooking, but bad concept?

Cooking is Eating with the Senses

Remember to consider all five senses when you cook…

- **Hearing:** listen for sizzling, boiling, or crunching
- **Seeing:** notice color, shape, and presentation
- **Touching:** feel texture, doneness, or temperature
- **Smelling:** detect aroma and freshness
- **Tasting:** balance flavors and seasoning

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Any Questions?