Physiology of Taste, Salt and How to Have One Without the Other

Minnesota School Nutrition Association Annual Conference

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Unlimited Possibilities …
Not if, but how.

Agenda

- We Feed People !
- Meet your Taste Buds
- Relearn How to taste
- Techniques and Strategies to Creating Flavor in a Sodium Demonized World !
- Skills Development / Demo

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"Happy and Successful cooking doesn't rely solely on knowhow. It comes from the heart, makes great demands on the palate, and needs enthusiasm and a deep love of food to bring it all to life."

– Georges Blanc, Michelin Three-Star Chef in Vonnas France

- Culinology® is the blending of the culinary arts and the science of food. It is defined as "the collaboration between culinary expertise and food science and how this collaboration affects the food we prepare and serve for consumption.

Breaking the Ice

Describe a transformative or epiphanic moment you've had with food. Why was it significant and what were the circumstances?

- The first I tasted fresh sashimi Ahi Tuna and realized that not all tuna is grey and comes in a can.

- *"I shuffled in from the cold dark garage after having one of the worst days in my life. As I opened the door a warm comforting and familiar aroma filled my nose. It was my grandmothers spaghetti sauce – something I hadn't had since I was a child. The warm humid air of the kitchen was thick with aromas of garlic, basil, fennel sausage and earthy tomatoes. Instantly the dark clouds of frustration storming in my head were overwrote by an olfactory hug from the past."*


“Ego’s Transformative moment…”
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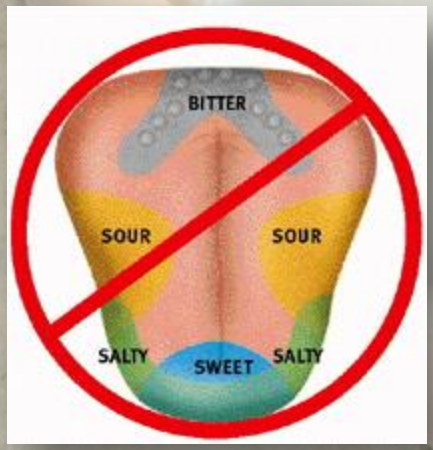
Flavor Perception = Tastebuds + Mouthfeel + Aroma + "The X Factor"

- Flavor is a combination of taste, smell, texture (touch sensation) and other physical features (eg. temperature) known collectivity as Mouthfeel

Meet Your Taste Buds:



- The notion that the tongue is mapped into four areas—sweet, sour, salty and bitter has long ago been debunked.
- What's the 5th?
- There are five basic tastes identified so far, and the entire tongue can sense all of these tastes more or less equally. although some regions may be more sensitive than others.
- There are taste buds throughout the oral cavity, even on the upper palette.

Sweetness

- The weakest of the five senses
- The single most important taste for making non savory foods delicious. Just as you would add salt on a steak, Sugar sprinkled on strawberries will increase the flavor perception of the fruit itself.. not just make it sweeter.
- Sweetness doesn't just come from sugar -- there are hundreds of organic, synthetic, and inorganic compounds that taste sweet. Stevia, for example, is a plant high in glycosides that is 300 times sweeter than sugar.

Saltiness

- The single most important taste for making savory foods delicious
- Ironical the most understood receptor mechanism in our mouths is also the most difficult to replicate
- The backlash has begun…

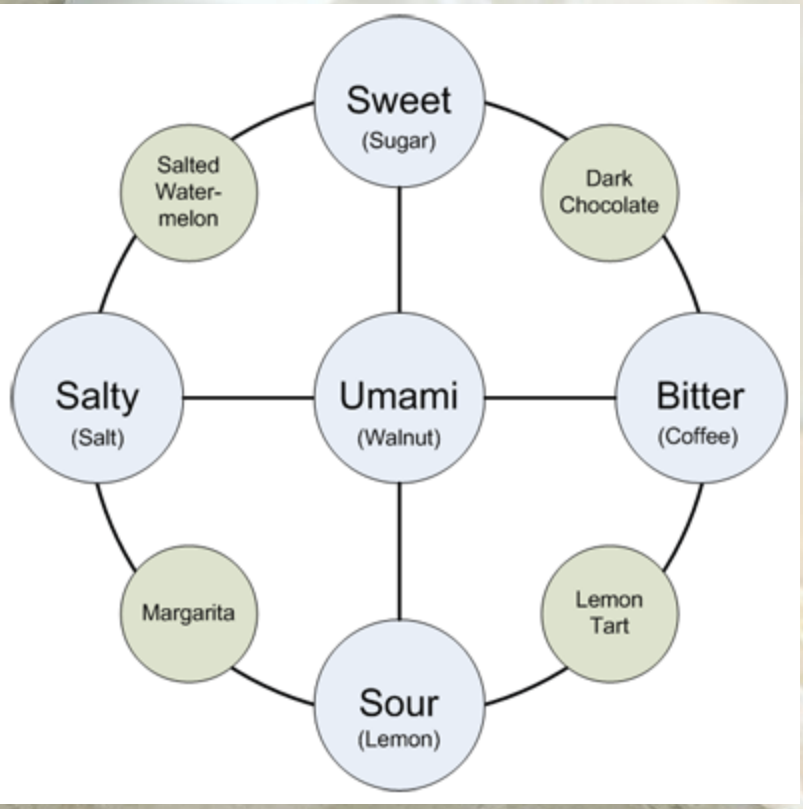
Sourness

- Typically the taste of acids - Often referred to as acidity. Adds that bright sparkle or brightness to foods
- Second only to salt in savory food and sugar in sweet food in its importance as a flavor enhancer
- Common sources: Citrus (citric acid), vinegars, ascorbic acid, fermented foods

Bitterness

- Salt enhances sweetness by inhibiting bitterness – this is one of the reason you find salt everywhere is that it reduces the bitterness of vegetables, thus making them taste better to kids
- Bitterness is the most sensitive of the tastes, and is perceived by many to be unpleasant, sharp, or disagreeable
- An evolutionary advantage that warned us away from eating plants containing bitter, poisonous alkaloids.
- Common bitter foods and beverages include coffee, unsweetened cocoa, beer, olives, citrus peel, Quinine
- Americans historically preferred foods that are salty and sweet (extra points for fatty) and, unlike most other cultures, shied away from bitter things.
- Recently though American chefs have been incorporating bitter flavors into their menus with great success.
- Being Bitter is Trendy!

Umami (savoriness)



- Umai which means Delicious **- Mi which m**eans Essence
- Believe it or not, our first encounter with Umami is as a baby. Baby formulas and mother's milk are loaded with Umami.
- Umami can also be detected in many normal every day foods we eat such as ripe tomatoes, parmesan cheese, cured ham, mushrooms, meat, fish, wine and beer.
- why is it so elusive to define? One reason is that we can not buy it in bulk like sugar or salt. (For those who think MSG is Umami, read on, you're only partially correct).
- Also, it has a strange name; the taste itself is rather subtle; and it actually interacts with the four other tastes.

Factors affecting taste perception:

- The perception of a mixture of ingredients does not simply equal the sum of the components. Several of the basic tastes compete with each other, so that adding one can reduce the perceived intensity of another. (we'll go into this a bit more in the flavor affinities section)

Taste Perception Continued

- Examples:
  - » Lemonade is made by combining lemon juice (sour), sugar (sweet), and water. Without the sugar, the lemon juice—water mixture tastes very sour. The more sugar that's added, the less sour the result tastes.
  - » Tonic water, made by combining quinine (extremely bitter), sugar (sweet), and water. The bitterness causes many people to not perceive tonic water as sweet, even though it **contains as much sugar as an ordinary soft drink.**

Other factors that affect taste perception

- Aging..and sadly… it's not for the better..
- Color blindness or vision impairments
- Hormonal influences
- Drugs and chemicals - smoking
- Natural substances. E.g. miracle fruit (discussed later)
- Common cold via blocked nasal pathways

Flavor Perception = Tastebuds + Mouthfeel + Aroma + "The X Factor"

You mouth has a sense of 'touch'

Temperature

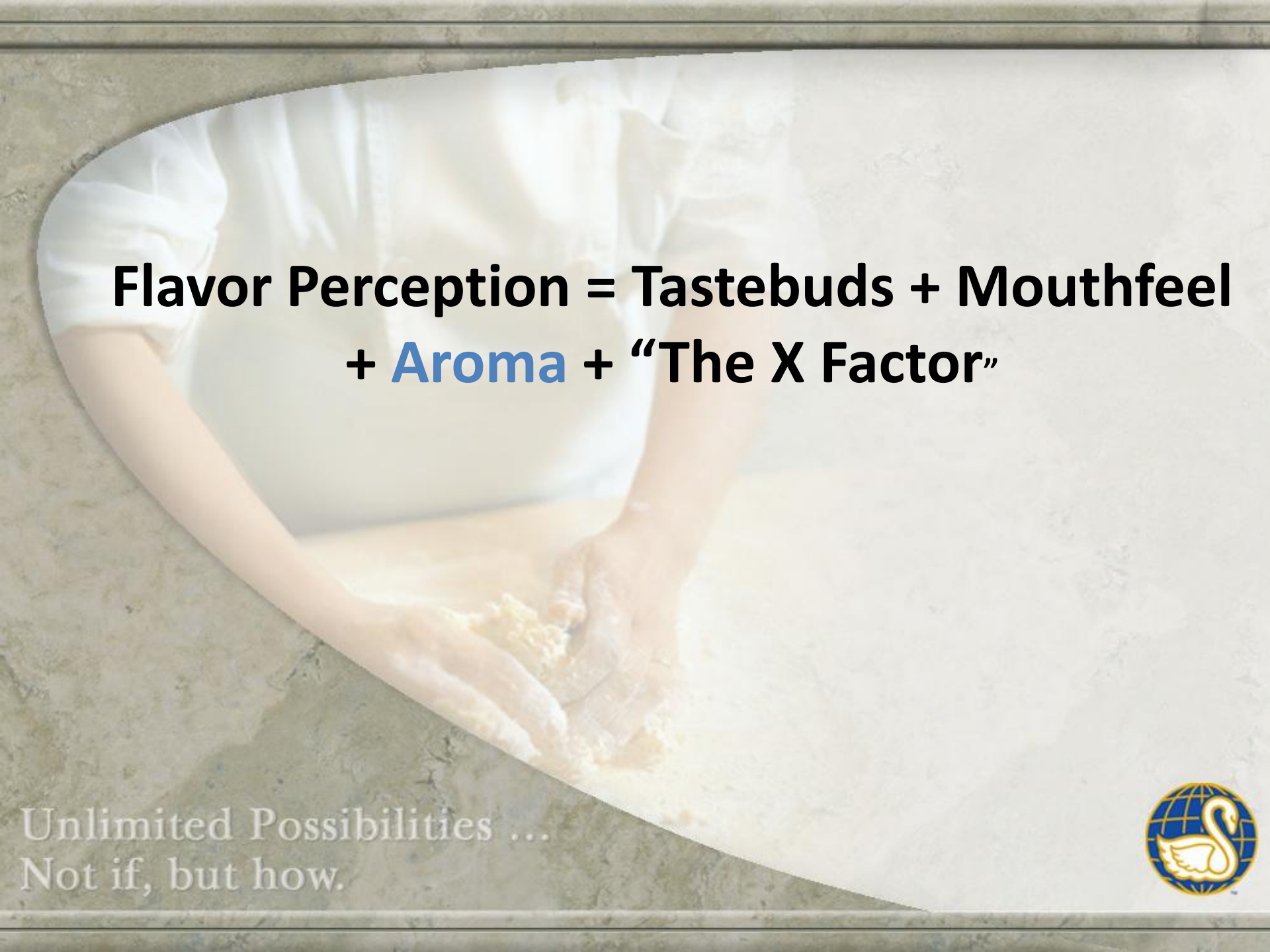
- The most important sensation effecting flavors associated with mouthfeel.
- Coldness suppresses sweetness while heat blocks acidic perception
- How Chef's consider the temperature of foods during menu creation
  - A chilled carrot soup of a hot summer day verses a hot roasted carrot soup on a winter day.
  - Serving the correct temperature food aids our bodies in attaining equilibrium or alignment with our environment and is of paramount importance in Asian cuisines as it is considered as a healing property..

Texture

- We enjoy texture in our foods as it stimulates multiples senses; touch, sight and sound
- Texture can be key indicators of foods quality
- Perhaps the hottest multi-year food trend - CRUNCHY
- That's why we use carrageenan, carob bean, food starch, and guar gum... They increase creaminess, amp up the thickness, and otherwise make foods feel better in your mouth.

Piquancy:

- Being pleasantly pungent or tart in taste; spicy.
- the perceived level of "heat" ranging from zero (the bell pepper) to atomic (the Naga Jolokia) on the Scoville Scale.
- Substances such as ethanol and capsaicin cause a burning sensation by inducing a trigeminal nerve reaction together with normal taste reception.
- The piquant ("hot" or "spicy") sensation provided by chili peppers, black pepper and also other spices like ginger and horseradish plays an important role in a diverse range of cuisines across the world.
  - Especially Ethiopian, Hungarian, Indian, Korean, Indonesian, Lao, Malaysian, Mexican, Pakistani, Southwest Chinese (including Sichuan cuisine), Sri Lankan and Thai cuisines.
- Ironically, taste researchers have recently discovered that capsaicin, the component that gives peppers their heat, can also be used as an anesthetic and pain reliever.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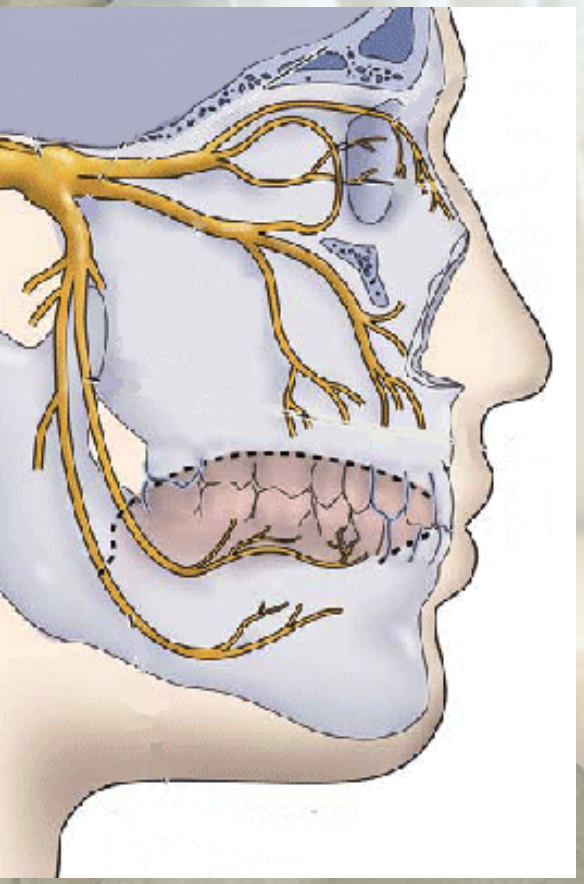
Aroma is responsible for up to 80% of flavor detection!

- Hold your nose, close your eyes, you won’t be able to tell the difference between coffee or tea, red or white wine, brandy or whisky. In fact, with a blocked nose you can't tell the difference between grated apple and grated onion!

Aroma Continued

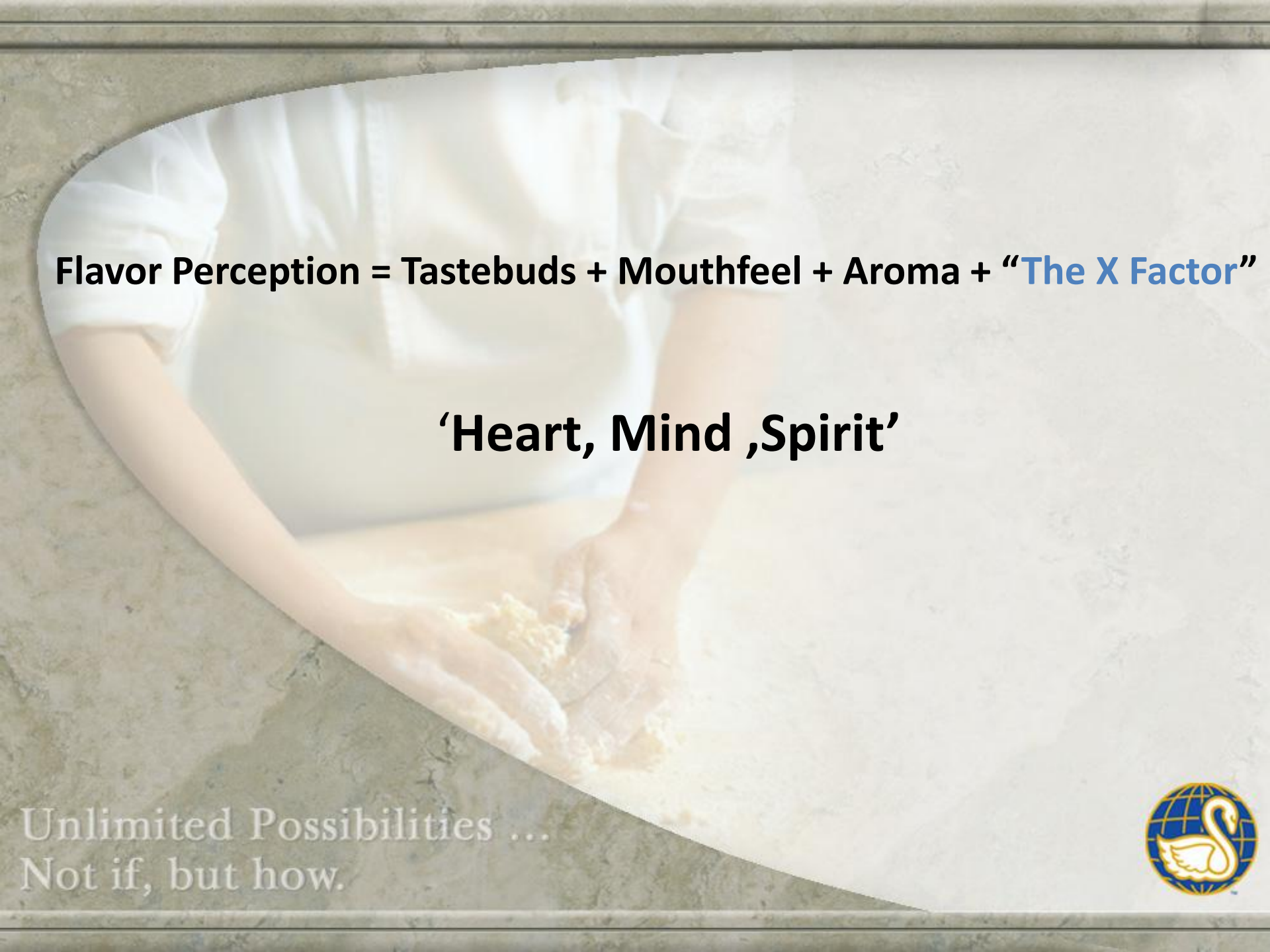
- Pungency :
  - Horseradish, wasabi, hot mustard: ingredients that pleasantly irritate the nose.
  - Can add dimension or interest in a system especially when paired with Umami rich foods

Chemesthesis:



Trigeminal Nerve

- the trigeminal nerve (shown in light brown) conveys a great deal of information about the presence of irritating and painful stimuli (like the burn from chili peppers) to the brain
- The trigeminal nerve also conveys information about temperature, like the cooling sensations that arise from the menthol in mouthwash.
- Mucus membranes are generally more sensitive to chemesthetic stimuli because they lack the a thick skin barrier.
- The burn from chili pepper, the coolness and burning from menthol in mouthwashes and topical analgesic creams, and the stinging or tingling of carbonation in the nose and mouth are all examples of chemesthetic sensations.
- Givaudan has patented a series of cooling compounds that company scientists now are optimizing for salt enhancement.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'Heart, Mind ,Spirit'
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‘Heart, Mind ,Spirit’ = The ‘X’ Factor

- This is everything else outside of your palette that effects your perception of foods and flavors
  - Visual
  - Emotional (remember ratatouille?)
  - Mental: (introspection) like a sculpture, it can make you think, (witty) can be a play on words, or even challenge your convention on what you think food might be. (molecular gastronomy)
  - Spiritual – healing, symbolic, ritualistic

We taste food everyday as part of our jobs, but do we do it right ?

10 Steps to maximize flavor perception:

1. Find a **location** free from background noise and smell: being able to concentrate as intently as possible will facilitate flavor detection.
2. **Clear your palate**. This means that your mouth should not contain residual flavors/oils from a previous meal or sample. Swooshing around a mouth full of sparkling water is the best (scrubbing bubbles!). This is crucial in order to detect subtleties of complex flavor.
3. Make sure that the **piece is large enough** to accommodate full evolution of the flavor profile. The important thing to remember is that flavor notes gradually evolve and unfold on the tongue rather than open up in one large package. So remember, don't think small here. 10g should be a minimum starting point.
4. Make sure the **sample isn't too hot or cold**. Near boiling soup or rock hard frozen ice cream will be nearly impossible to taste.
5. **Use your eyes first.** What do the identifiable ingredients tell you about the sample you are about to taste. Visual texture and color are important precursors to the sense of taste.

6. **Smell the sample**, especially at a break point (is there is one). Remember, 80% of flavor is detected in your nose - Inhaling will prime the tongue for the incoming sensations.
7. Place the sample on the tongue and allow it to arrive at body temperature. **Chew it only to break it into small enough pieces to co mingle.** You're tasting and not eating! This step is crucial,
8. **Observe the taste and texture.** Concentrate on the flavors that are enveloping your tongue. Close your eyes and inhale deeply through your mouth while lightly chewing. Make mental/physical take notes of what you are experiencing.
9. Now that the tasting is nearing its finish, **swallow**. How has the flavor evolved? Do any changes in texture and flavor occur? Take note of how the sample leaves the palate. Is there a strong reminder lingering in your mouth, or does it quickly vanish? What pleasant or unpleasant flavors do you notice in the finish?
10. **Repeat** the process. The comparison will highlight the subtle flavor notes in the sample. Be sure to cleanse your palate thoroughly before tasting a new sample.

- Tasting /Demonstration
  - Dark Chocolate!
  - Apply what we just discussed with a sample of dark chocolate

Flavor Enhancers

Not Just the Salt of the Earth

Sodium Chloride

- Sodium Chloride- “Salt”, Inorganic Compound initially used for food preservation
- Essential Nutrient in the Human Diet
- As discussed, one of the four basic tastes (Sweet, Sour, Salty, Bitter)
- Taste enhancer and aroma impression strengthener
- Bitter Suppressor
- Edible Salt are 98% to 99.7% Pure Sodium Chloride

Salt in History

- Exchanged as currency
- "*Worth his Salt*" and "*the Salt of the Earth*"
- Salary-**Origin:**
  1350–1400; salarie; salārium *salt money*.
- Sauce-*def.* Middle English, from Old French, from Vulgar Latin *salsa, from Latin, feminine of salsus, past participle of sallere, *to salt*

Seasoning to Taste

- Season: an addition to food for the savor that imparts
- *Theory*: 1% of total salt in a food system (naturally occurring/added) is approximately the same concentration as in human blood plasma
- Sensitivity and preference to salty food vary from person to person
- Retail soup manufactures target 1% salt (10 grams 0r 2 tsp per quart/liter) as idea for flavor enhancement

Monosodium Glutamate

- Contains 1/3 Sodium of Table Salt
- Can be blended with Sodium for a 20% to 40% Sodium Reduction while maintain flavor
- Plays Role in Normal Body Function
- Negative Stigma due to potential allergen issue
- Toxicology has concluded it is safe
- Poor Public Image
- Current Umami Revival and Image Overhaul (Anjinomoto)

Adjusting Flavor Without Direct Sodium Chloride Addition

- Flavor Synergy
  - Affinities: Spices to Enhance Flavor
    - Apples and Cinnamon
    - Lamb and Rosemary
    - Tomato and Basil
- Food with Inherent Sodium Chloride Composition

  -Capers

  -Olives (Brined)

  -Cured Meats and cheese like pepperoni and parmesan

Adjusting Flavor Without Direct Sodium Chloride Addition *(cont.)*

- Compounds the deliver Umami
  - Monosodium Glutamate
  - Inosinic Acid (IMP) and Salt Derivates of IMP
  - Guanosine Monophosphate (GMP)
  - Yeast extracts: Anjiomoto's 'Super Ye'
- Foods with Natural Occurring Umami
  - Soy Sauce
  - Autolyzed Yeast Extract
  - Hydrolyzed Soy Protein
  - Mushrooms

Other Strategies..

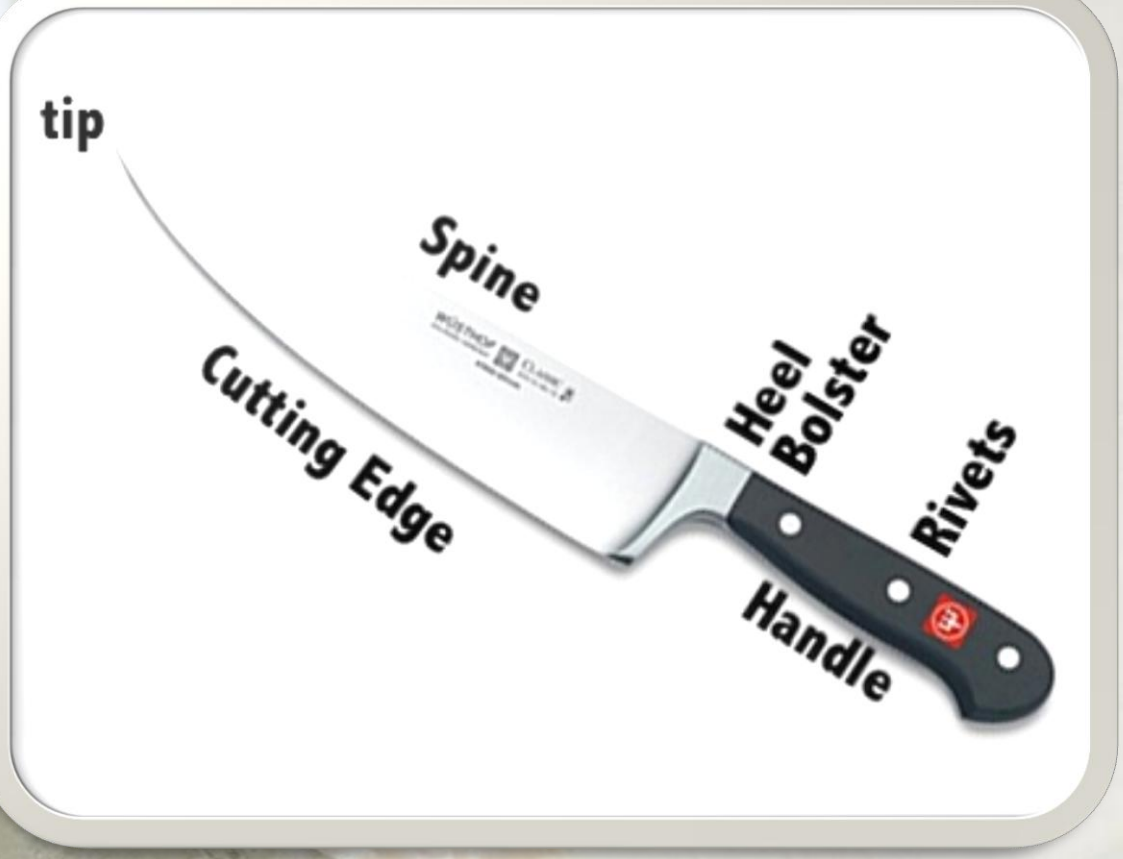
- What time is best to season dishes in the cooking process?
  - Seasoning mashed Potatoes both internally and topically – may achieve up to a 40% sodium reduction.
  - Adding flavors to provide distraction
    - Garden vegetable flavor in sodium reduced chips
    - Strong fermented cheese, like Gruyère or Fontina flavors in a reduced sodium Alfredo

Food Safety and Salt

- Salt was the originally used as a preservative.
- Besides sensory challenges, taking salt out of products may lead to food safety issues.
- Requiring microbial driven reformulations that have nothing to do with flavor but everything with to do with food saftey.

Elementary Knife Skill Techniques to Combat the Salt Shaker.

- Benefits
  - Releases the food inherent flavors
  - More surface area to contact the taste receptors on the tongue
  - Makes your food visually appealing. As we discussed earlier, eye appeal is often the first step in eating.



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