STEM, your students, and their future opportunities

Katie Sudler

McCormick

Katie Sudler – McCormick

- 23+ years in the Flavor Industry, supporting Food& Beverage Companies
- **Current Role:** McCormick & Company, Flavor Division - Responsible for partnerships in the communities we manufacture and in food/beverage industry, to build good name and reputation in both.
- **Past Roles:** Food Regulations, Business Unit Marketing, Corporate Marketing
- **Brands:** Have worked with 100's of companies to ideate and create products across Beverage, Alcohol, Confection, Dairy and Bakery segments.
- **Education:**
  - B.S. in Dietetics - Purdue University
  - Business classes - Northern Illinois University
  - M.S. in Child, Youth & Family Studies – University of Nebraska-Lincoln
  - IL Teaching Certificate - grades 6-12 to teach Health, Family & Consumer Sciences

McCormick FONA

Our work with AU:

- NSF Grants
- Chemistry & Biology Degree Program
- Host students for Applied Learning Experiences
- Career Fairs
- Student Tours
- Chemistry Technology Degree Program

Agenda

- Teaching Science through Food
- Flavor Perception – Brain Science
- Sensory inputs – How you can activate the brain and turn on
- Your next generation of students - Gen Alpha’s
- Future workforce – Skills, employability, lighting a love of learning and curiosity

What is your favorite lab/activity to do with your students?

McCormick Brands

Nutrition Facts

9 servings per container

Serving size 2/3 cup (95g)

Amount per serving

Calories 240

	% Daily Value*
Total Fat 14g	18%
Saturated Fat 9g	45%
Trans Fat 0g	
Cholesterol 40mg	13%
Sodium 50mg	2%
Total Carbohydrate 25g	9%
Dietary Fiber 1g	4%
Total Sugars 24g	
Includes 19g Added Sugars	38%
Protein 4g	

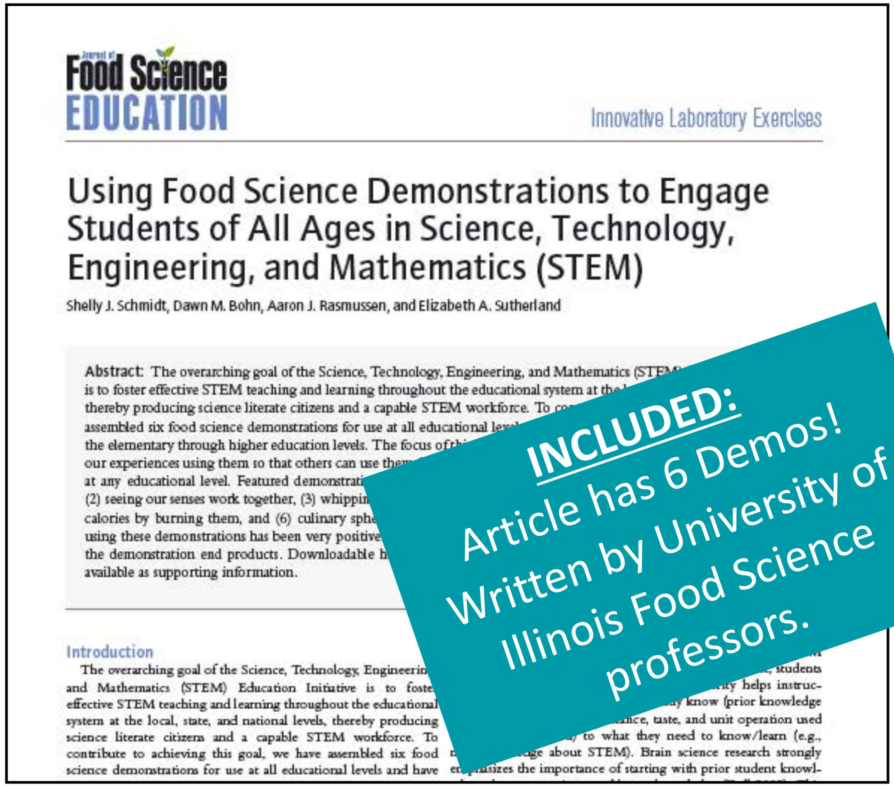
Vit. D 0.1mcg 0% • Calcium 120mg 10%

Iron 0.4mg 2% • Potassium 200mg 4%

*The % Daily Value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

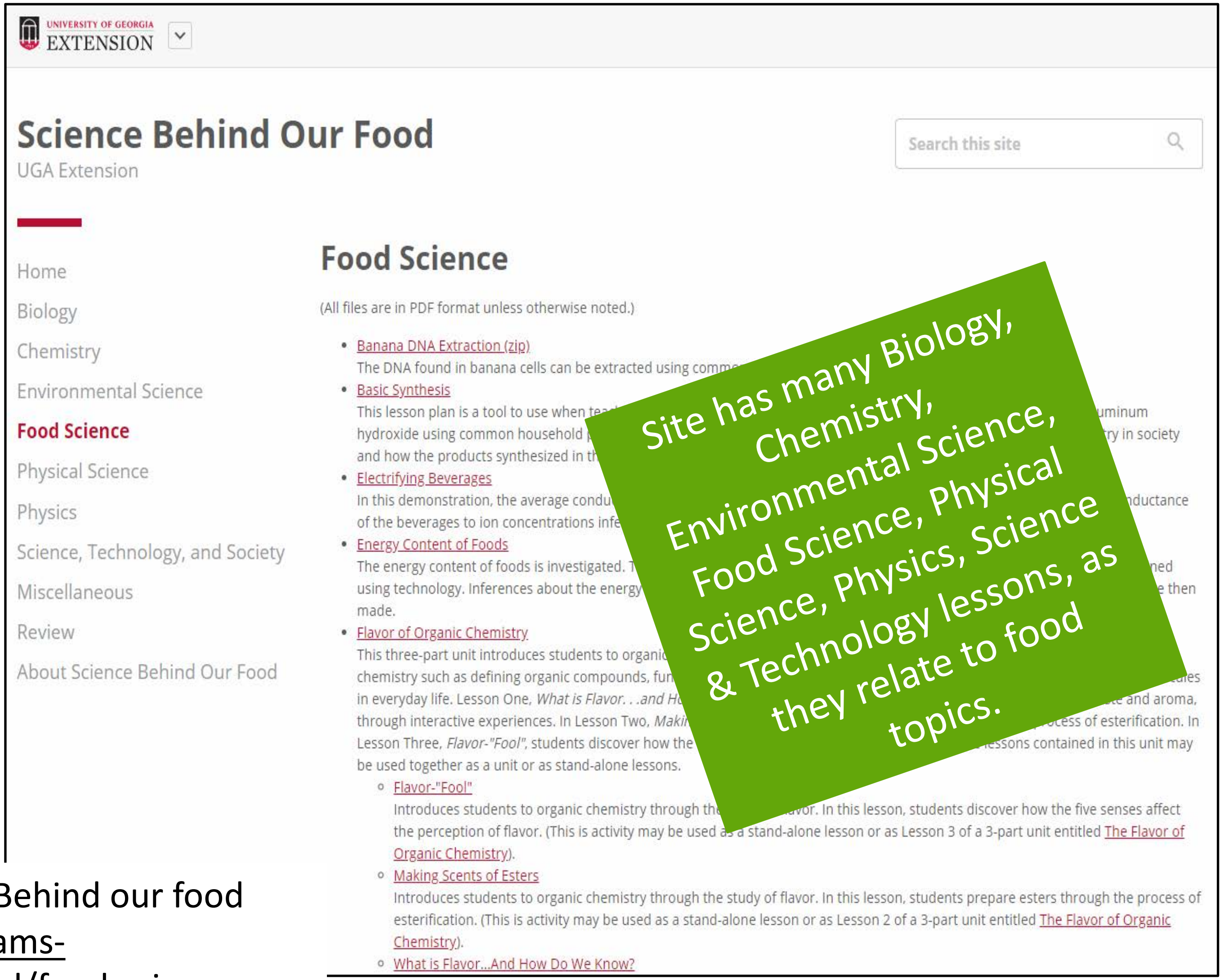
Cream, Skim Milk, Milk, Sugar, Coconut Oil, Cocoa (processed with alkali), Peanut Oil, Pasteurized Egg Yolks, Cocoa, Natural Peppermint Flavor, Natural Flavor, Tara Gum, Guar Gum, Soy Lecithin .

Food Science & STEM



INCLUDED:
Article has 6 Demos!
Written by University of Illinois Food Science professors.

Journal of Food Science Education
[*Use Google Scholar to find article above]



Site has many Biology, Chemistry, Environmental Science, Food Science, Physical Science, Physics, Science & Technology lessons, as they relate to food topics.

University of Georgia – Science Behind our food
http://extension.uga.edu/programs-services/science-behind-our-food/food-science-lesson.html

Food Science & STEM

Google: "Comprehensive Review in Food Science & Food Safety 'Feeding The World Today & Tomorrow'"

Applications of Disciplines Involved in Food Science and Technology

Discipline	Examples of Food Science and Technology Applications
Biology, Cell Biology	Understanding of postharvest plant physiology, food quality, plant disease control, and microbial physiology; food safety
Biotechnology	Rice with increased content of beta-carotene (vitamin A precursor); enzymes for cheesemaking, breadmaking, and fruit juice manufacture
Chemistry	Food analysis, essential for implementing many of the applications listed here; improved food quality; extended shelf life; development of functional foods (foods and food components providing health benefits beyond basic nutrition)
Computer Science	Food manufacturing process control, data analysis
Genomics	Understanding of plant and animal characteristics; improved control of desirable attributes; rapid detection and identification of pathogens
Materials Science	Effective packaging; understanding of how materials properties of foods provide structure for texture, flavor, and nutrient release
Microbiology	Understanding of the nature of bacteria (beneficial, spoilage, and disease-causing microorganisms), parasites, fungi, and viruses, and developments and advances in their detection, identification, quantification, and control (for example, safe thermal processes for commercial sterilization); hygiene; food safety
Nutrition	Foods fortified with vitamins and minerals for health maintenance; functional foods for addressing specific health needs of certain subpopulations; development of diets that match human nutrient requirements; enhanced health and wellness
Physics, Engineering	Efficient food manufacturing processes to preserve food attributes and ensure food safety; pollution control; environmental protection; waste reduction efforts
Sensory Science	Understanding of chemosenses (for example, taste and odor) to meet different flavor needs and preferences
Toxicology	Assessment of the safety of chemical and microbiological food components, food additives

Why teach about Food Science?

- As consumers, it's pertinent to know more about the food we consume!
  - Your students are already familiar with food!
- Inherent interest
  - They are being "fed" information about cooking, nutrition, trends, new products on social media
- Interdisciplinary

- Students love playing with their food!

  Taste the "science".

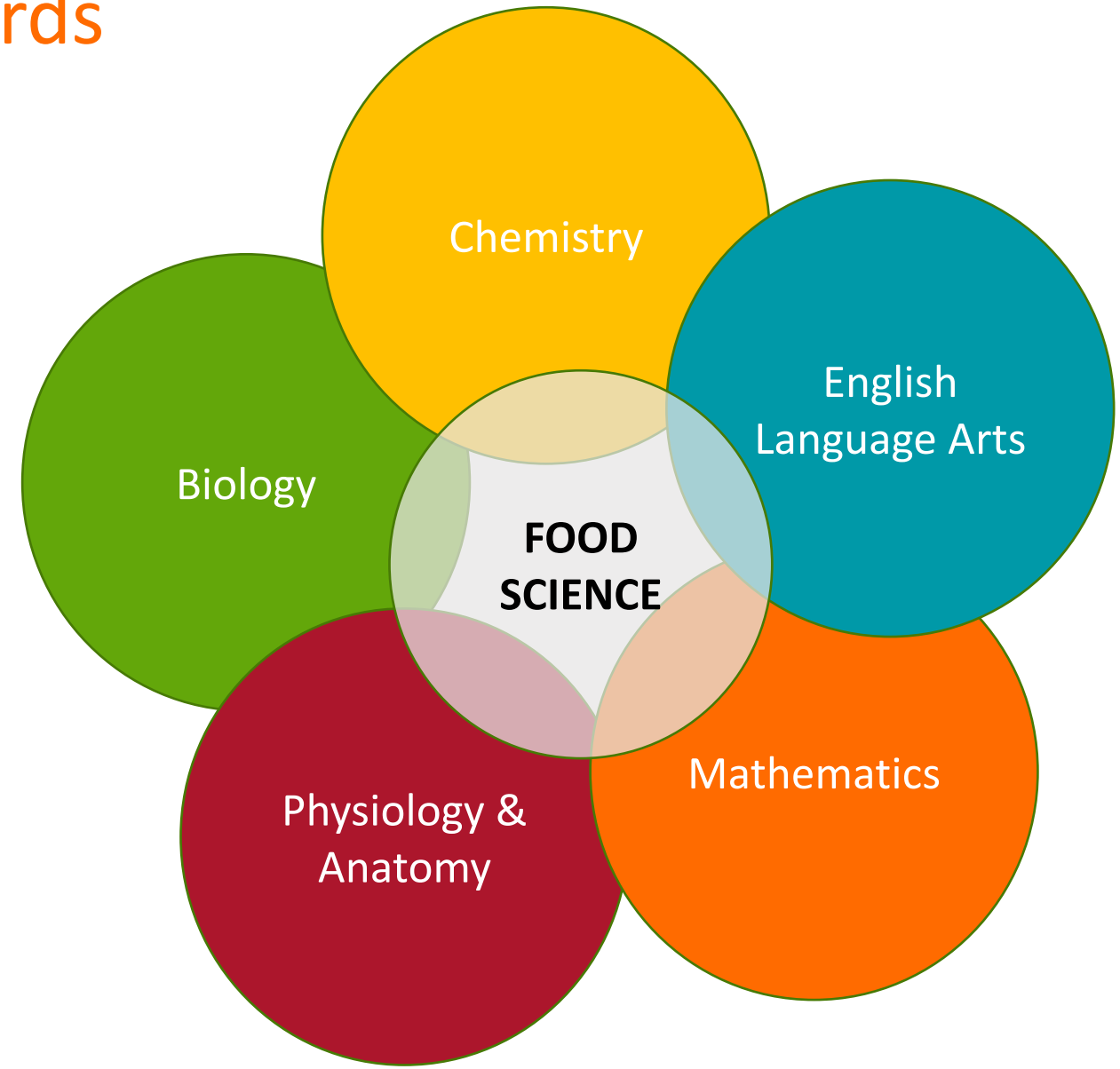
Educational Application

Understanding how we interact with food involves:

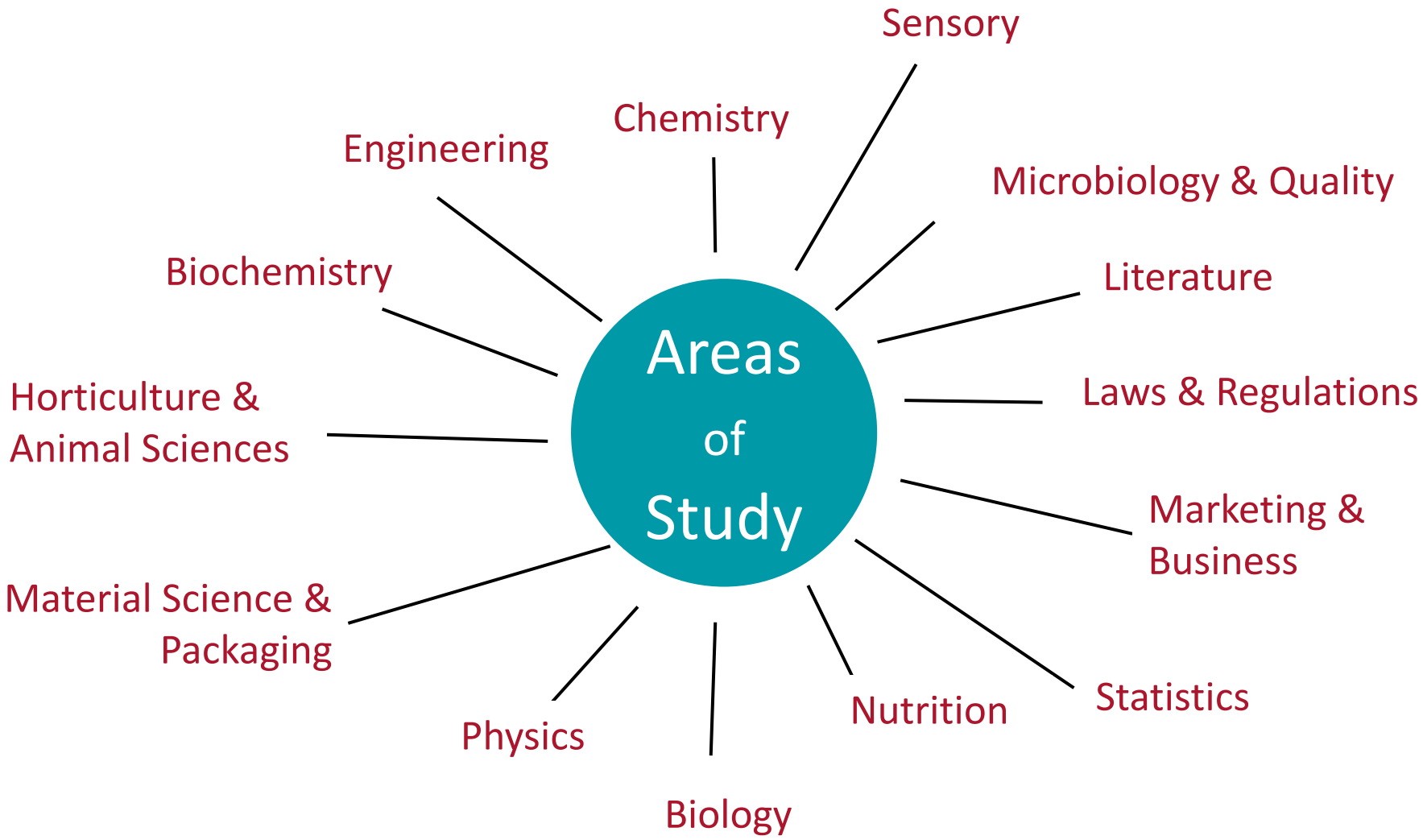
- Chemistry & Organic Chem: mixtures, density, emulsions, concentrations
- Biology & Physiology/Anatomy: Senses & taste, Smell/Memory, Biologically wired to desire sweet & fat, impact of growing population, water use in agriculture
- Mathematic: Statistic, data analysis, consumer preferences, concentrations/conversions
- Environment, Social & Cultural: social changes due to globalization of food, impact of increase middle income-globally, hunger, eco friendly products & packaging
- Economic: actual cost vs time cost as it relates to food & cooking, financial impact of globalization on small farmers and specialized products
- Physics: Qualitative & Quantitative Analysis with GCMS, spectroscopy, attraction of charged particles to magnetic fields

Next Generation Science Standards

- Practices
  - Demonstrations
  - Hands on Activities
- Cross Cutting Concepts
  - Interdisciplinary connections
- Disciplinary Core Ideas



What is Food Science?



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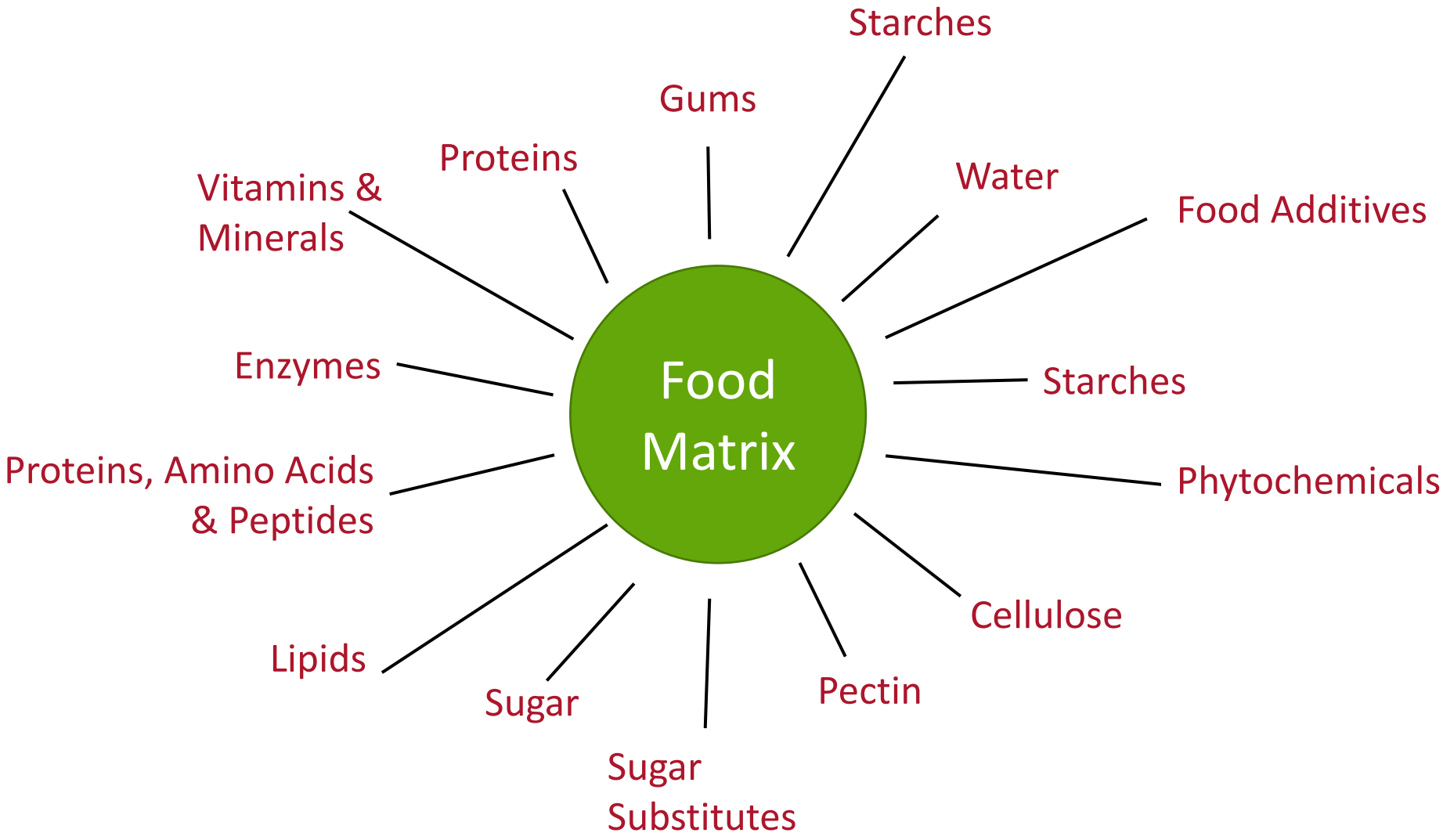
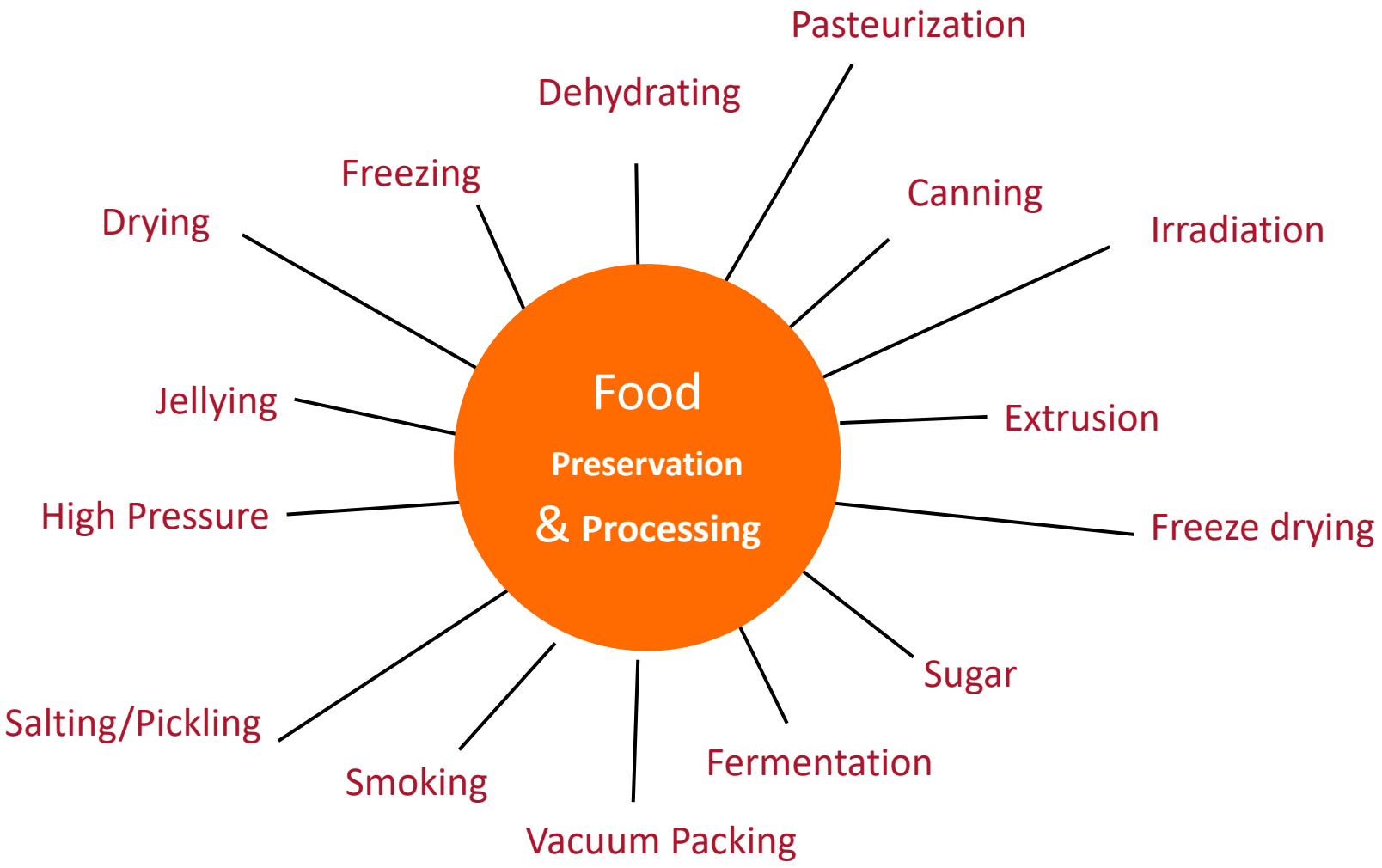


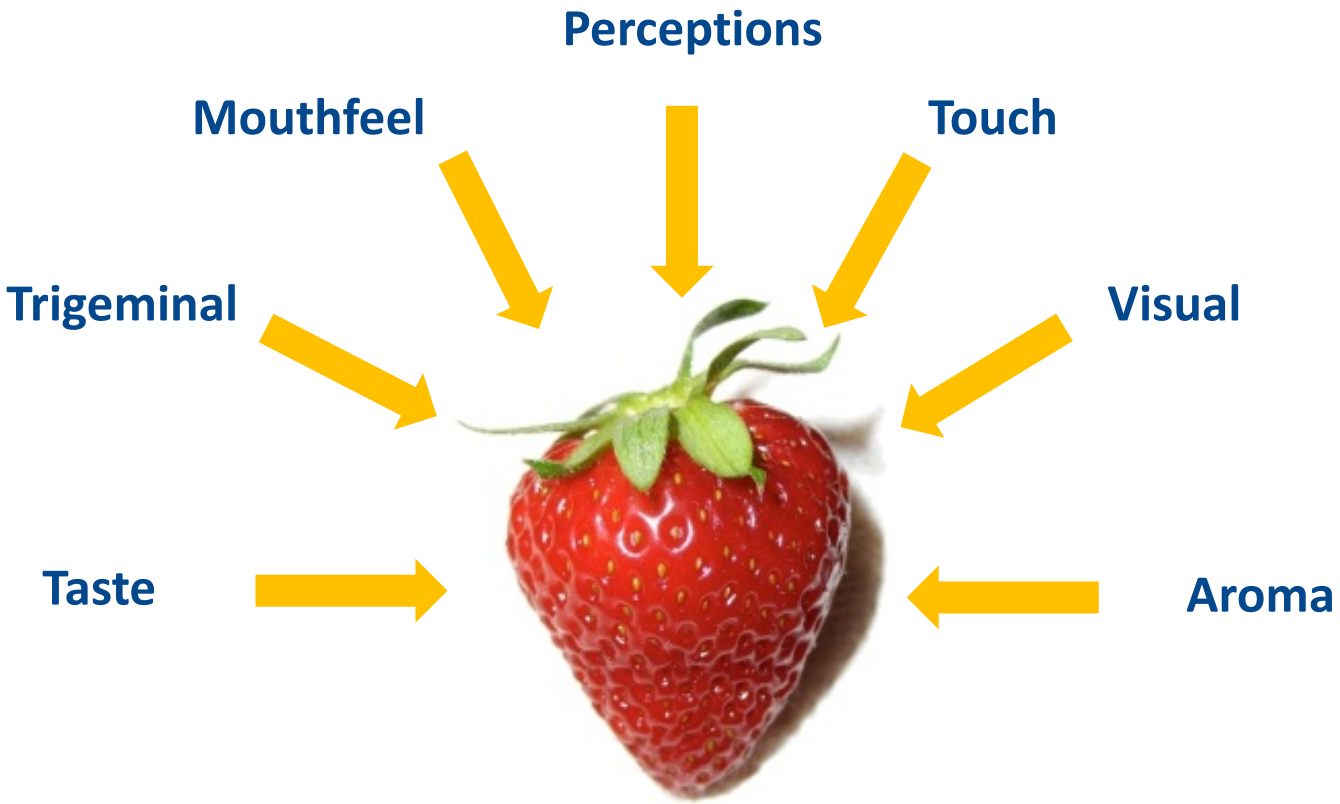
Food Scientists understand



The Science of Taste & Smell

Why are flavors important in food?

Flavor Cognition – Sensory Inputs



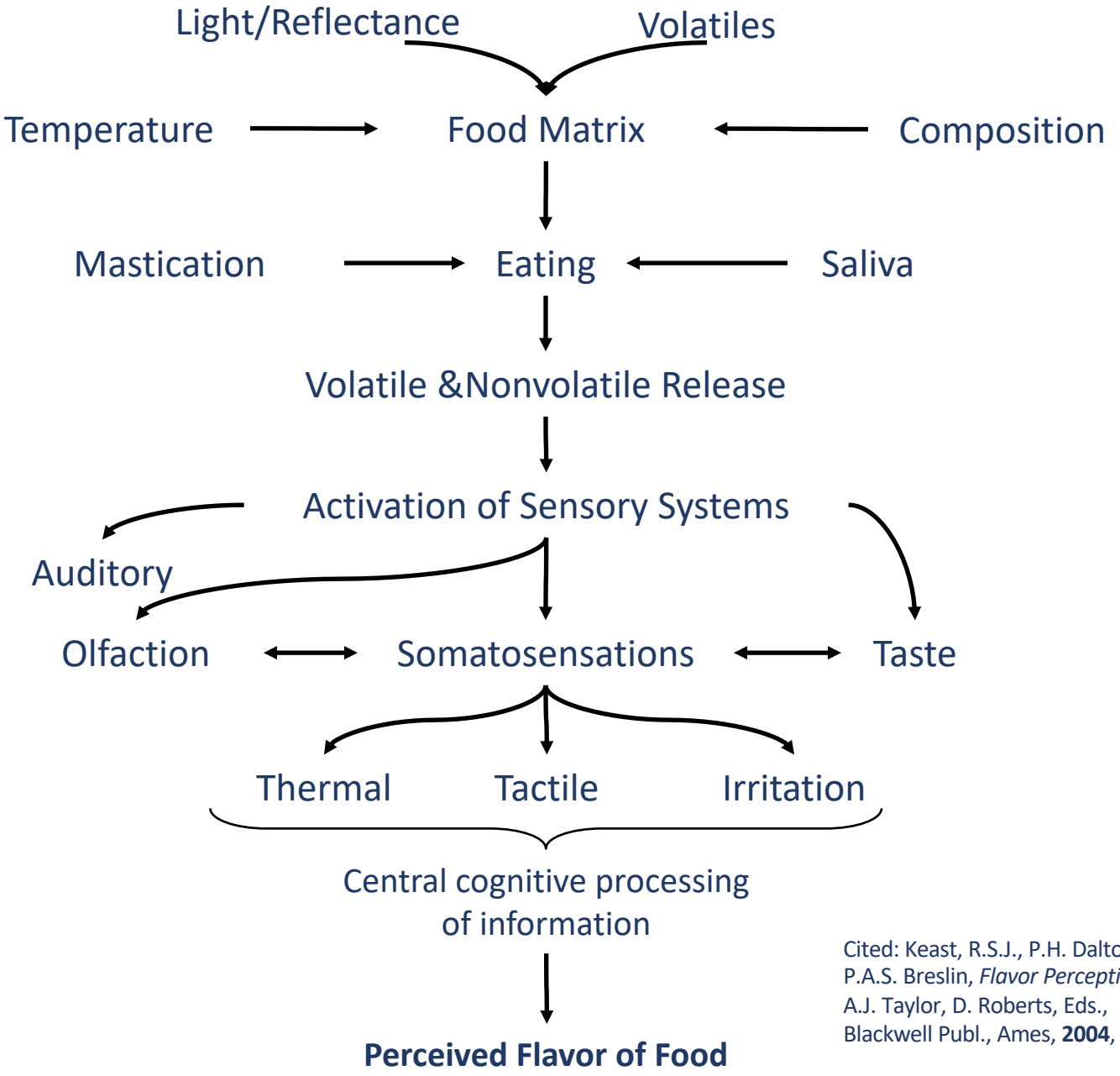
3 stages to help process information

Physical Stimuli

Physiology

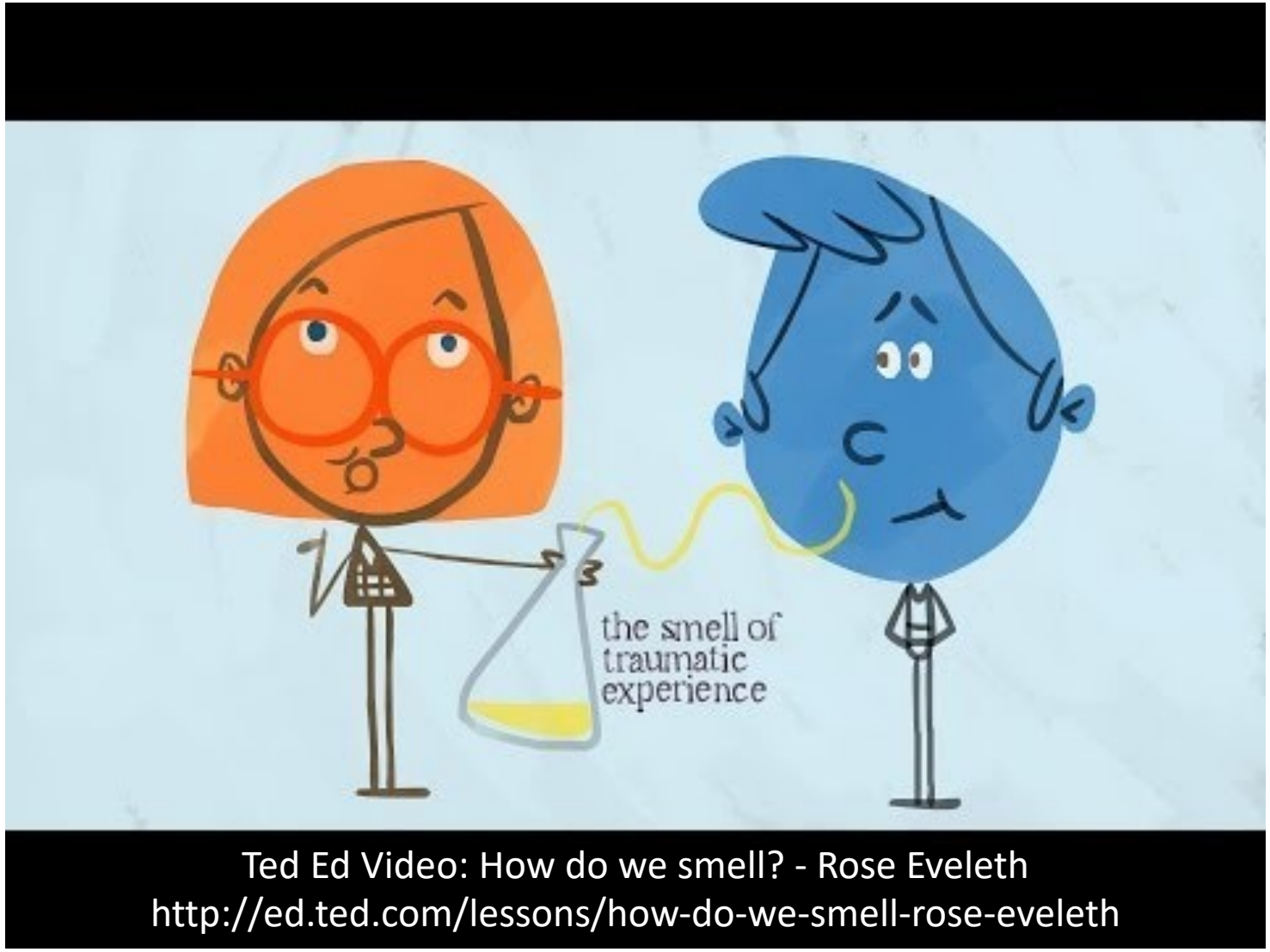
Perception

170 mph



Cited: Keast, R.S.J., P.H. Dalton, P.A.S. Breslin, *Flavor Perception*, A.J. Taylor, D. Roberts, Eds., Blackwell Publ., Ames, **2004**, p. 228.

Ted Ed Video: How do we Smell?



Ted Ed Video: How do we smell? - Rose Eveleth
http://ed.ted.com/lessons/how-do-we-smell-rose-eveleth

80-90% of what you experience as "**flavor**" *is* **aroma**.

Olfaction Routes

1. Orthonasal Pathway

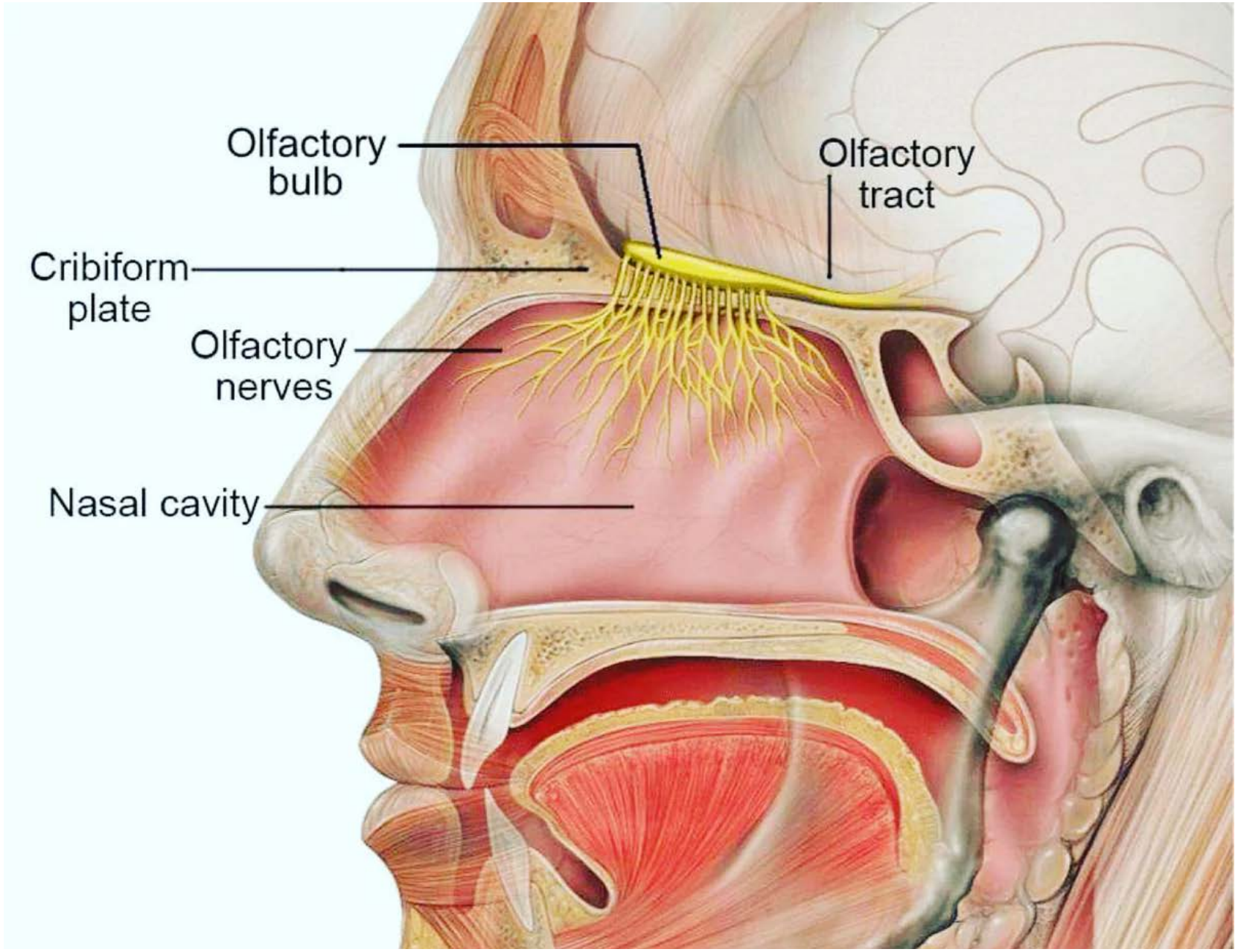


Fig. 8. Cross sectional depiction of naso-oral cavity

Olfaction Routes

2. Retronasal Pathway

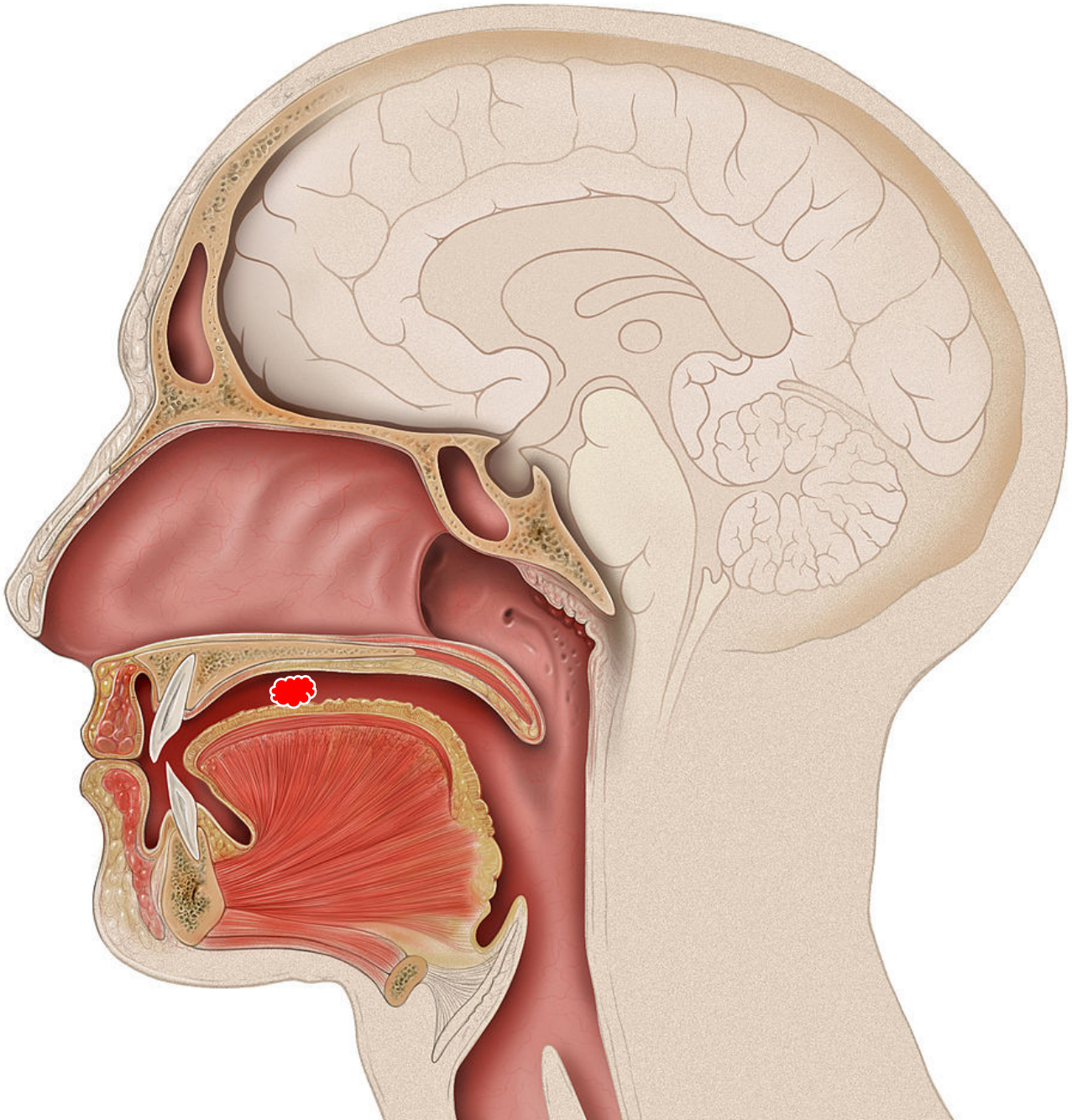
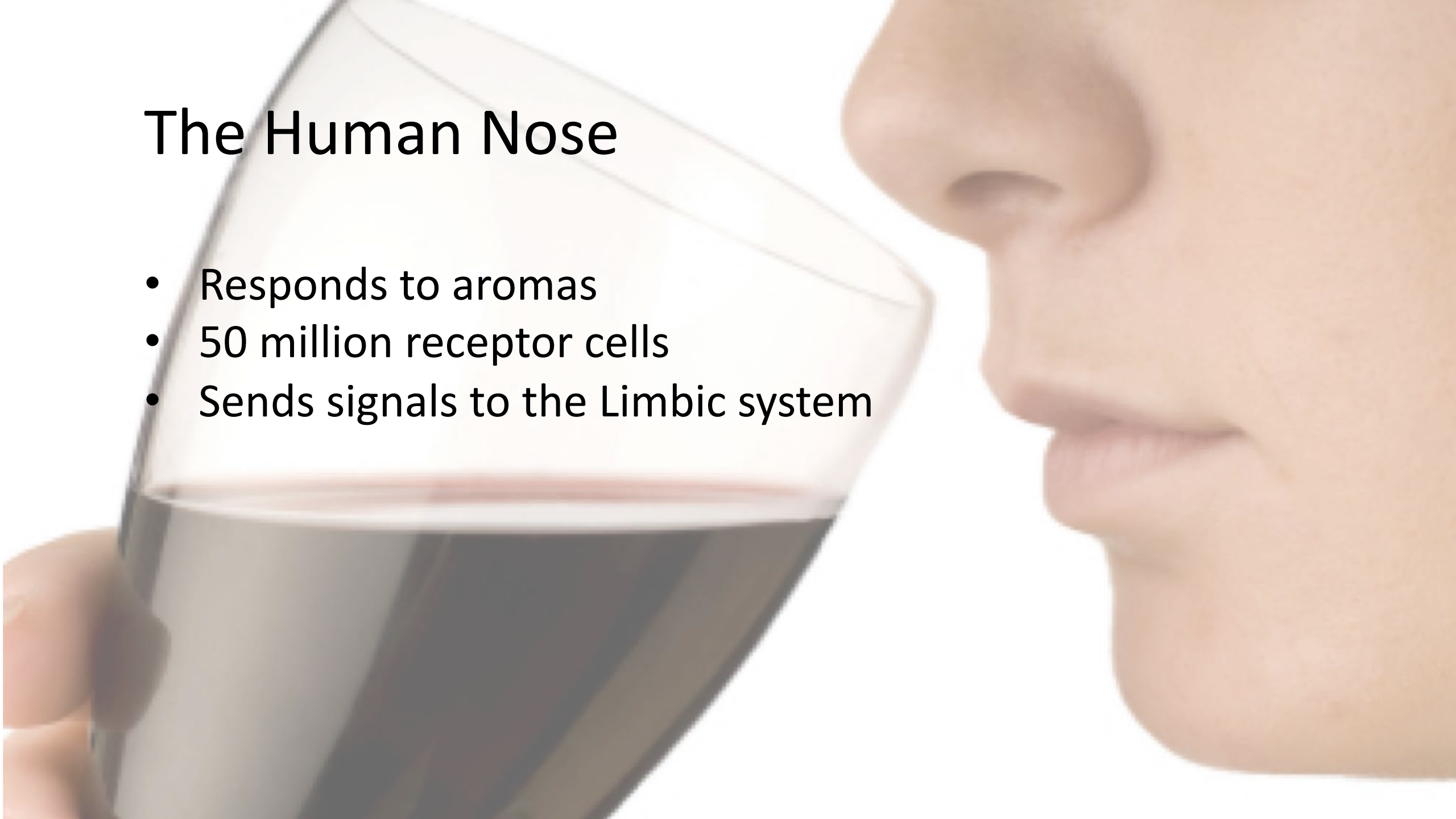


Fig. 8. Cross sectional depiction of naso-oral cavity

The Human Nose

- Responds to aromas
- 50 million receptor cells
- Sends signals to the Limbic system



Processing Aroma

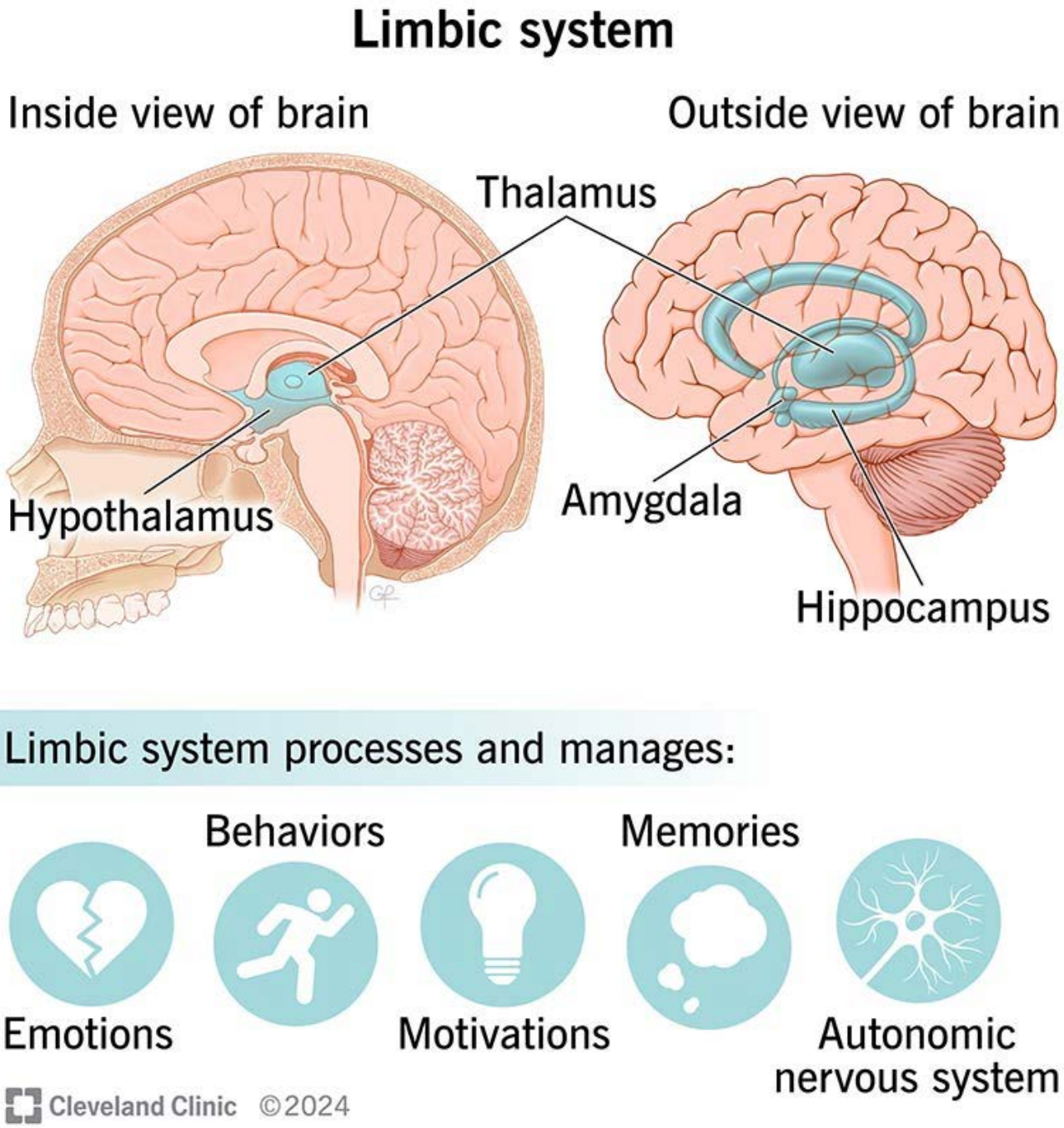
Limbic System

Structures:

1. Amygdala
2. Hippocampus
3. Hypothalamus
4. Thalamus

Function:

- Learning & Memory
- Emotions & Behavior
- Smell



Flavor Cognition

CAREER
Sensory Science

is a scientific discipline used to evoke, measure, analyze, and interpret those responses to products that are perceived by the senses of sight, smell, touch, taste, and hearing (Stone and Sidel 1993)“.

Study of:

- Food Science
- Psychology
- Statistics
- Trends

Sensory Scientist Video:
https://www.youtube.com/watch?v=hxwm7Fde9B0

CAREER
Flavor Creation

Flavor Chemists are creative scientists. They tend to specialize and become experts in specific areas of flavor chemistry.

- Flavor profile
- Application
- Traditional vs. process flavors

Certification Process

- Training is 7-years minimum
- Must train under a Certified Flavorist
- First test with The Society of Flavor Chemists at 5-year (Apprentice)
- Certification exam at 7 years

Flavor Chemist Video:
https://www.youtube.com/watch?v=Yv3WVqVVxj0

What is a Flavor?
https://www.youtube.com/watch?v=iyuW-fhkE78

Flavor Formation

If all our natural food had to have ingredient statements

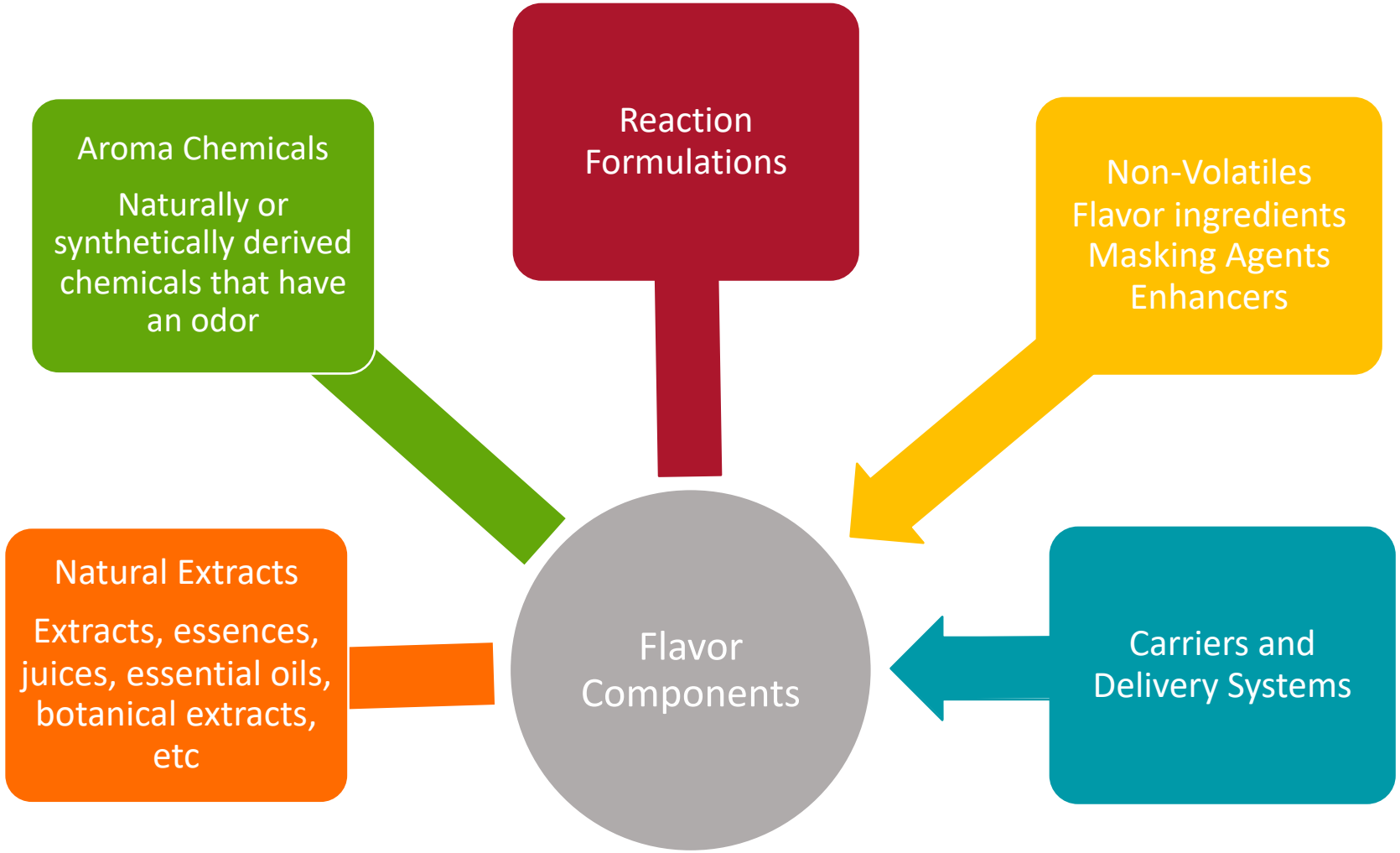
INGREDIENTS: AQUA (90.9%), **SUGARS (4.9%)** (FRUCTOSE (50%), GLUCOSE (41%), SUCROSE (9%)), FIBRE E460 (2.0%), ASH, **FATTY ACIDS (<1%)** (OMEGA-6 FATTY ACID: OCTADECADIENOIC ACID (42%), OMEGA-3 FATTY ACID: OCTADECATRIENOIC ACID (31%), OCTADECAENOIC ACID (20%), HEXADECANOIC ACID (6%), OCTADECANOIC ACID (1%), HEXADECAENOIC ACID (<1%)), **AMINO ACIDS (<1%)** (ASPARTIC ACID (26%), GLUTAMIC ACID (17%), LEUCINE (6%), ALANINE (6%), LYSINE (5%), GLYCINE (5%), ARGININE (5%), PROLINE (4%), SERINE (4%), TYROSINE (4%), THREONINE (4%), ISOLEUCINE (3%), PHENYLALANINE (3%), VALINE (3%), HISTIDINE (2%), TRYPTOPHAN (1%), CYSTINE (1%), METHIONINE (<1%)), **PRESERVATIVES** (E236, E296) **COLOURS** (E160a, E161b, E161c, E140, E161d, E161e, E161g, E161h) E300, E307, FOLATE, CHOLINE, BETAINE, PHYTOSTEROLS, **FLAVOURS** (2,5-DIMETHYL-4-HYDROXY-2H-FURAN-3-ONE, 2,5-DIMETHYL-4-METHOXY-2H-FURAN-3-ONE, GAMMA DECALACTONE, GAMMA-DODECALACTONE, 2-FURFURAL, 5-HYDROXY METHYL-FURFURAL, LIMONENE, LINALOOL, (E)-NEROLIDOL, E1510, HEXANOL, OCTANOL, METHYL BUTANOATE, ETHYL BUTANOATE, METHYL HEXANOATE, ETHYL HEXANOATE, HEXYL ETHANOATE, (E)-2-HEXEN-1-YL ETHANOATE, BUTYL ETHANOATE, METHYL OCTANOATE, ETHYL OCTANOATE, OCTYL-2-METHYL BUTANOATE, OCTYL HEXANOATE, DECYL BUTANOATE, DECYL ETHANOATE, METHANETHIOL, ETHYL 3-METHYLBUTANOATE, GERANIOL, E210, FARNESYL ACETATE, MESIFURANE, METHYL ANTHRANILATE, GAMMA-DECALACTONE, METHIONAL, DIMETHOXYMETHANE, 1-BUTOXY-1-ETHOXYETHANE), 2-(4-HYDROXYPHENYL)-ETHYL BETA-D-GLUCOPYRANOSIDE.

- In descending order from most to least prevalent.
- PLUS, more chemicals that are not listed.

Look at all the flavor chemicals found in a strawberry!

James Kennedy, Chemistry teacher from Australia
https://jameskennedymonash.wordpress.com/category/infographics/chemistry-of-everything/

Flavor Formation

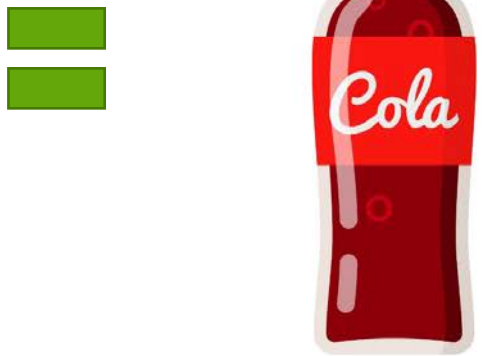


DEMO - Flavor Chemistry

Create a flavor, it's fun!

Flavor chemists create all the flavors for foods around the world.

- Natural, organic & artificial flavors
- Talk about flavor chemistry and food science/product development, purchasing, quality of products.



Food Science & your students

- Your students need to understand how science, technology & society are ***interrelated***.
- Challenge our students to build on what they already know– ***connecting*** what is learned in a science class & their lives in the world.
- Take the concerns, interests & experiences of students and connect them to the classroom, using ***scientific knowledge*** & ***critical thinking***.

What happens when you Smell or Taste something new?

Sensory Influence:
The Power of the Human Brain

The pweor of the hmuan mnid. Aoccdrnig to rscheearch codnutced at Cmabrigde Uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are tpyed, the olny iprmoetnt tihng is taht the frist and lsat ltteer be in the rghit odrer. The rset can be a total mses and you can still raed it wouthit porbelm. Tihs is bcuseae the huamn mnid deos not raed ervey lteter by istlef, but the wrod as a wlohe.

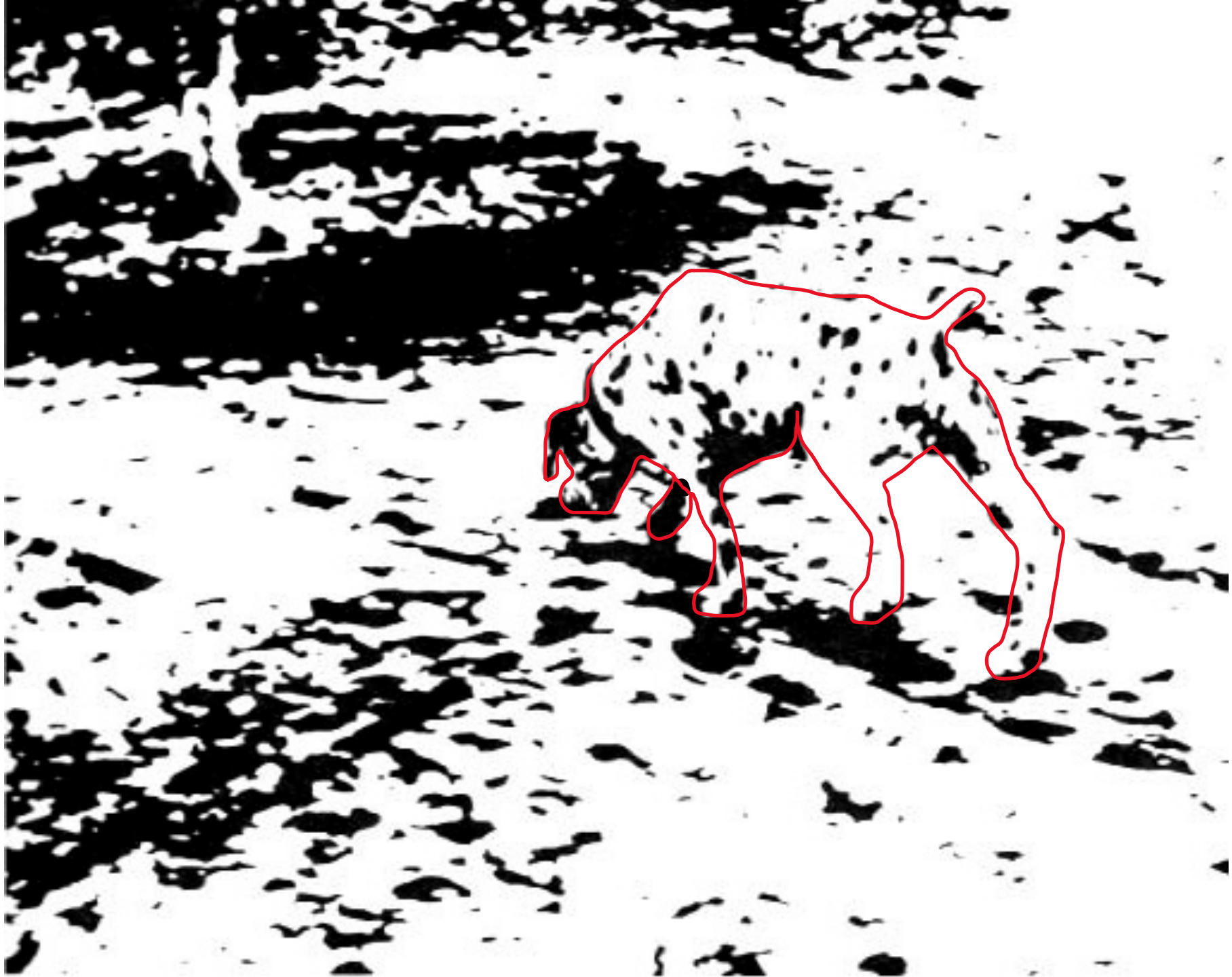
Amzanig huh?

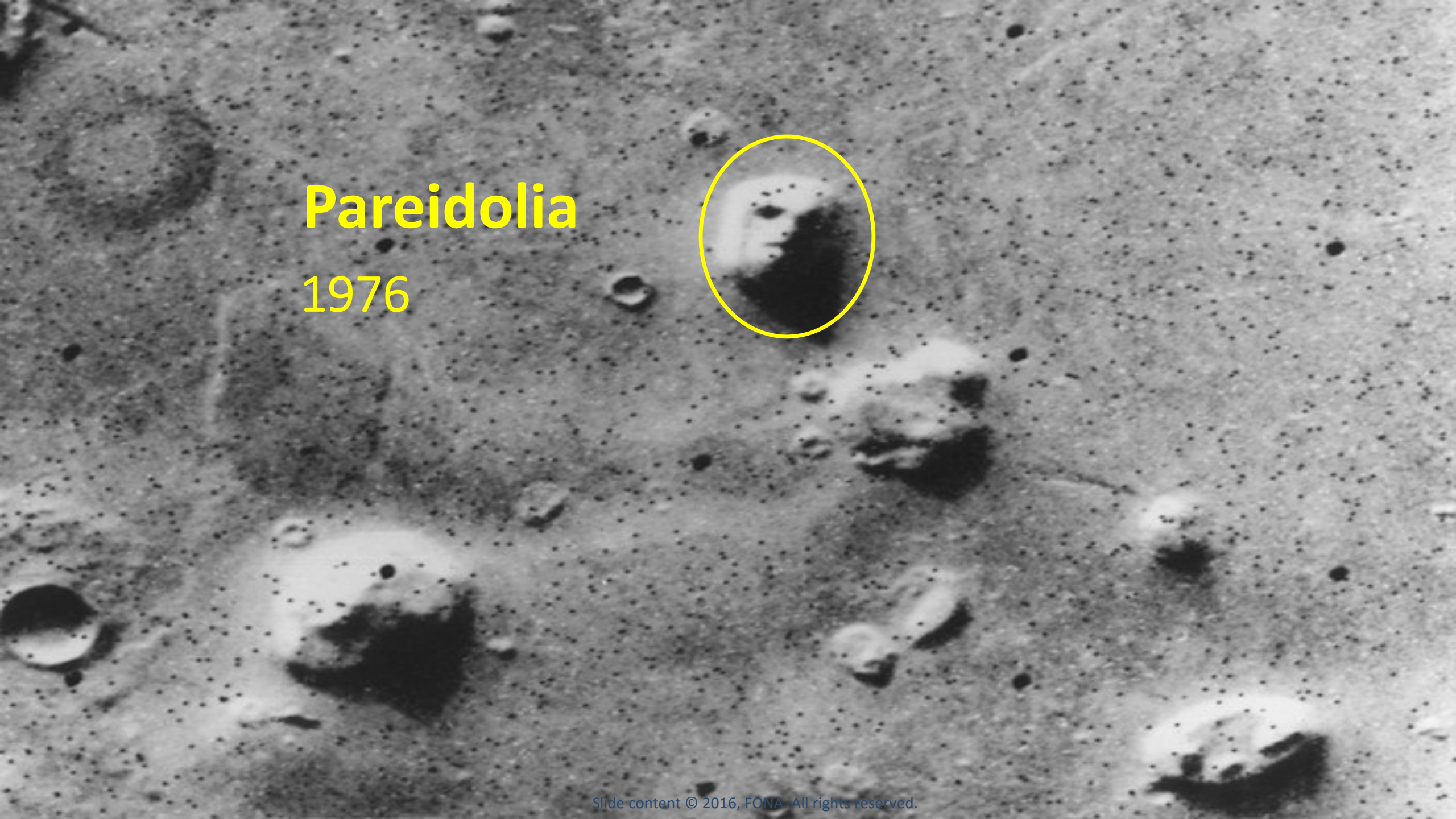
Sensory Influence:
The Power of the Human Brain

The power of the human mind. According to research conducted at Cambridge University, it doesn't matter in what order the letters in a word are typed, the only important thing is that the first and last letter be in the right order. The rest can be a total mess and you can still read it without problem. This is because the human mind does not read every letter by itself, but the word as a whole.

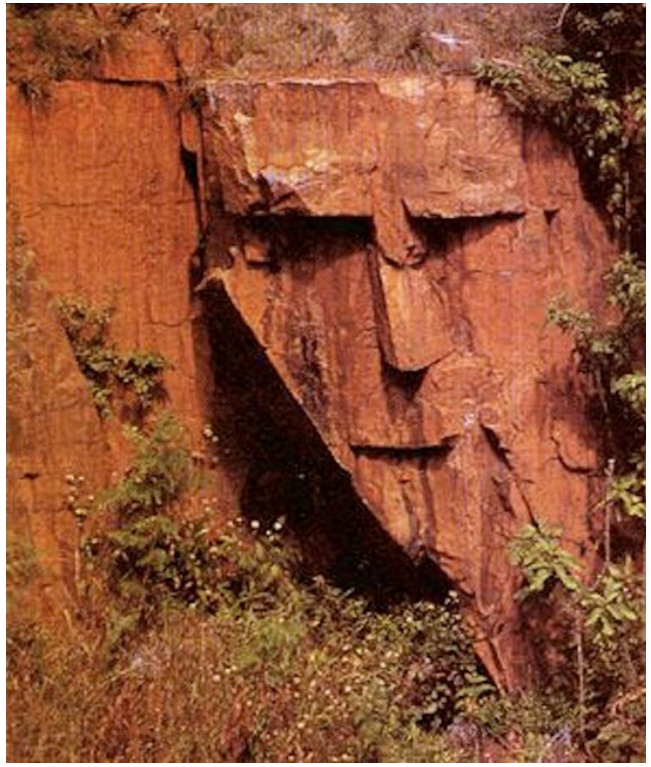
Amazing huh?

Outlying information processing theory

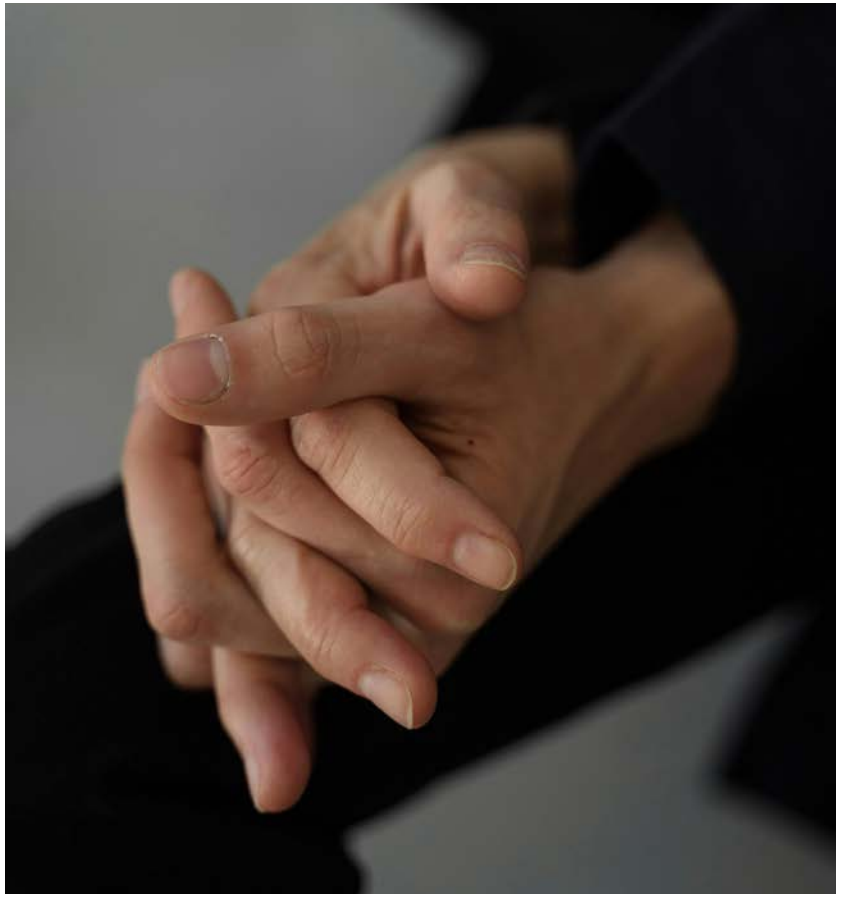




Pareidolia



Learning something new is uncomfortable!



Initial Discomfort:

- You'll likely feel awkward and unnatural at first, as your brain is trying to establish a new motor pathway.

New Habit Formation:

- The brain needs time to create new neural connections for the new thumb position to feel natural.

Practice Makes Permanent:

- Consistent practice, even just for short periods, will help your brain re-wire and make the new position a new habit.

Activate your student's brains!

- Present information in a new way
  - Various types of learning
- **Sounds** – what kind of effect they can have
  - Loud jarring bells vs therapeutic calming noises
- **Aromas**
  - mints, citrus
  - Chewing gum studies

Link to studies about activating the human brain
- chewing gum

Activate your student's brains!

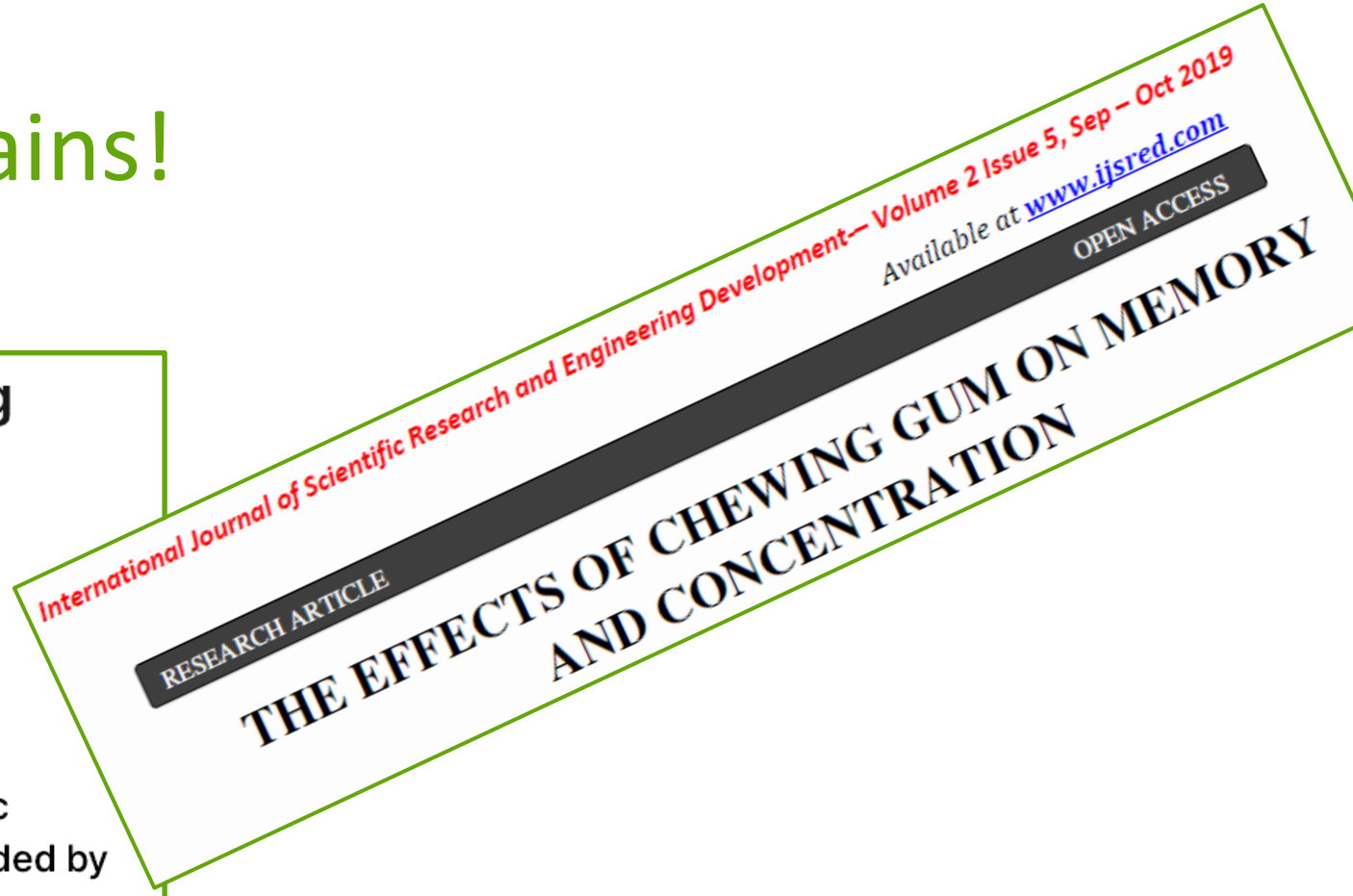
Teenage brain power boosted by chewing gum: Wrigley study

By Sarah Hills

23-Apr-2009 Last updated on 18-Mar-2017 at 02:19 GMT

Chewing gum could have a positive affect on the academic performance of teenagers, according to new research funded by the Wrigley Science Institute (WSI).

The study examined whether chewing Wrigley sugar-free gum could lead to better academic performance in a "real life" classroom setting.



Your future students -

GENERATION ALPHA

The Gen Alpha Moment

Consumer Insights & Preferences

January 2025

Gen Alpha is a generation still in the making.

Making up **12% of the population**, Generation Alpha is the **youngest generation in the U.S.** Born between 2010 and 2025, the oldest Alphas are in their early teens.

By 2030, the **collective spending power** of this group of young consumers is **projected to reach $12 trillion.**

By the time Alphas are 16, their generation's spending power will surpass Gen Z & Millennials combined.

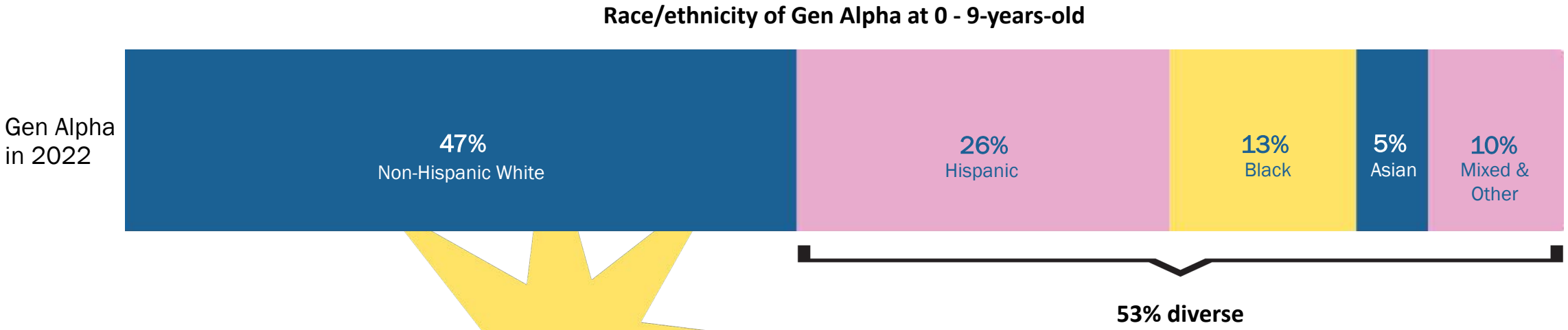
Source: Datassential, Kantar, The Food Institute

Flavor solutions

Diversity Demographic

Gen Alpha is the most diverse generation in U.S. history.

Gen Alpha represents the future of the nation. They are a majority-minority generation, the first generation to have less than half of their population identify as white.



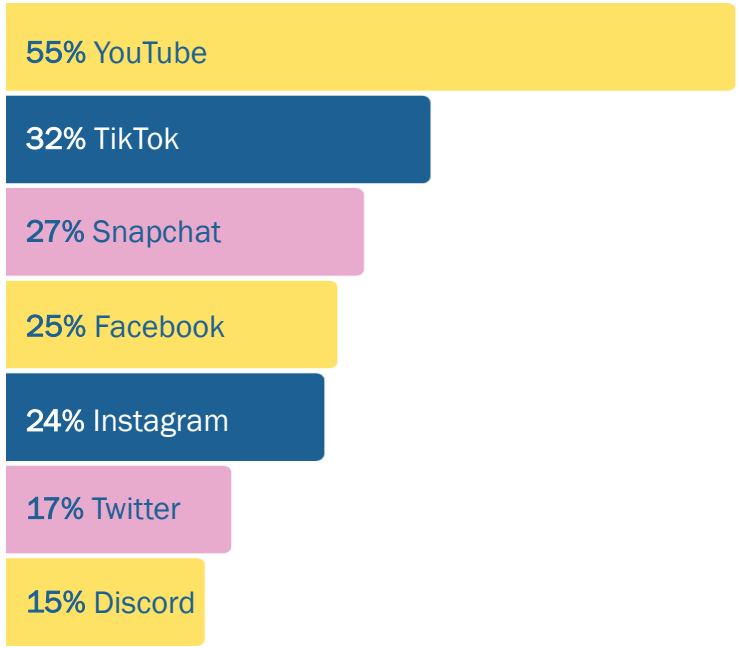
Source: Datassential, Kantar, The Food Institute

Flavor solutions

The Phone Zone

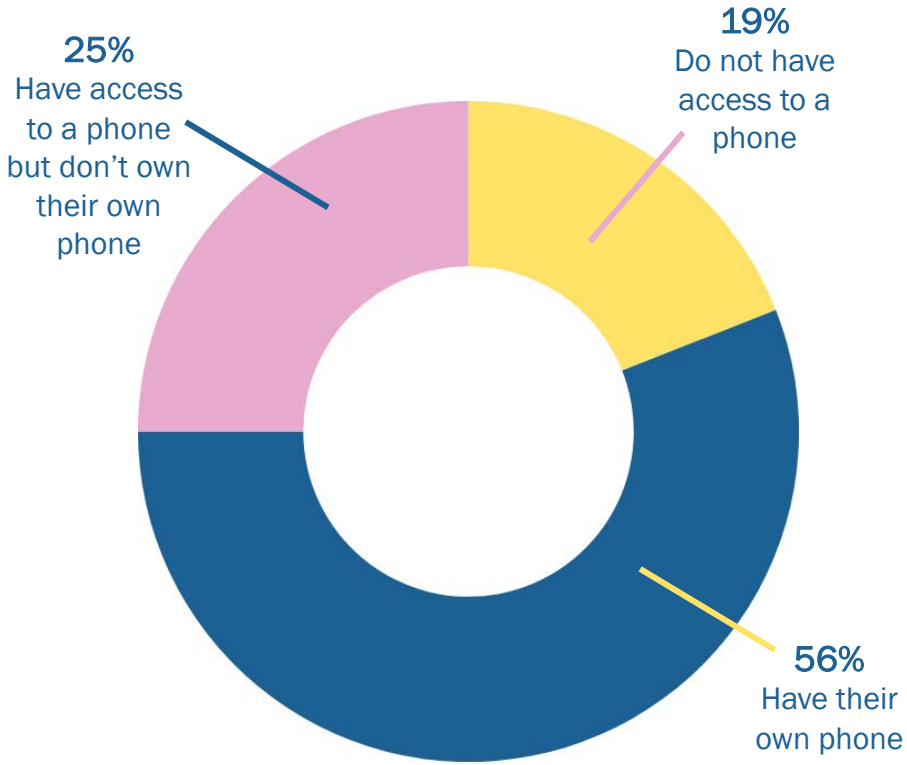
Nearly 90% of Gen Alphas spend at least **an hour a day** looking at screens, for socialization and entertainment.

Which of the following media platforms are your children currently on and allowed to use with parental supervision?



Source: Datassential

Do your children have access to a smartphone?



Flavor solutions

The Power of a New Generation

Despite their young age, Gen Alpha already possesses significant social influence.

Tech Savvy & Digital Natives:

- Growing up with **technology seamlessly integrated** into their lives
- Identify as “gamers” and use tech “to live and enjoy their life”
- **Already content creators**, sharing their lives and perspectives online, with power to influence trends, opinions, and social movements

Social Consciousness:

- Describe themselves as “**incredibly creative**” and “**kind**”
- **Care strongly** about environmental issues, social justice, and other causes at a young age
- **Support their causes** through involvement in social activities in school and social campaigns in media

Consumer Power:

- Developing strong brand loyalty early on
- Preferences significantly impact family purchasing decisions and household spending
- Highly receptive to social media influencers and prioritize recommendations from their favorite creators

Source: ABC News, Britopian, Datassential

Gen Alpha is growing up with a **deeper appreciation for overall wellness, convenience, and flavor variety.**

Nearly half of **Gen Alphas eat fresh fruits daily.** 80% of parents try to maintain healthy, balanced diets for their kids as much as they can.

Gen Alpha is captivated by spicy and bold flavors, proving to be the most **adventurous consumers** we've seen so far. 53% of households look for flavors they have never tried before.

43% of parents report that their children eat fast food at least weekly, and 79% **appreciate value, variety, and convenience**.

Flavor solutions

Source: The Food Institute, Innova, Fuch Gruppe, Mintel, Perdue Food Service

CAREER
Food Marketing

Focuses on activities aimed at selling products or services. Food marketing aims to create awareness, generate interest, and drive sales for food business.

<u>Key aspects of marketing:</u>

- Consumer Understanding & Data analysis
- Product Development
- Promotion & Advertising
- Social & Digital Marketing
- Branding & Packaging

CAREER
Food Science

McCormick FONA Scientist will do the demo with you!
https://www.youtube.com/watch?v=9XyPH4P5BRU-W

What is Food Science?
https://www.youtube.com/watch?v=9XyPH4P5BRU

Food Scientists can work in:

- Product Development
- Food Safety & Food Quality
- Research
- Sales & Marketing
- Sensory
- And more!

CAREER
Research & Innovation

Ooho-Edible Water bottle

https://youtu.be/x3K5SxV4NI4

McCormick FONA Scientist will do the demo with you!
https://www.youtube.com/watch?v=DCHp7GCt-LY

<u>Different terminology:</u>

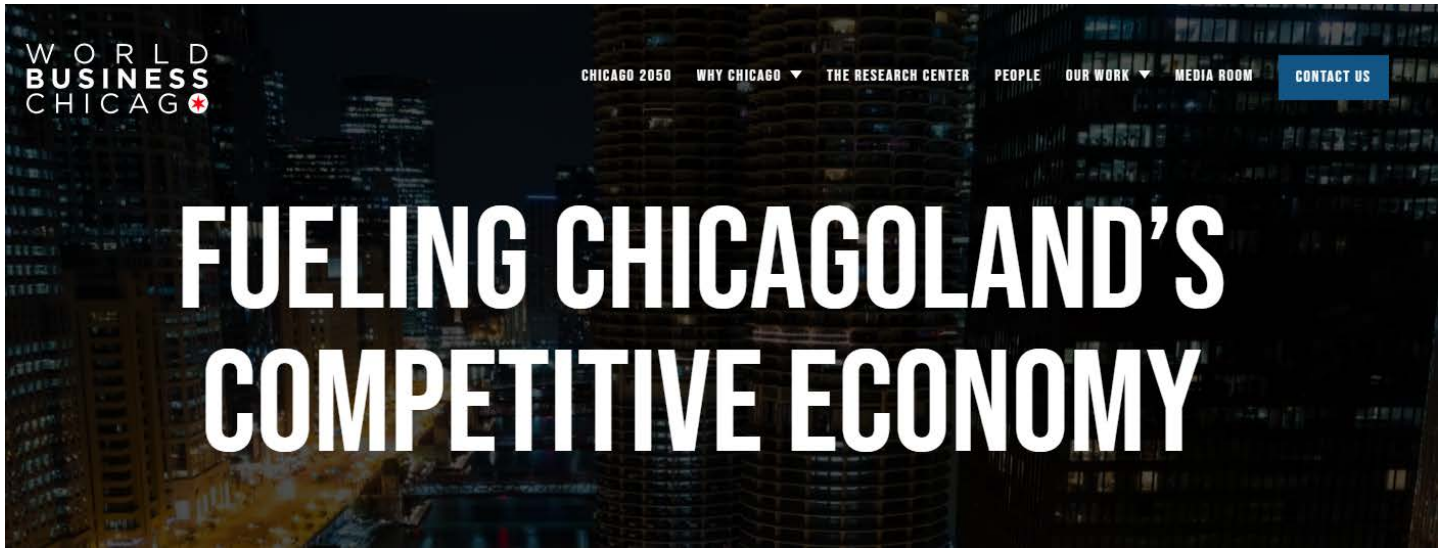
- Flavor Encapsulation by Ion-Exchange
- Culinary Spherification
- Molecular Gastronomy

Employment opportunities for your students

Food Science & Your Students

- Food Science is a viable career option – one with a great job outlook, combining everyday life and science!
- It is a fun, social science – eating your way through the day.
- Many of your students will never consider food science or careers in the food industry!

World Business Chicago



https://worldbusinesschicago.com/

EXPLORE THE DATA ON CHICAGO AND THE REGION

The World Business Chicago Research Center curates original content and data analysis on core priority industries, special interest topics, and briefs about the diverse economy of Chicagoland.

ECONOMY OVERVIEW

For the 11th consecutive year, Chicagoland secured its title as the Top Metro in the U.S. for Corporate Relocation and Site Selection, showcasing economic resilience amidst uncertainties.

- High Growth Industries in Chicagoland
- Year in Review 2023
- Year in Review 2022
- Year in Review 2021

FOOD MANUFACTURING

Chicago is the nation's food innovation and manufacturing capital, offering the nation's largest food manufacturing workforce and concentration of Fortune 500 companies in the industry.

- Food Innovation & Manufacturing Fact Sheet
- Innovation in Chicago's Food Industry May 2023
- Innovation in Chicago's Food Industry May 2022

FINANCE & FINTECH

The third highest employment numbers in the finance and insurance sector are here in Chicago- the city with the most diverse economy among US metros.

- Fintech in Chicago
- Finance & Fintech Fact Sheet

INNOVATION & TECHNOLOGY

Innovation and technology platforms all of Chicagoland's core industry to achieve inclusive growth and opportunity for the city's tech, innovation, and start-up ecosystem.

- Chicago's Innovation Ecosystem Map
- Chicago's Growth Capital Trends 2022

LIFE SCIENCES & HEALTHCARE

A future powerhouse industry for Chicagoland- Life Science and Healthcare are concentrated in and around the central business district for Chicago, with more lab space than ever.

- Life Sciences Industry Profile

MANUFACTURING

We have one of the largest manufacturing industries in the US, dubbing us, "The City that Works."

- Innovation in Manufacturing & Chicagoland's Advantages
- Manufacturing Industry Profile

TRANSPORTATION, DISTRIBUTION & LOGISTICS

As a top market for logistics tech, we are the nation's transportation and logistics hub serving as a crossroads of innovation and moving freight and people.

- Transportation & Logistics Technology Industry Profile
- Logistics Tech in Chicago

EMERGING INDUSTRIES

The dynamic technological and green ecosystems benefit from Chicago's diverse range of industries, allowing for a cross-pollination of ideas for rapid commercialization and practical applications.

- Chicagoland's Quantum Ecosystem
- Chicago's Competitive Edge in the Cannabis Industry
- Chicagoland's Green Future

CHICAGOLAND INDUSTRY PROFILE

FOOD INNOVATION & MANUFACTURING

Chicago is the nation's food innovation and manufacturing capital. The city's proximity to the nation's most productive farmland and an extensive transportation network helped grow the historic industry. Today, the metro area is home to the nation's largest food manufacturing workforce and the industry's largest and most innovative corporations.

OUTPUT (NOMINAL GDP)

$10.29B	1st	+5.4%
2024 (est.)	among metro areas	growth over 2023

EMPLOYMENT

69K	1st	+4.31%
as of Q4 2024	among metro areas	growth over Q4 2023

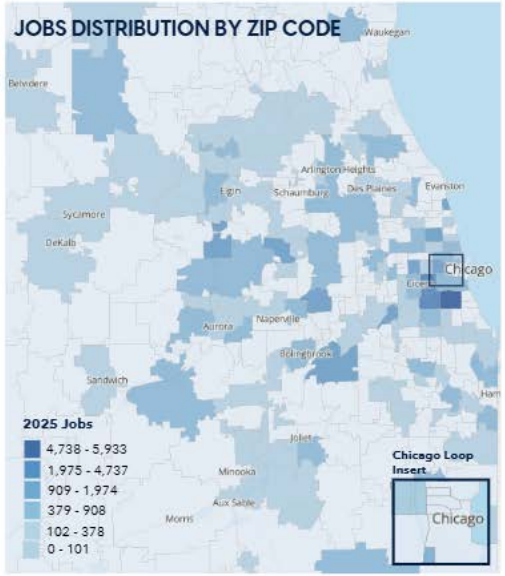
BUSINESS COUNT

1,404	3rd	+3.5%
as of Q3 2024	among metro areas	growth over Q3 2023

HIGH-GROWTH SUB-INDUSTRIES

- Animal slaughtering and processing has grown by 6.93% since 2023 and has over 13K in employment in 2024.
- Other food manufacturing has grown by 6.90% since 2023 and has over 14K in employment in 2024.

JOBS DISTRIBUTION BY ZIP CODE



LOCAL ASSETS

Chicago is the nation's crossroads, making it easy for food manufacturers to get their products to market.

- Chicagoland has 6 of 7 Class I railroads.
- Chicagoland is home to North America's largest inland port: CenterPoint Intermodal occupies ~6,400 acres and handles ~3M TEU annually.
- O'Hare International Airport continues to be of the top ports by value, moving $271B in imports and exports in 2023.

Chicago also has a supporting ecosystem for industry innovation and business growth.

- 24 known corporate innovation centers, many of which are food-related, like Mars Wrigley, McDonald's, and Ferrero.
- Over 75 incubators and accelerators, such as the Hatchery, the Food Foundry, and FoodLab Chicago, among others.

CHICAGOLAND INDUSTRY PROFILE

FOOD INNOVATION & MANUFACTURING

LABOR POOL & TALENT PIPELINE

Chicago has the nation's largest food manufacturing workforce.
As of 2024, Chicago is home to:

288K	**Production** occupations, ranking number one in the nation.	30K	Food processing occupations, the 2nd most in the nation.
+12K	Production jobs gained in 2024 from 2019.	456	**Food scientist and technologist** occupations, the **6th** most in the nation.

Chicago has a strong talent pipeline for food manufacturing.
In 2023, higher education institutions in the Chicago metro area granted:

150	Food science degrees – including from the University of Illinois at Urbana-Champaign – the **second most** in the nation.	33,954	STEM degrees, the **5th** most in the nation and **34%** more than in 2020.
3,131	Engineering degrees, the **8th** most in the nation.	1,684	Engineering technician programs completions, the **4th** most in the nation.

TOP EMPLOYERS

By global employee count

- McDonald's
- Mondelez International
- ADM
- Conagra Brands
- Kraft Heinz Co.
- Mars Wrigley
- US Foods
- Molson Coors
- Ingredion
- Quaker Oats

PRO-CHICAGO DECISIONS

Since 2021, there have been 58 food manufacturing and related pro-Chicagoland decisions. Combined, these projects have created nearly 40,000 jobs and brought earnings of over $3.2 billion to the metro area. A few notable projects include the expansions of:

- Mars Wrigley–opened its $40 million innovation hub on Goose Island in 2022 creating 30 new jobs
- Red Bull–leased space in both Arlington Heights and Romeoville for a combined total of 127,900 square feet in 2024.
- Ferrero–announced that in 2025, they'll be investing $75 million in its Franklin Park plant creating 65 new jobs.

ACCESS TO CAPITAL

Food innovation is one of Chicago's top verticals by growth capital raised. Investment decreased 88% between 2021 and 2024.

Since 2021, there have been:

- Nearly 135 local growth capital investors in Chicago's food innovation firms
- Over 25 companies acquired

Food Innovation
Growth capital raised, 2021 - 2024

WORLD BUSINESS CHICAGO

https://worldbusinesschicago.com/

Food Science Career Areas

- Food Safety & Defense
- Food Health & Nutrition
- Product Development
- Public Policy & Regulations
- Education & Careers
- Food Processing & Packaging
- Sustainability
- Business, Marketing & sales
- Engineering, Production & Logistics

Potential Career Descriptions

- **Product Development**: Develop New products or improve existing products. Qualities: Creativity & Teamwork
- **Research and Development:** Use microbiology, chemistry, engineering, or nutrition skills to investigate scientific principles and as they pertain to specific food components, food products, or food processes.
- **Technical Support:** Apply knowledge of raw materials and ingredients to food processing applications.
- **Management:** Involved with the organization, operation, and development of food processing companies. Their key role is to oversee employees and operations in the processing of specific foods.
- **Quality Assurance:** Analyze the components of ingredients & finished product to ensure it is safe & quality food.

Source: http://foodscience.psu.edu/majors/careers

Potential Career Descriptions

- **Regulation:** Work with governance of food, dealing with USDA, FDA, EPA, and the Patent Office. Positions include policy development, enforcing food sanitation and labeling regulations, or ensuring the safety of our food supply.
- **Extension Education:** Extension educators specializing in food safety, food processing, or human & educate the community.
- **International:** Many larger food companies are multinational and employ graduates with international experience or who speak a foreign language. Graduates looking to expand their horizons can be involved with helping citizens of developing nations improve their food handling and storage procedures through agencies such as the Food and Agriculture Organization, World Health Organization, or the Peace Corps.
- **Professional Schools:** Many food science graduates continue on to attend dental school, medical school, law school, and other professional fields using their food science education as foundation for future studies.

Source: http://foodscience.psu.edu/majors/careers

Jobs a Food Scientist can have

- Food Scientist
- **Biochemist**
- Cereal **Scientist**
- Dairy Products Scientist
- Director of Quality Assurance
- FDA/USDA **Research Scientist**
- **Flavor Chemist**
- Food Biochemist
- Food Biotechnologist
- Food Chemist
- Food **Engineer**
- Food Industry R&D
- Food Ingredient **Sales**
- Food Inspector
- Food **Microbiologist**
- Food Product Consultant
- Food Product Developer
- Food **Safety Inspector**
- Food Technologist
- Food **Toxicologist**
- General Manager, Research
- Laboratory Director
- Manager, **Analytical** Lab
- Manager, Meat Applications
- Market Researcher
- Meat Scientist
- Natural Products Researcher
- New **Technologies**
- **Packaging** Specialist
- Plant Manager
- Plant Supervisor
- **Product Development**
- Project Leader, Technology
- **Project/Product** Manager
- **Public Health** Official
- Quality Assurance Director<
- **Quality Assurance** Manager
- Quality Assurance Supervisor
- **Research and Development**
- Research Scientist
- Quality Assurance Officer
- Sales Manager
- Scientific and **Regulatory** Affairs
- Scientific Research
- Senior **Food Scientist**
- Sensory Evaluation Expert
- **Sensory** Scientist
- Technology Development Manager
- Technical **Sales** Representative

Where can Food Scientists work?

- Food processors
- Ingredient manufacturer/suppliers
- Academia
- Self-employed/Consultant
- Government
- Non-government organizations
- Foodservice
- Testing laboratory


Skills Industry wants your students to learn!

- Effective **communication** – written & oral, technical communication
- Intellectual **curiosity**
- **Self-starter**
- Ability to **collaborate**
- Strong **lab skills**
  - Physical precision
  - Must wear PPE (Personal Protective Equipment)
- Interpret data, **Critical thinking**, Problem Solving
- **Organization** & documentation practices
- **Integrity**, Trust, Respect for others

Careers at McCormick FONA

Degree Careers at McCormick FONA

RESEARCH & DEVELOPMENT

- **Flavorist** *(7-yr apprentice program)* creatively and intellectually create flavors using knowledge of extracts, oils, and natural & artificial chemicals. Flavorists create the flavors you love!
- **Research & Innovation Scientist** continuously looks at new ways to produce and deliver flavors, taste and smell.
- **Analytical Chemist** analyze, identify, and quantify ingredients in our food products to gain knowledge of how to make, recreate or develop something new.
- **Food Scientist** (or product developer) creates new tastes for the grocery store shelves. They develop new products or find new better tasting flavors for products currently being sold.
- **Sensory Scientist** research all the parameters of what makes something taste a certain way, picking food apart at molecular level. Evoke, analyze, measure & interpret responses to foods.
- **Lab Technician** supports any of the above positions and their tasks.
- **Regulatory** is responsible for disseminating national & international food law into easy to understand, workable knowledge so our developers abide by the guidelines set forth to keep our food safe.

BUSINESS

- **Sales** build & maintain relationships with customers.
- **Marketing** understand consumer needs and how flavors can influence and improve products on the market. Research market trends and assists in product concept & ideation.
- **Accounting** ensure all bills are paid, employees are paid, and services are paid for.
- **Finance** is responsible for the financial health of the organization and to helps fund new ventures & reinvesting in the company.
- **Human Resources** supports the organization by finding potential employees, support employees with training & guidance, organize health care and financial tools for employees.
- **Legal** reviews contracts & negotiations, preserves IP and ensures the company is protected.
- **IT** builds the best networks to support the business and proactively works to protect and build systems for growth.

OPERATIONS *(degree careers)*

- **Engineer** assists the entire business to ensure everything is working properly and most efficiently.
- **Purchasing** is responsible for buying all the right supplies so we can make flavors. If you like to negotiate, this may be a great job for you!
- **Product Safety/Quality** ensures the ingredients that come into our manufacturing facility and the flavors that leave are exactly what we expect based on buying & quality parameters, and customer specifications.
- **Environmental, Health & Safety** is important to make sure processes & procedures are in place to always ensure safety while at McCormick FONA or working with/for/around us.
- **Scheduling** plans out the manufacturing schedule to make sure each flavor is made to order, for an on-time delivery to our customers.
- **Customer Service** engages with our customers and our salespeople to make sure anything our customer needs is received in a timely manner.

Non-degree Careers at McCormick FONA

OPERATIONS *(certificate, associates degree careers)*

- **Warehouse**
  Building where all pre & post-production materials are stored. Logistics, keeping track of materials, moving products around the warehouse and ensuring the correct products are shipped to the customer on-time.
  - **Shipping/Receiving Clerk** - Receive shipments of supplies & ingredients, ship manufactured flavors to customers
  - **Material handler** - Move products, equipment and materials around the manufacturing plant & warehouse.
- **Production**
  Responsible for measuring, mixing ingredients & making finished flavor products, to fill customer orders.
  - **Compounder**
  - **Spray Dry operator**
  - **Liquid blend operator**
  - **Production assistant**
- **Sample Services**
  Serve our customers to get them customized flavors that are reproducible, so they can 'test' them in their manufacturing facility before ordering large quantities from our manufacturing team.
  - **Compounder**
  - **Spray Dry operator**

- **Maintenance**
  This team works with the safety, manufacturing & engineering teams to make sure the manufacturing floor is safe and ready to run at full capacity each and everyday. The maintenance team ensures McFONA equipment is properly cared for and working efficiently.
  - **Maintenance Mechanic**
  - **Welder**
  - **Electrician**
- **Facilities**
  Ensure our facility looks pristine, is clean and functions properly every day for all employees and guests!
  - **Janitor**
  - **Facility technician**

For all CAREER INFORMATION:

- For career opportunities - https://careers.mccormick.com/
  - Search by location (i.e. Geneva, IL)
- Scan QR code for 2-minute videos of various careers & to learn about flavor or food science or visit https://www.fona.com/learn/discover-fona-food-science-for-young-minds/career-exploration .

FOOD. SCIENCE. FLAVOR. FUN!

Summary

- The Food industry is a very diverse industry.
- 1500 companies in Chicagoland area in Food & Beverage
  - Another 2000+ support the food industry.
- Food manufacturing accounts for 15% of all manufacturing jobs.
- Americans spend about 15% expendable income on food.
- We need your students to become problem solvers!!
  - Engineers, Developers, Science Communicators, Regulations, Manufacturers, etc!
- Food is FUN. *Enhance* lessons with opportunities for your students to learn more about what they eat.

Katie Sudler

Website: https://www.mccormickfona.com/learn/discover-fona-food-science-for-young-minds
Email: katie_sudler@mccormick.com
Email: https://www.linkedin.com/in/katiesudler/

McCormick FONA

Website: https://www.mccormickfona.com
LinkedIn: https://www.linkedin.com/company/mccormick-fona/

Food Science Resources

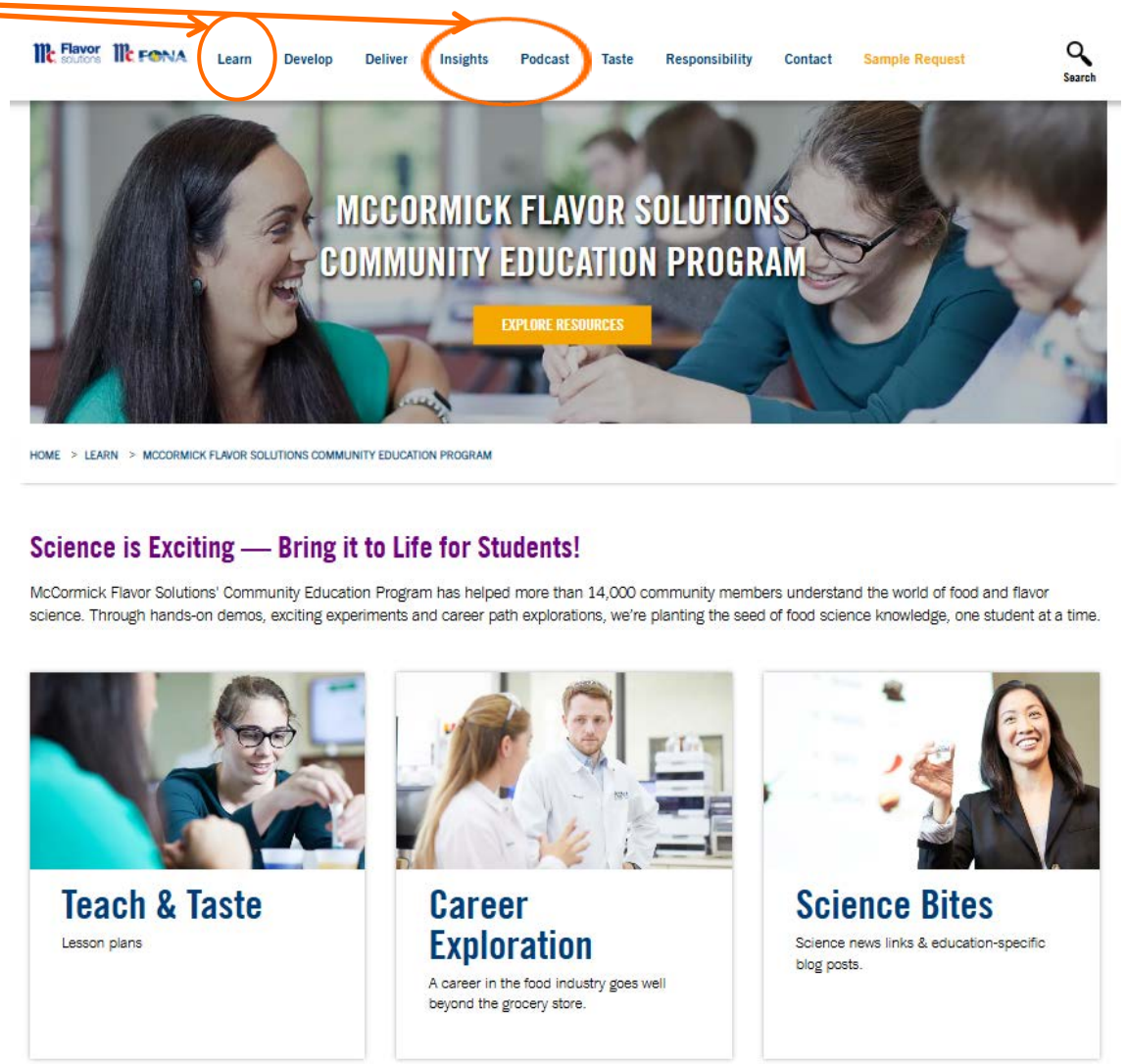
Katie Sudler

Discover FONA *(this program ☺)*

McCormick FONA

https://www.mccormickfona.com/learn/discover-fona-food-science-for-young-minds

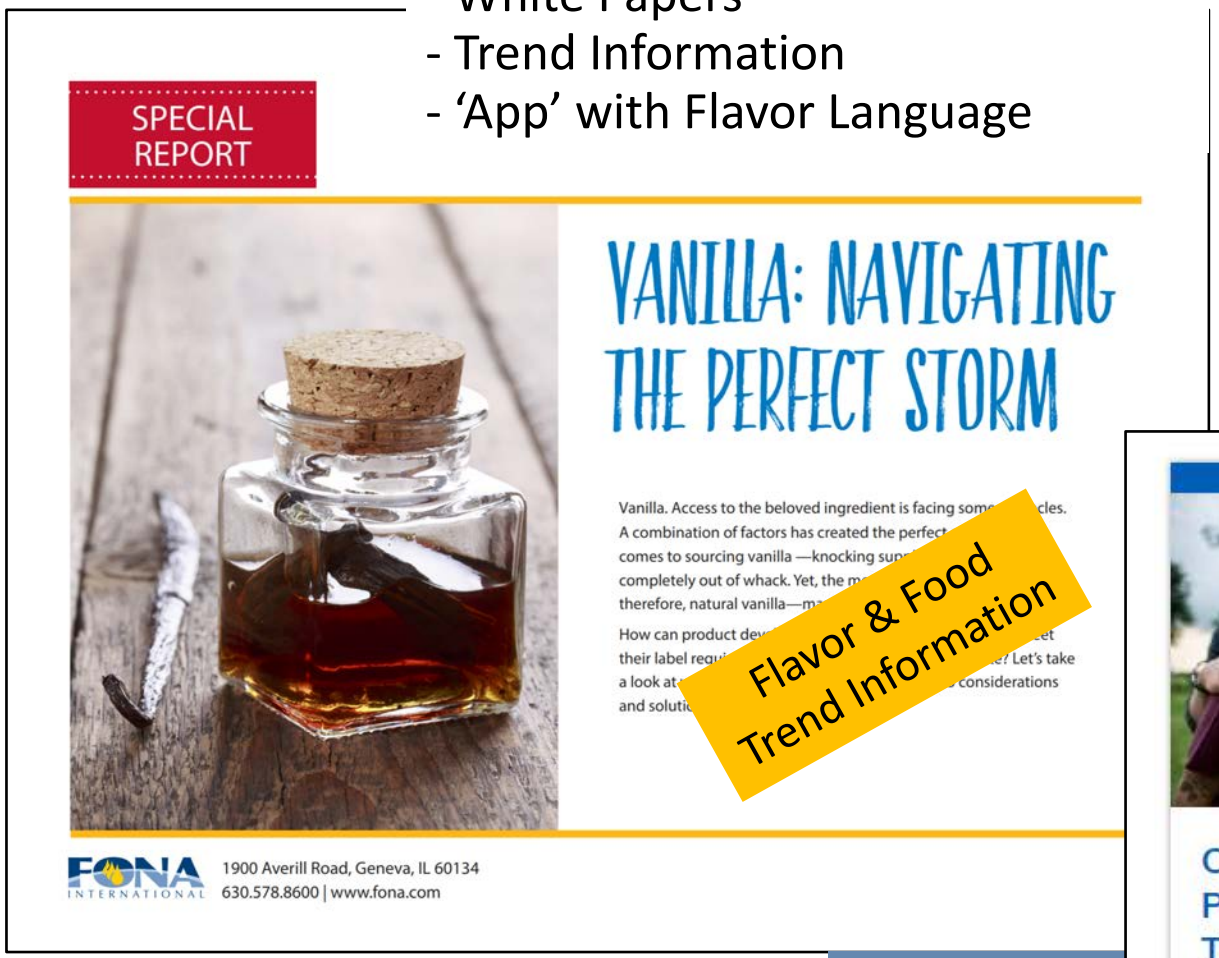
- **Teach & Taste**
  - Lesson Plans & Demonstrations
- **Career Exploration**
  - FONA Employee short career videos
- **Science Bites**
- **Trend & White Papers**
- **Podcast** (with technical & marketing)
- Sign up to be a **taste tester**!

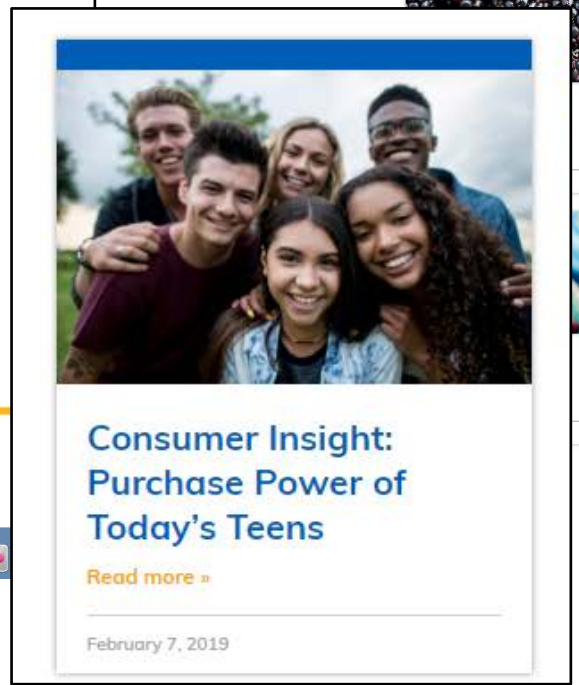


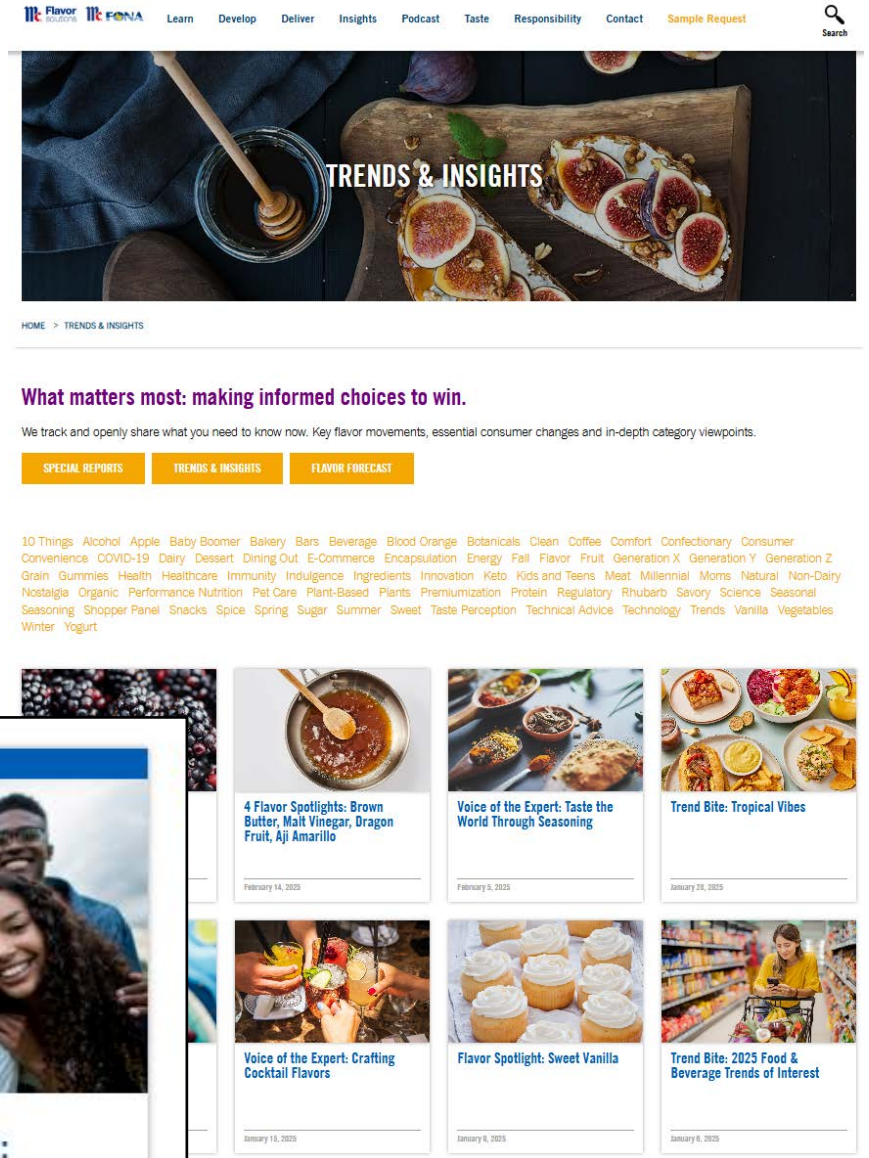
McFONA Resources

https://www.mccormickfona.com/category/trends-insights

- White Papers
- Trend Information
- ‘App’ with Flavor Language

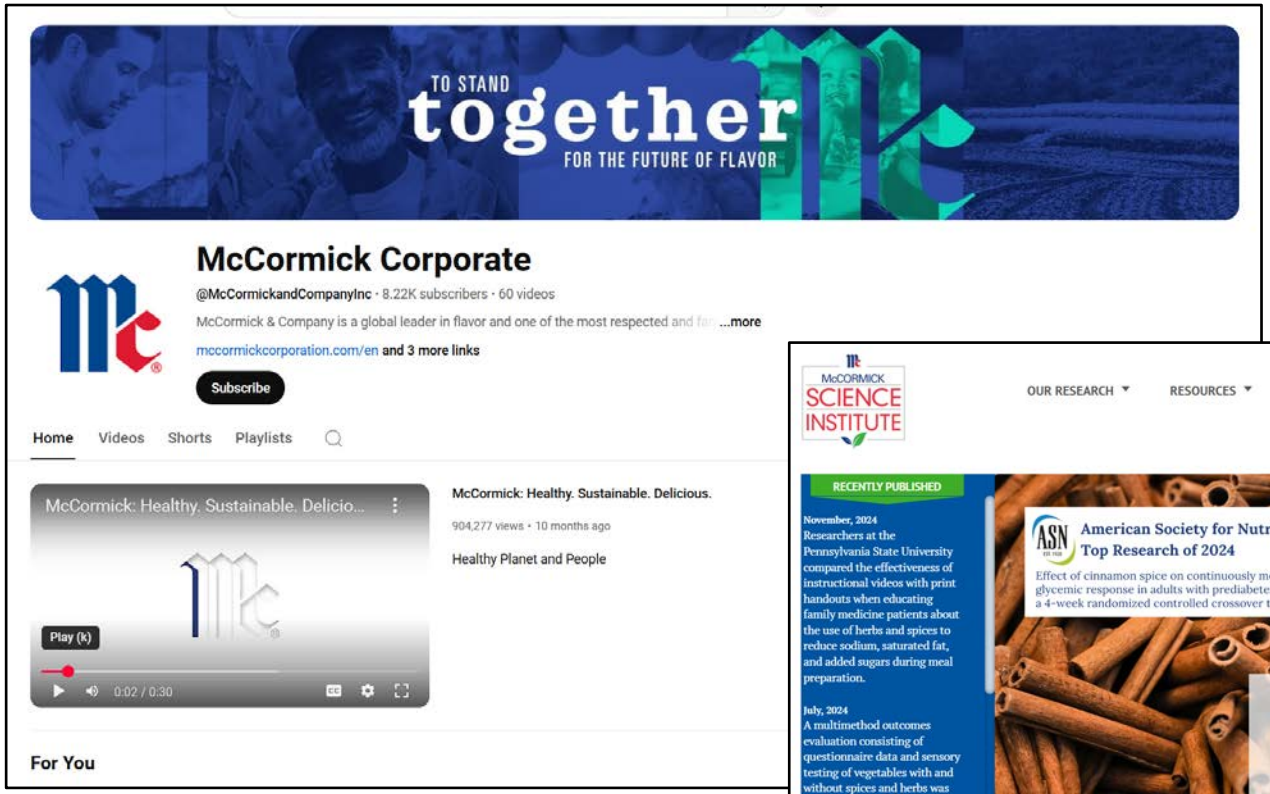




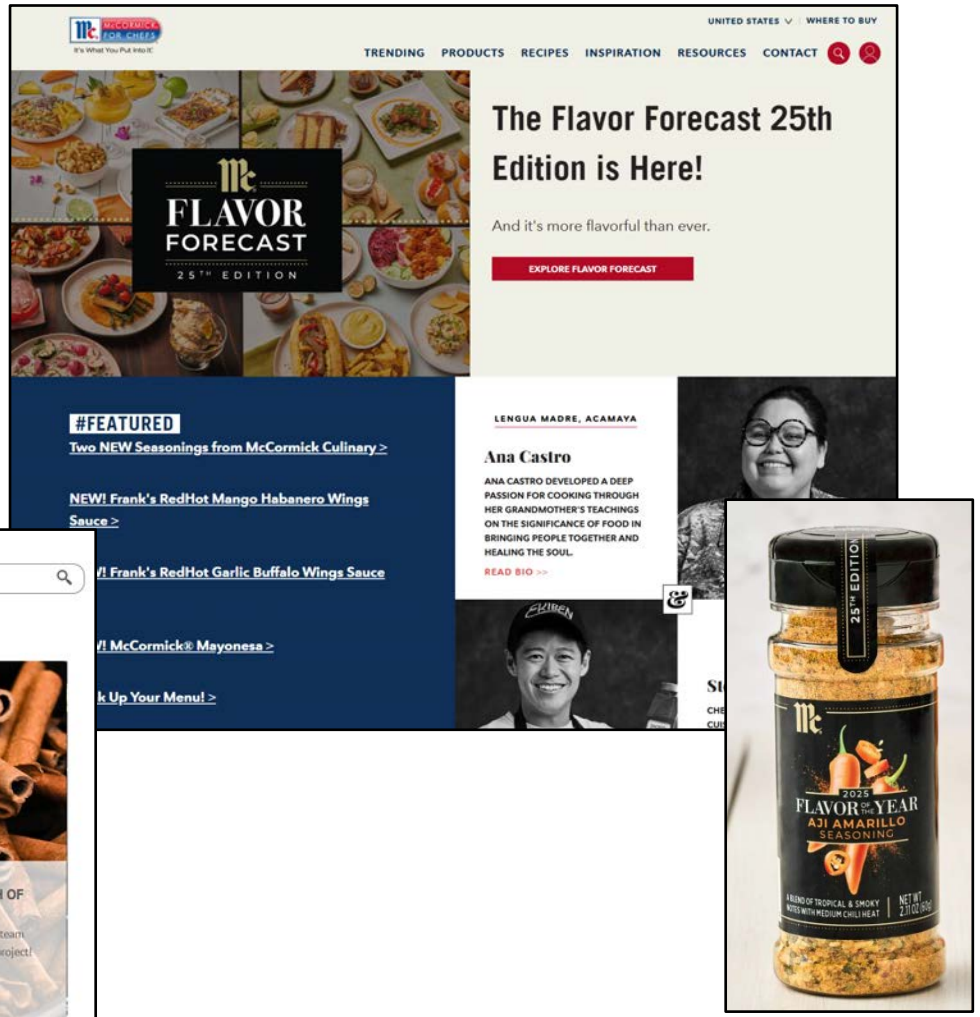


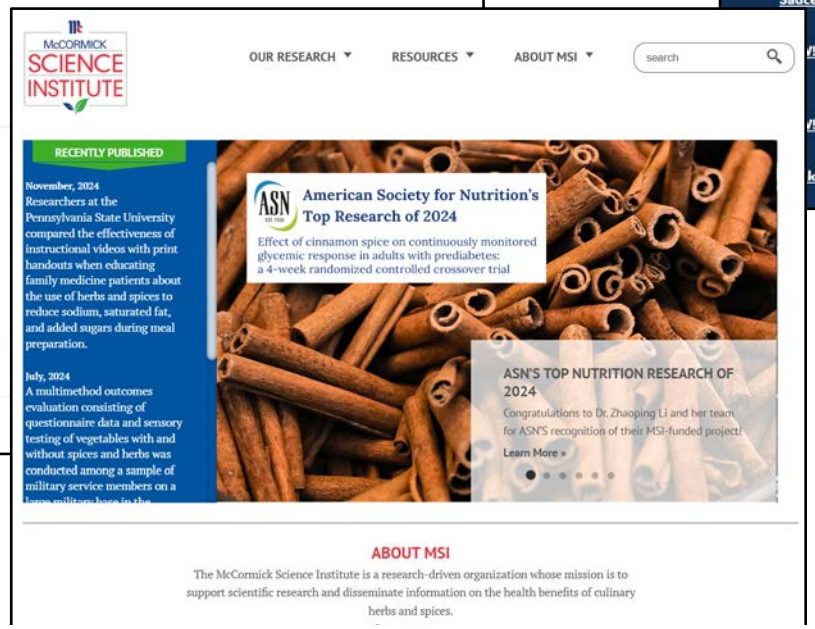
McCormick & Company

YouTube: @McCormickandCompanyInc



https://www.mccormickforchefs.com/en-us

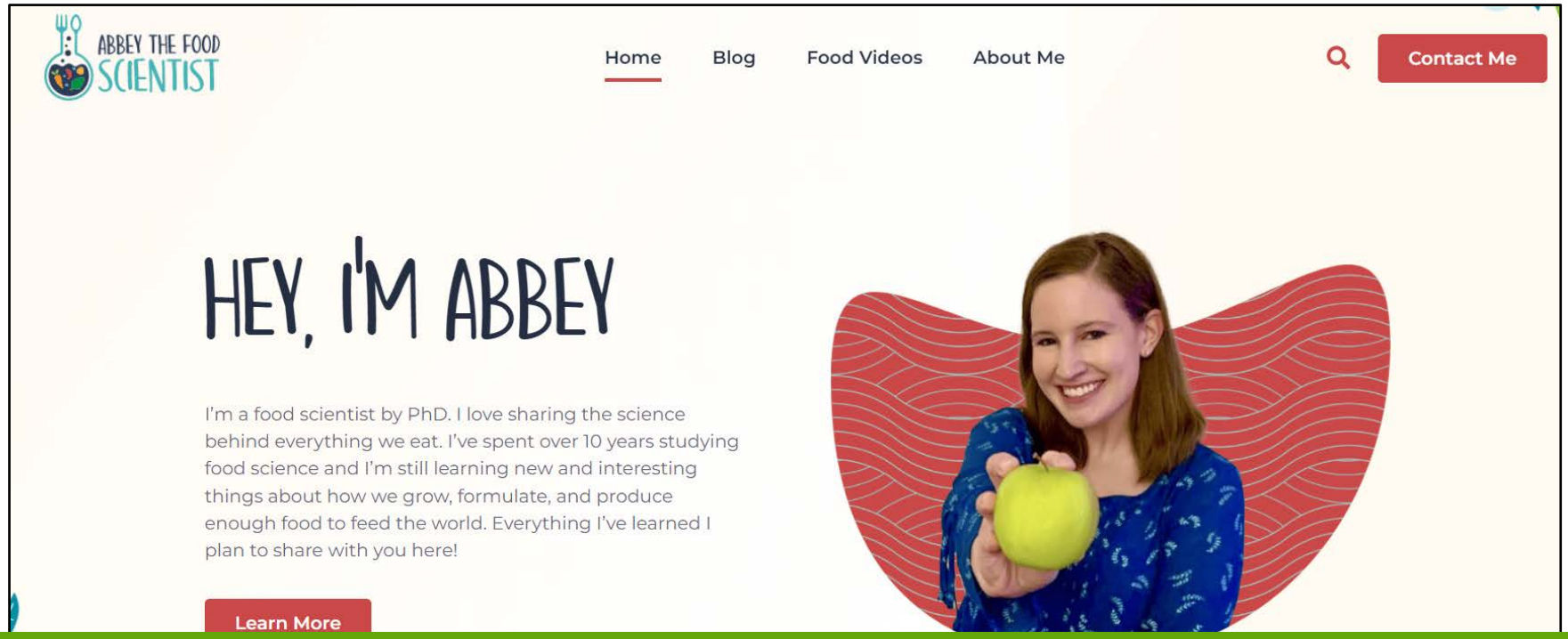




https://www.mccormickscienceinstitute.com/

Abby the Food Scientist

https://abbeythefoodscientist.com/



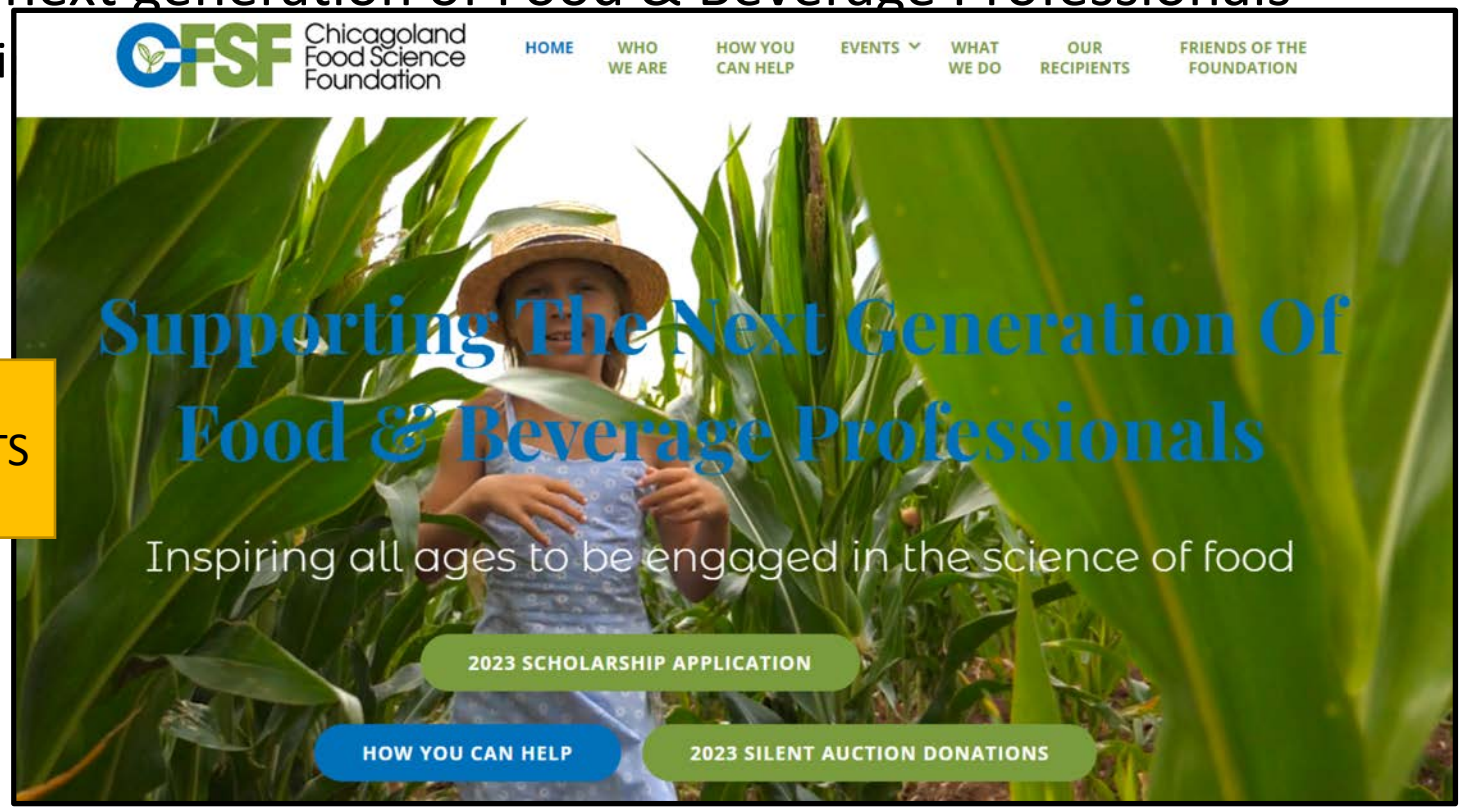
- Abby is a food scientist & researcher. Abbey The Food Scientist – Explanation of all things food!
- Blog & Videos and more great videos on YouTube @AbbeytheFoodScientist

Chicagoland Food Science Foundation

https://chicagofoodscience.org/

- CFSF supports the next generation of Food & Beverage Professionals
  - College scholarshi

SCHOLARSHIPS FOR STUDENTS

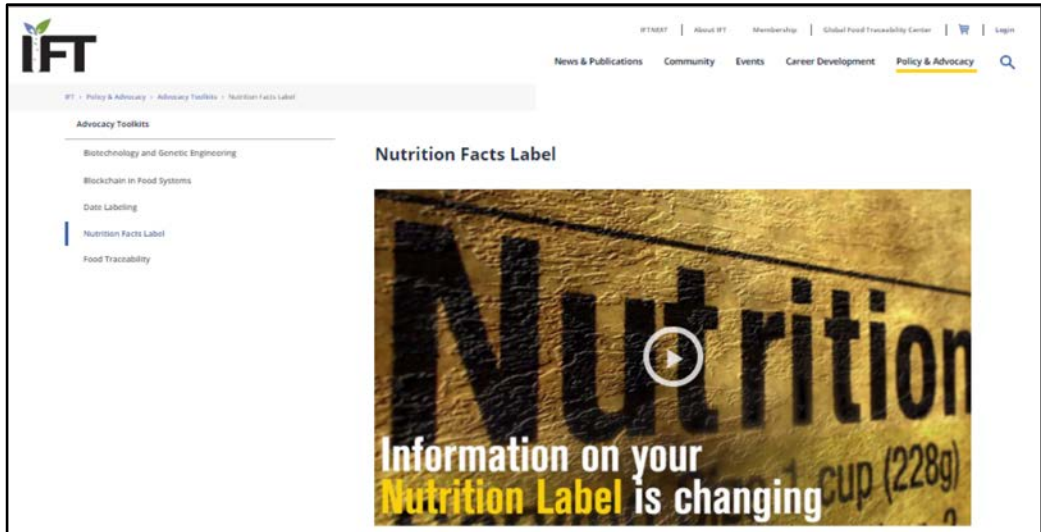


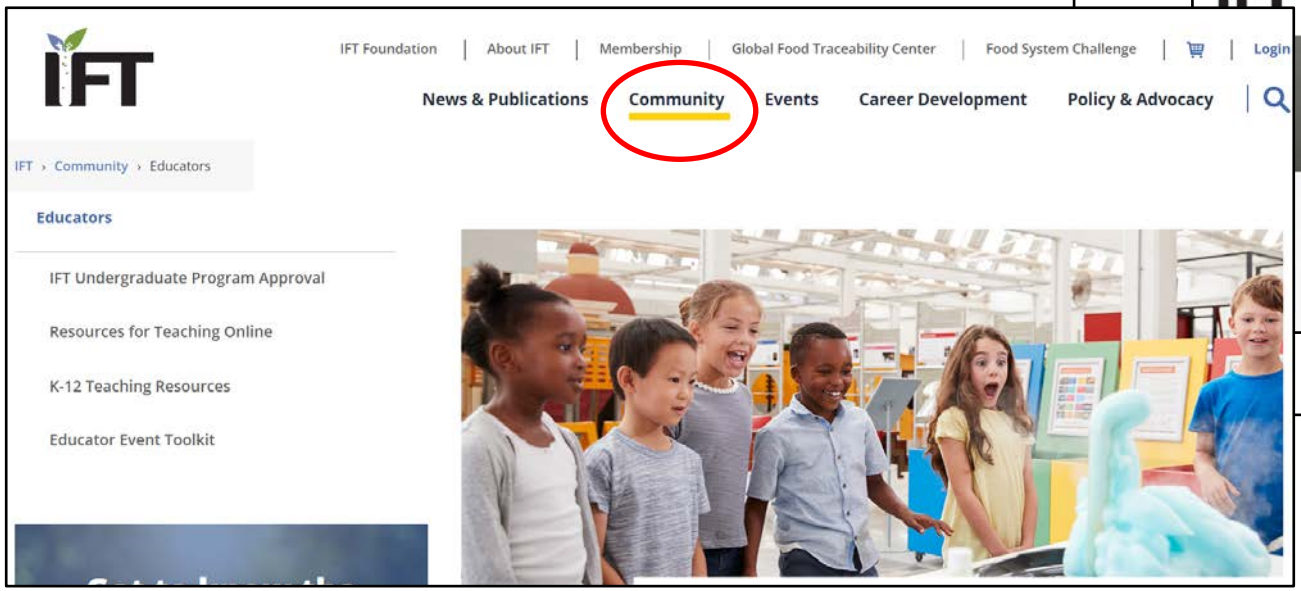
IFT: Institute of Food Technologist

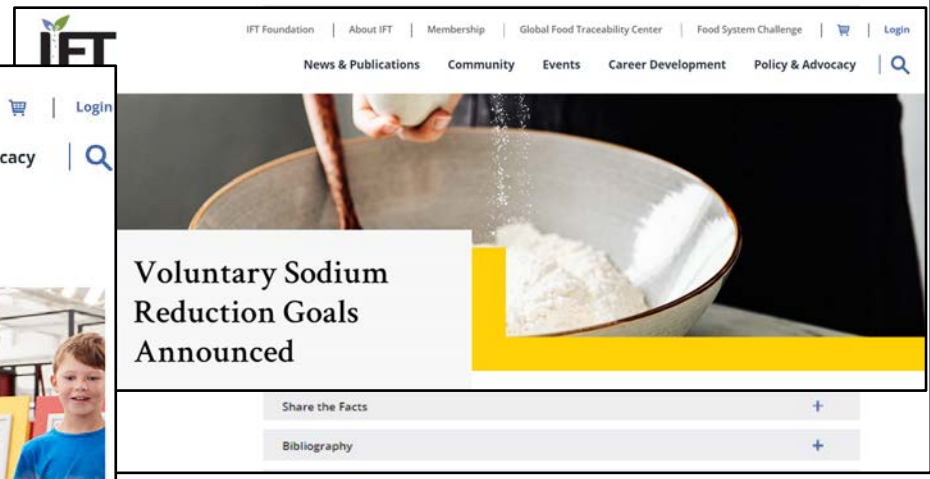
https://www.ift.org/

- The IFT is the professional organization for food industry professionals.
- The group communicates all things the food industry needs to know – changes, laws, improvements, new technologies, research, consumer trends and more!

For Educators!

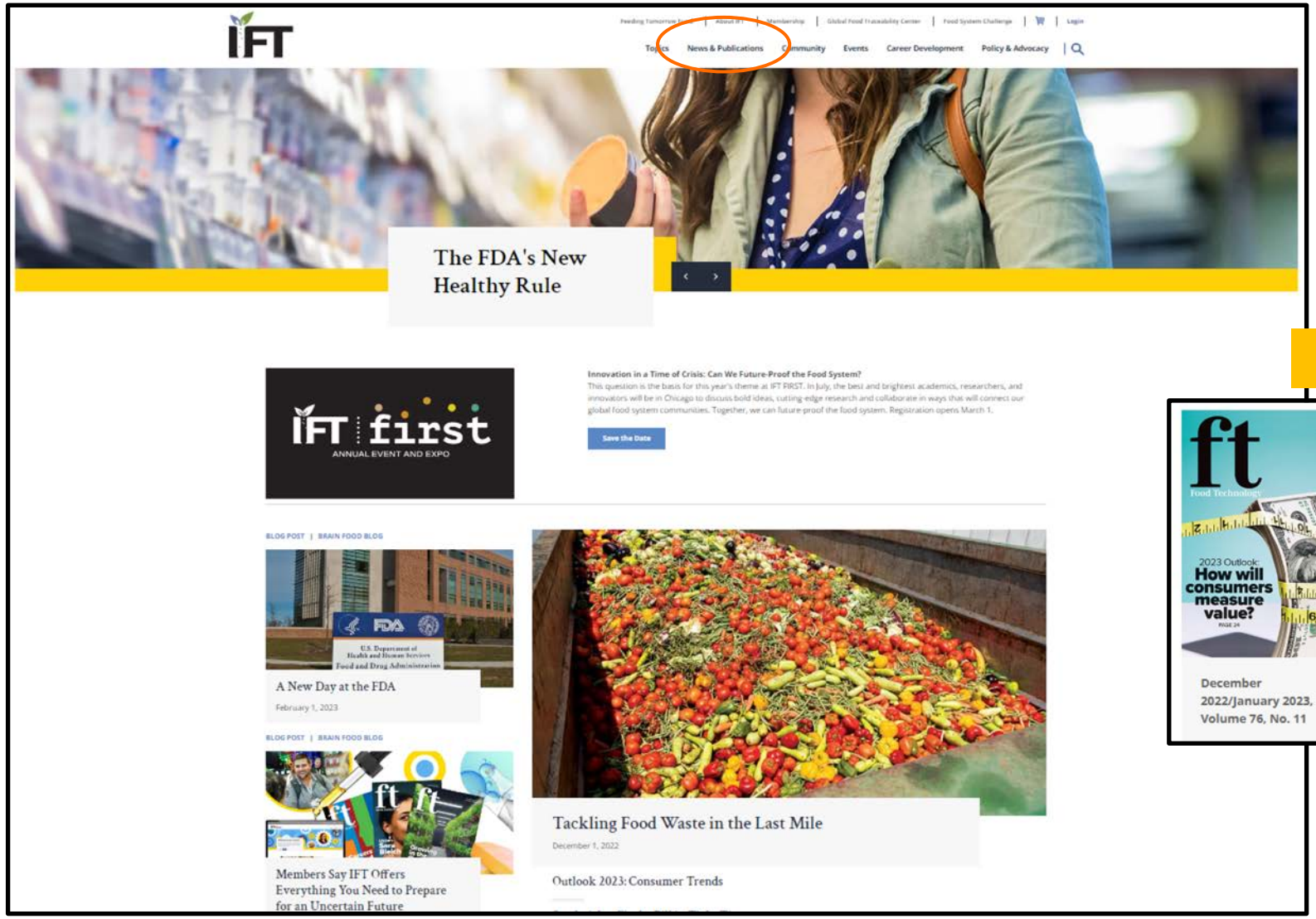


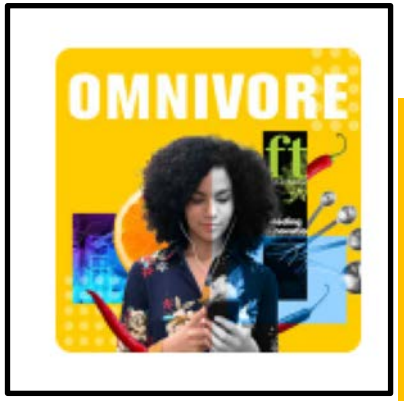




IFT: Institute of Food Technologist

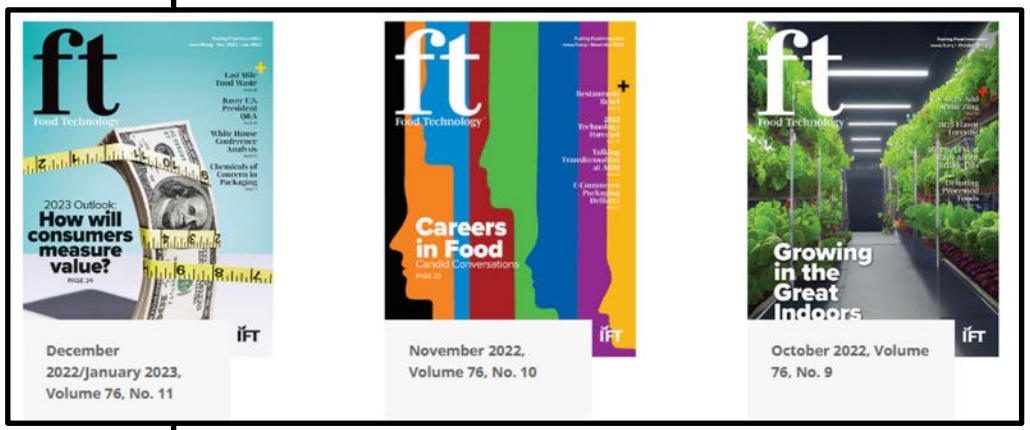
https://www.ift.org/news-and-publications/podcasts/omnivore





PODCAST:
Salary/Career Trends, Sandwiches on the menu, Food Waste, Sensory, Pet food, etc

FOOD TECHNOLOGY MAGAZINE:



Ag Explorer

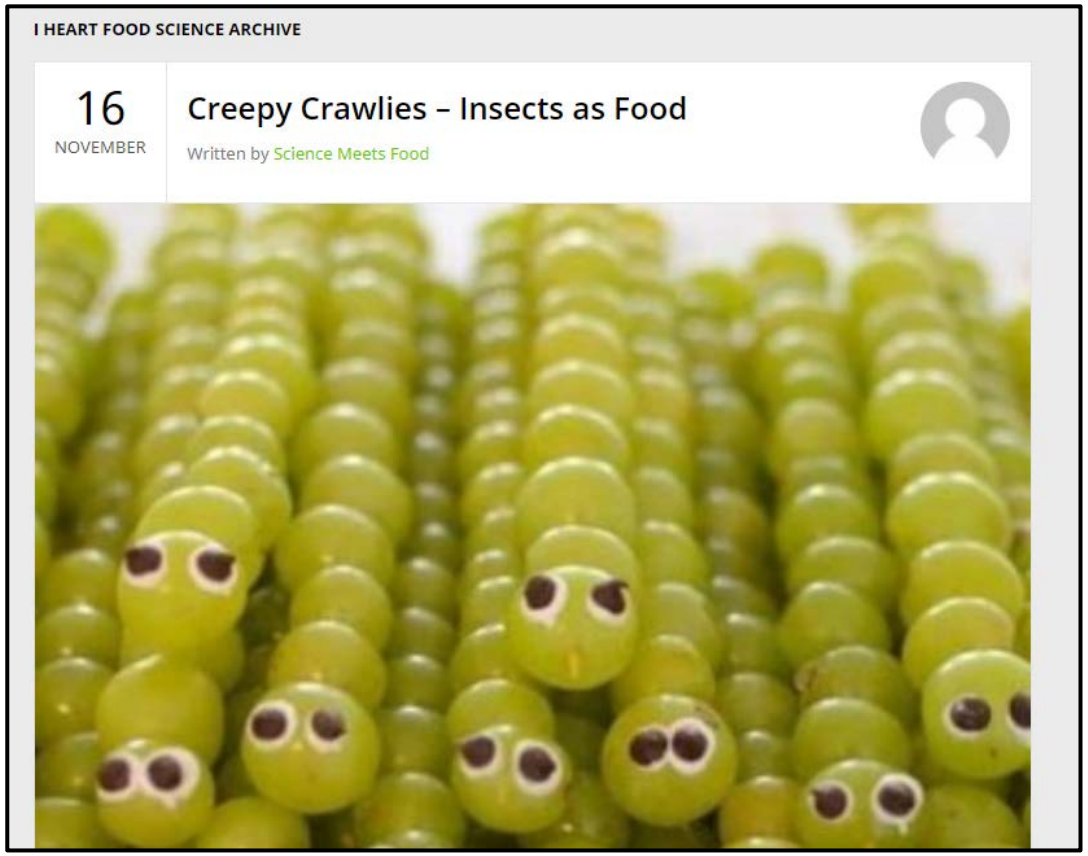
https://www.agexplorer.com/

- Virtual Field Trips
  - Current videos on interesting companies
- Career Finder
  - Descriptions about 100's of careers in the various areas of business

Science Meets Food-Blog

http://sciencemeetsfood.org/

Institute Food Technology Student Association



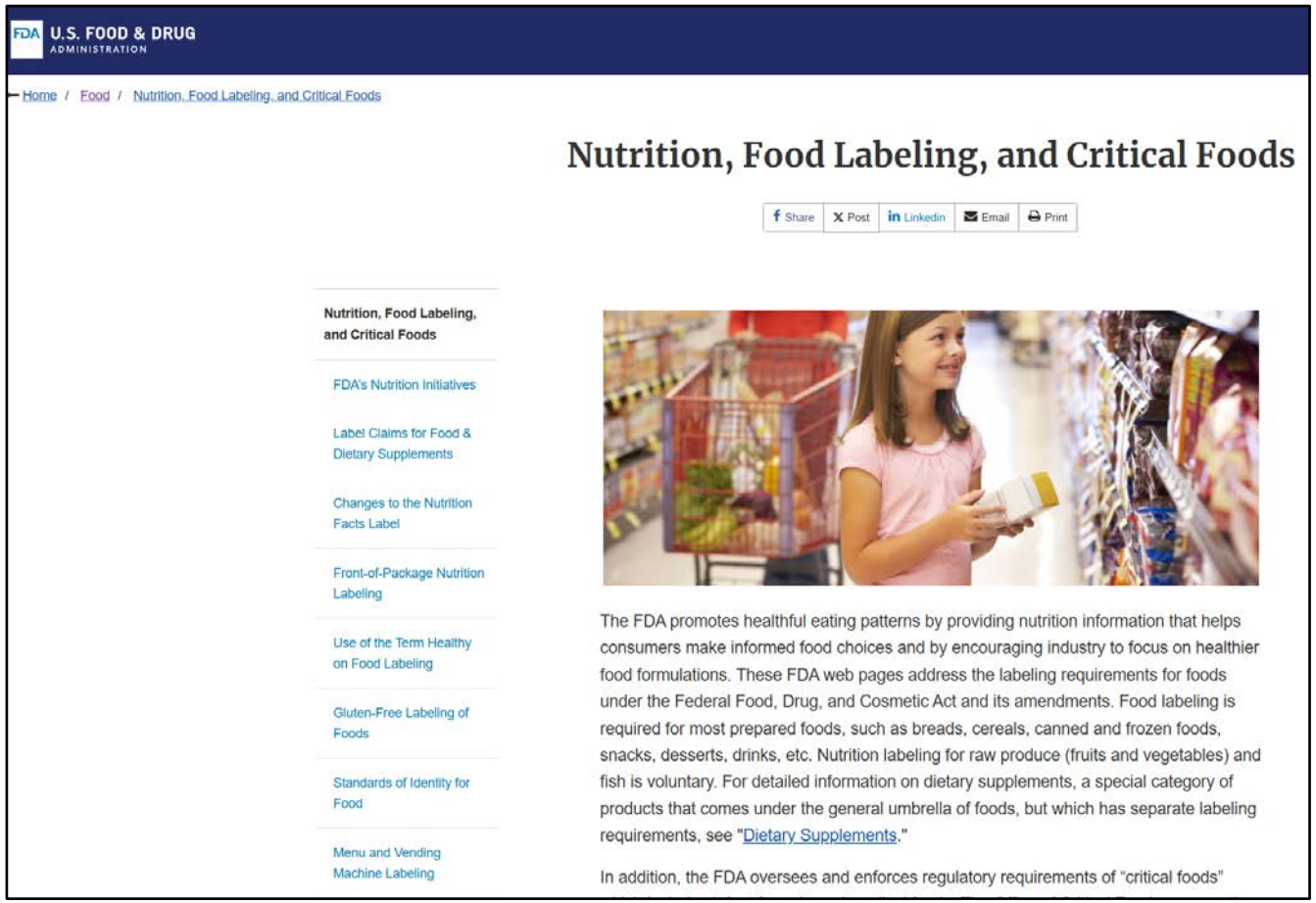
FDA resource – Food Additives

https://www.fda.gov/Food/IngredientsPackagingLabeling/ucm115326.htm

Types of Ingredients	What They Do	Examples of Uses	Names Found on Product Labels
Emulsifiers	Allow smooth mixing of ingredients, prevent separation Keep emulsified products stable, reduce stickiness, control crystallization, keep ingredients dispersed, and to help products dissolve more easily	Salad dressings, peanut butter, chocolate, margarine, frozen desserts	Soy lecithin, mono- and diglycerides, egg yolks, polysorbates, sorbitan monostearate
Stabilizers and Thickeners, Binders, Texturizers	Produce uniform texture, improve "mouth-feel"	Frozen desserts, dairy products, cakes, pudding and gelatin mixes, dressings, jams and jellies, sauces	Gelatin, pectin, guar gum, carrageenan, xanthan gum, whey
pH Control Agents and acidulants	Control acidity and alkalinity, prevent spoilage	Beverages, frozen desserts, chocolate, low acid canned foods, baking powder	Lactic acid, citric acid, ammonium hydroxide, sodium carbonate
Leavening Agents	Promote rising of baked goods	Breads and other baked goods	Baking soda, monocalcium phosphate, calcium carbonate
Anti-caking agents	Keep powdered foods free-flowing, prevent moisture absorption	Salt, baking powder, confectioner's sugar	Calcium silicate, iron ammonium citrate, silicon dioxide
Humectants	Retain moisture	Shredded coconut, marshmallows, soft candies, confections	Glycerin, sorbitol
Yeast Nutrients	Promote growth of yeast	Breads and other baked goods	Calcium sulfate, ammonium phosphate
Dough Strengtheners and Conditioners	Produce more stable dough	Breads and other baked goods	Ammonium sulfate, azodicarbonamide, L-cysteine
Firming Agents	Maintain crispness and firmness	Processed fruits and vegetables	Calcium chloride, calcium lactate
Enzyme Preparations	Modify proteins, polysaccharides and fats	Cheese, dairy products, meat	Enzymes, lactase, papain, rennet, chymosin
Gases	Serve as propellant, aerate, or create carbonation	Oil cooking spray, whipped cream, carbonated beverages	Carbon dioxide, nitrous oxide

FDA resource – Food Additives

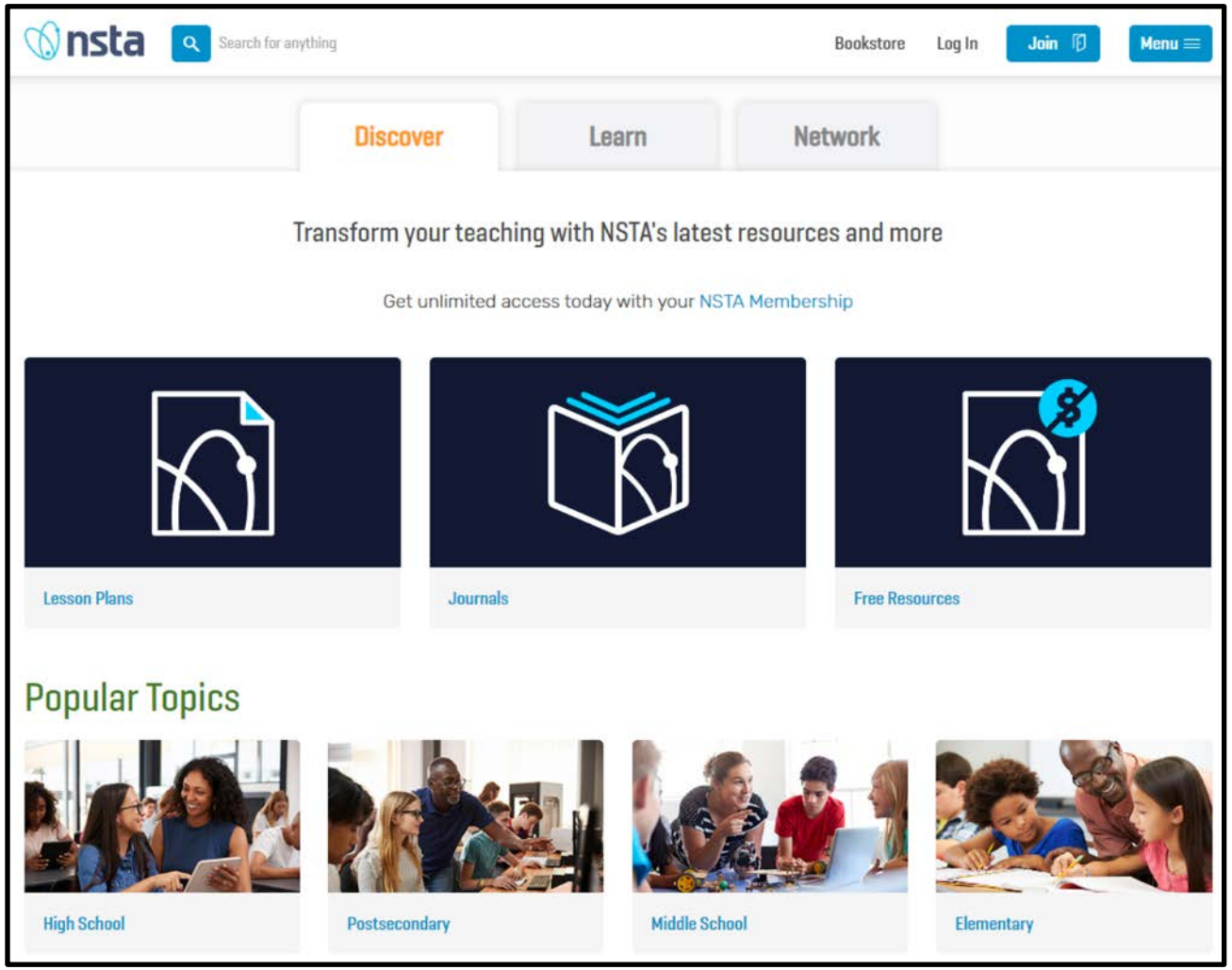
https://www.fda.gov/food/nutrition-food-labeling-and-critical-foods

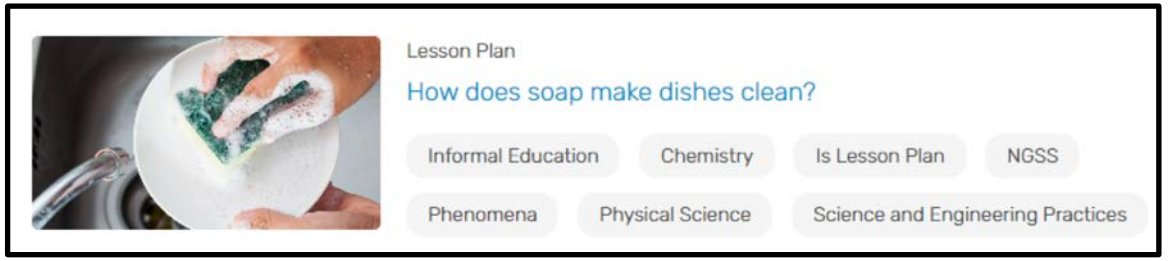


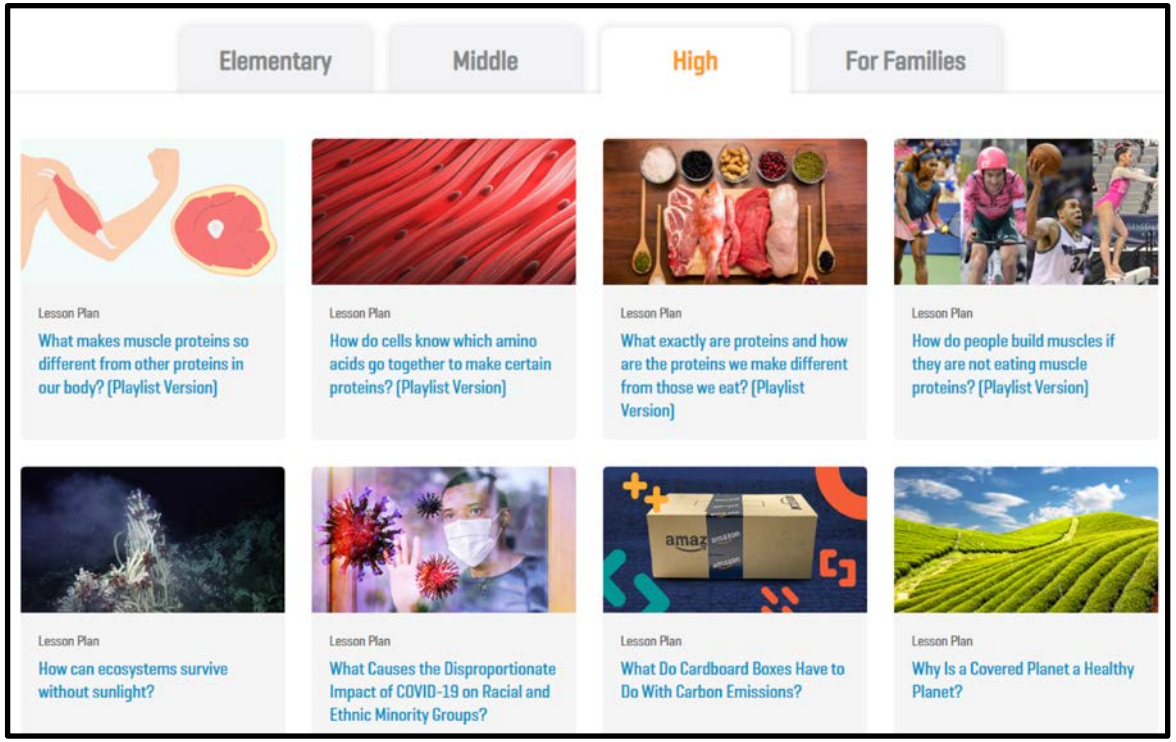
- FDA has a few older, but still appropriate **labs** (Nutrition)
- **Food Additives** (Food Science)
- **Food Allergies** (Food Science, Culinary Arts, Health)
- **Standards of Identity**

National Science Teachers Assn.

http://www.nsta.org/conferences/fda.aspx

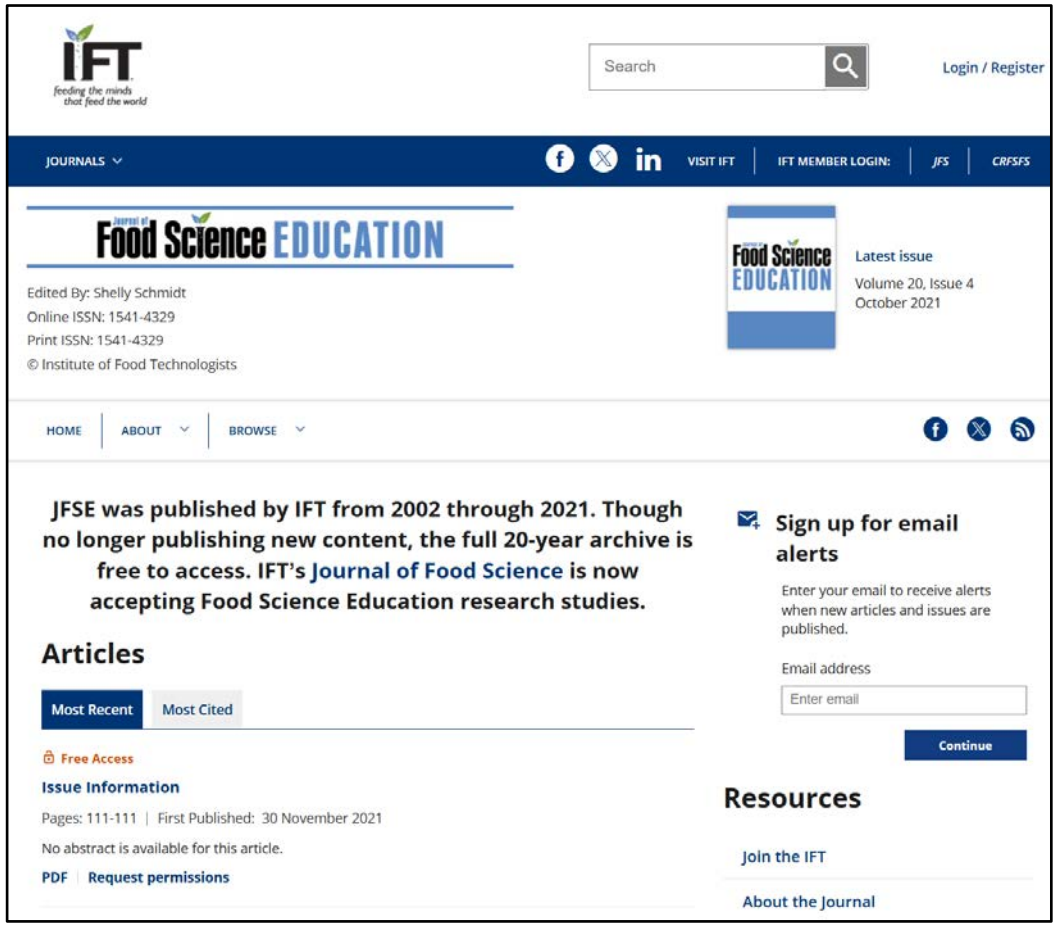






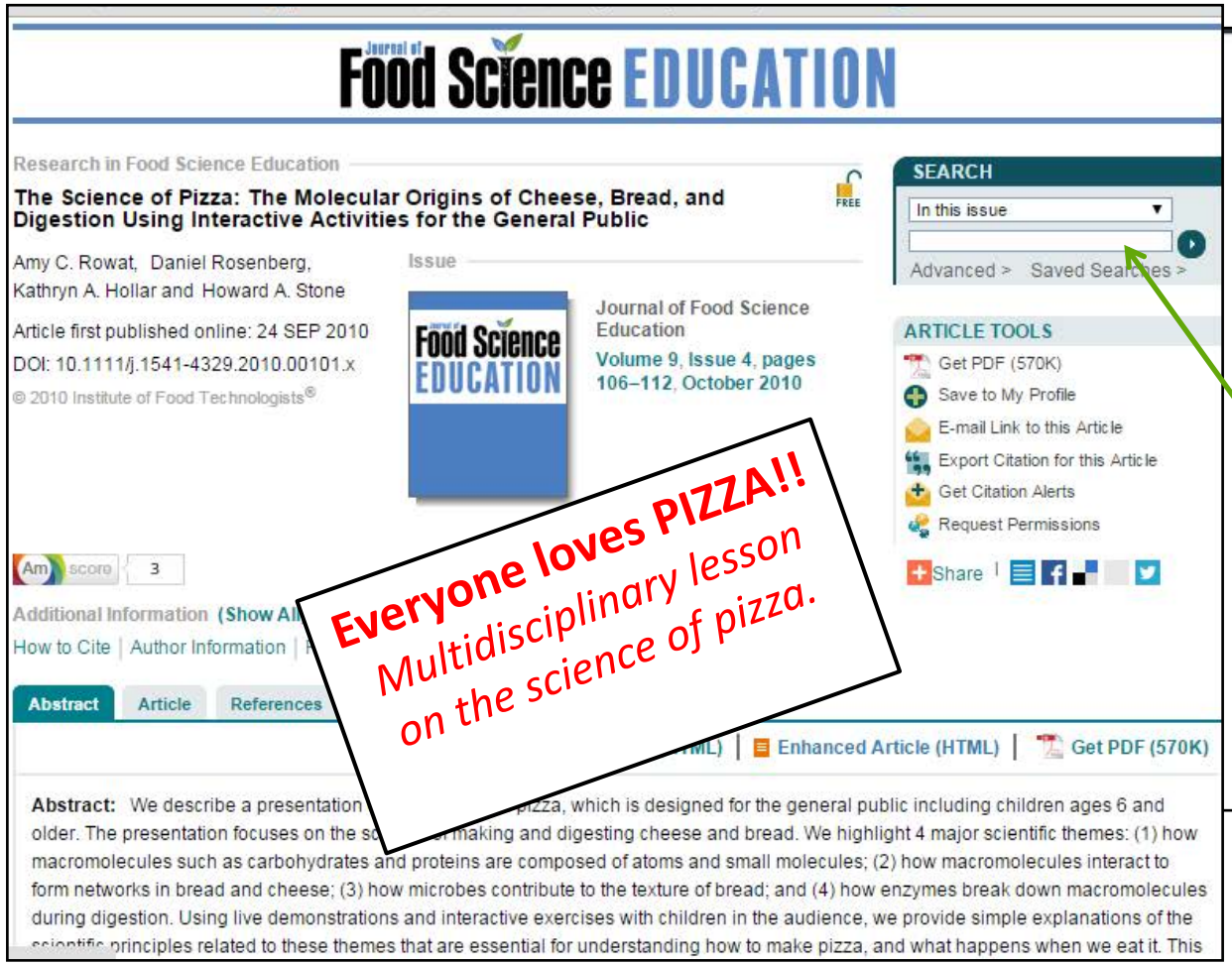
Journals for Food Science Education

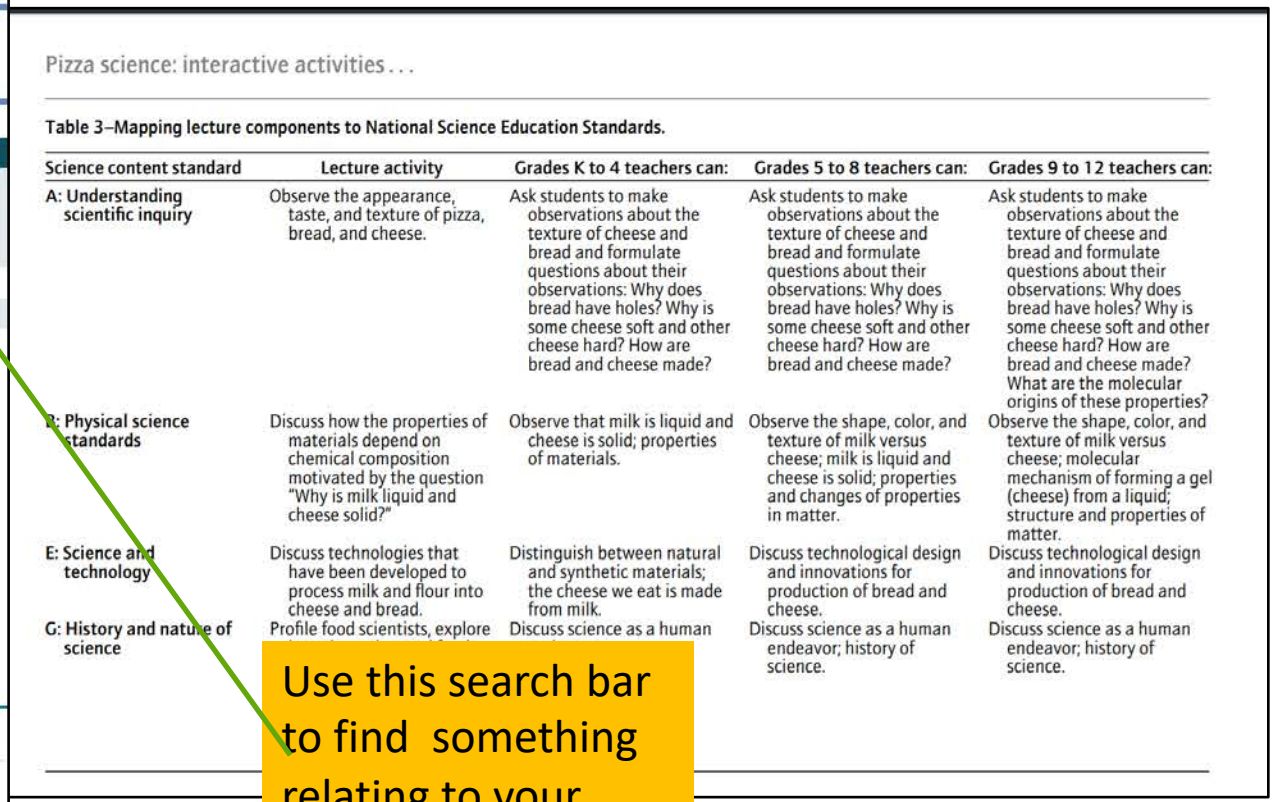
https://ift.onlinelibrary.wiley.com/



IFT: Journal of Food Science Education

http://www.ift.org/knowledge-center/read-ift-publications/journal-of-food-science-education.aspx





Pizza science: interactive activities . . .

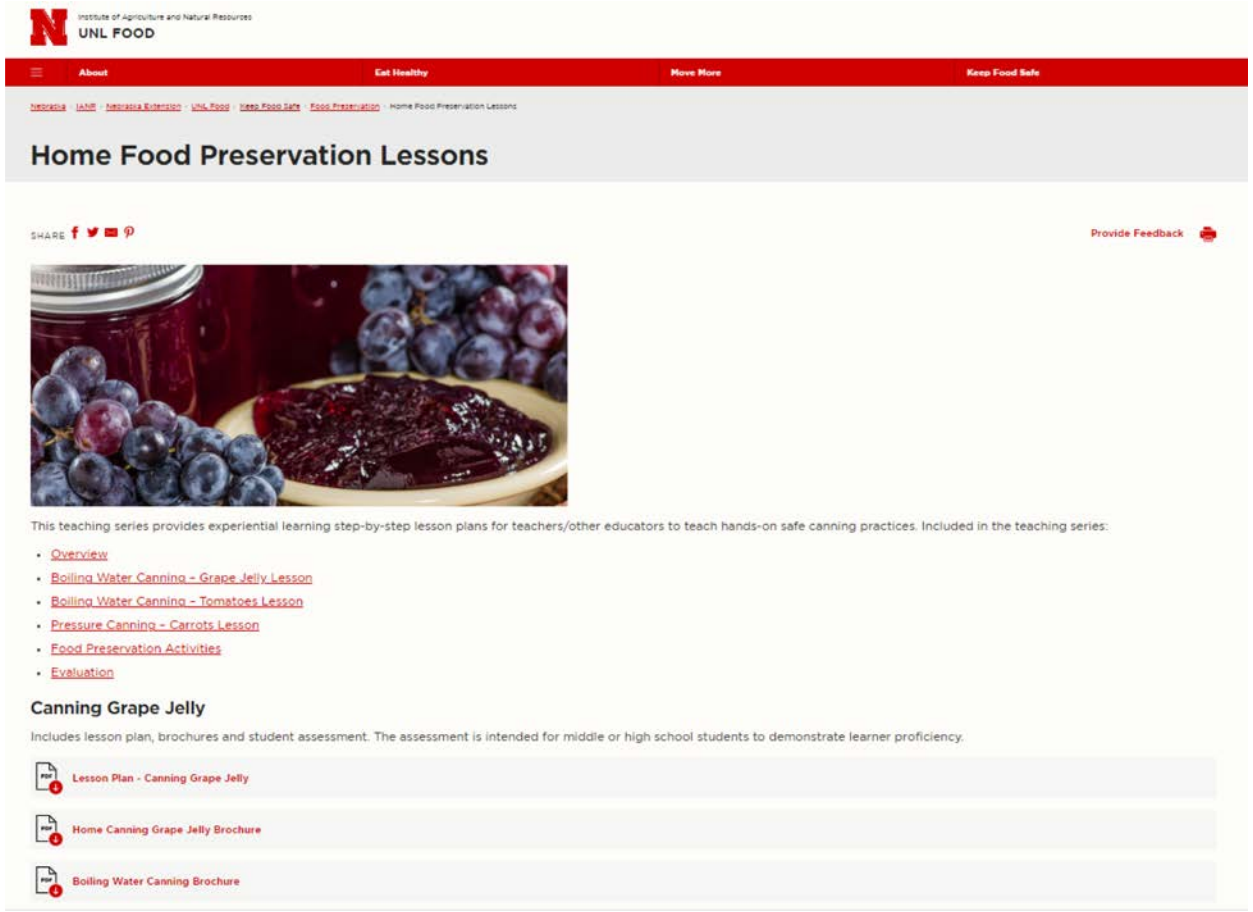
Table 3–Mapping lecture components to National Science Education Standards.

Science content standard	Lecture activity	Grades K to 4 teachers can:	Grades 5 to 8 teachers can:	Grades 9 to 12 teachers can:
A: Understanding scientific inquiry	Observe the appearance, taste, and texture of pizza, bread, and cheese.	Ask students to make observations about the texture of cheese and bread and formulate questions about their observations: Why does bread have holes? Why is some cheese soft and other cheese hard? How are bread and cheese made?	Ask students to make observations about the texture of cheese and bread and formulate questions about their observations: Why does bread have holes? Why is some cheese soft and other cheese hard? How are bread and cheese made?	Ask students to make observations about the texture of cheese and bread and formulate questions about their observations: Why does bread have holes? Why is some cheese soft and other cheese hard? How are bread and cheese made? What are the molecular origins of these properties?
B: Physical science standards	Discuss how the properties of materials depend on chemical composition motivated by the question "Why is milk liquid and cheese solid?"	Observe that milk is liquid and cheese is solid; properties of materials.	Observe the shape, color, and texture of milk versus cheese; milk is liquid and cheese is solid; properties and changes of properties in matter.	Observe the shape, color, and texture of milk versus cheese; molecular mechanism of forming a gel (cheese) from a liquid; structure and properties of matter.
E: Science and technology	Discuss technologies that have been developed to process milk and flour into cheese and bread.	Distinguish between natural and synthetic materials; the cheese we eat is made from milk.	Discuss technological design and innovations for production of bread and cheese.	Discuss technological design and innovations for production of bread and cheese.
G: History and nature of science	Profile food scientists, explore	Discuss science as a human	Discuss science as a human endeavor; history of science.	Discuss science as a human endeavor; history of science.

Use this search bar to find something relating to your classroom topics!

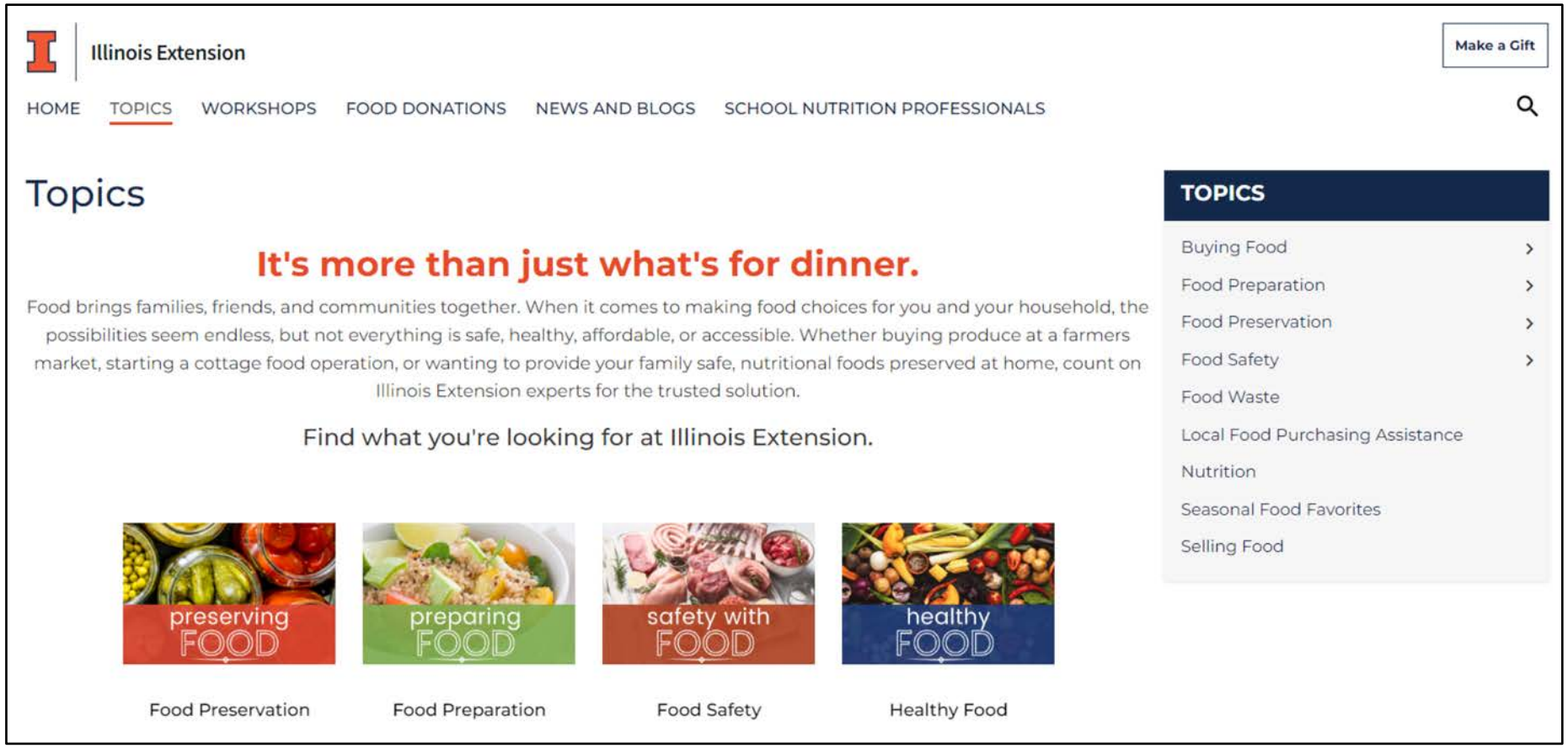
Univ. of Nebraska Lincoln –
Food Science Labs

1. **Food Innovation Center Virtual Tour** - https://innovate.unl.edu/food-innovation-center
2. **Food Safety** - https://food.unl.edu/food-safety
3. **Food Safety Lunch hour videos** - https://nemep.unl.edu/food-safety-lunch-hour
4. **Game Based Learning about Genetic Engineering & Biotechnology** https://growable.unl.edu/tags/hs-ets1-3
5. **Home Food Preservation Lab** - https://food.unl.edu/home-food-preservation-lessons



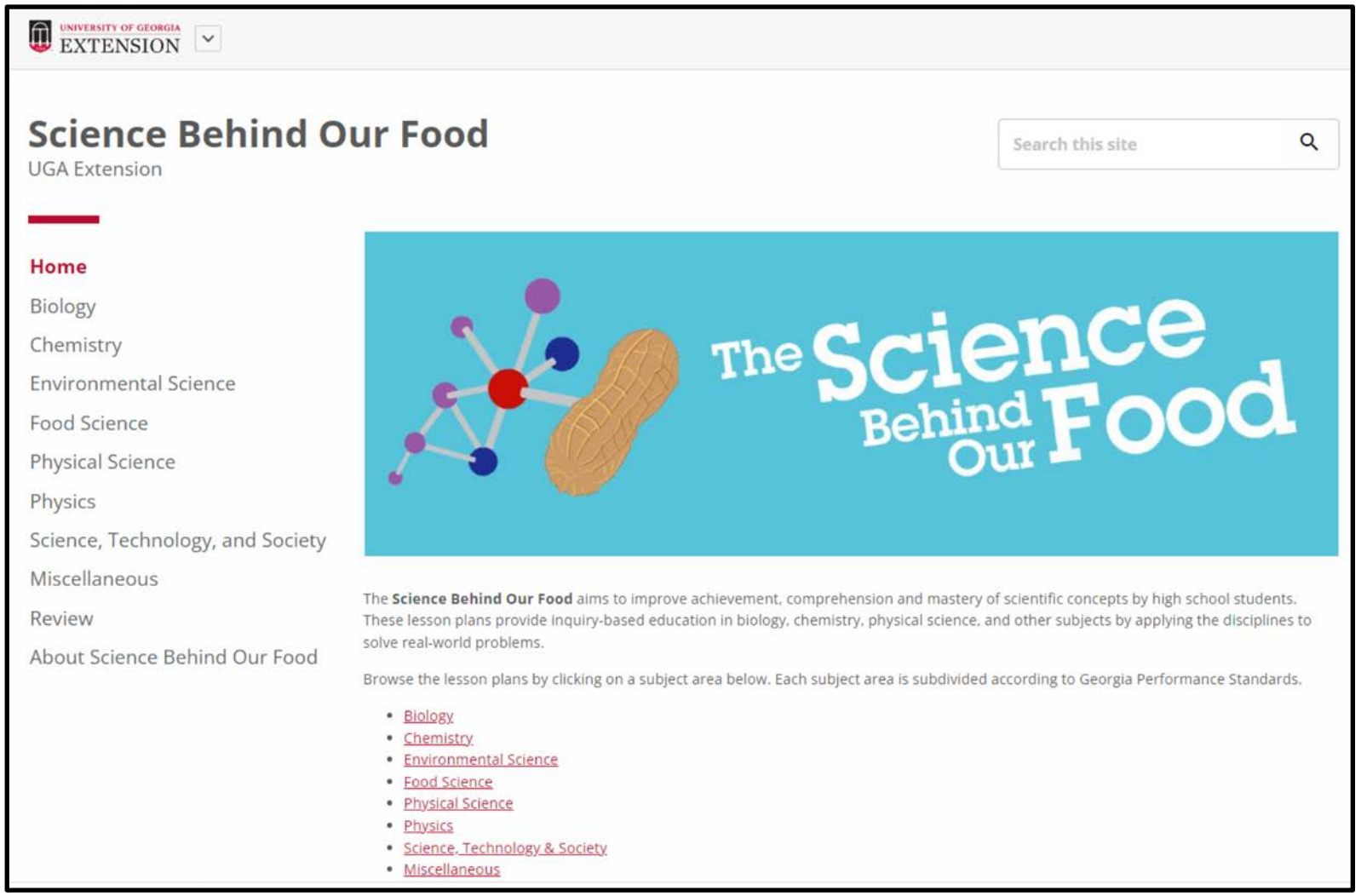
University of Illinois – Food related Labs

1. Food Safety - https://extension.illinois.edu/food



University of Georgia – Science of Food

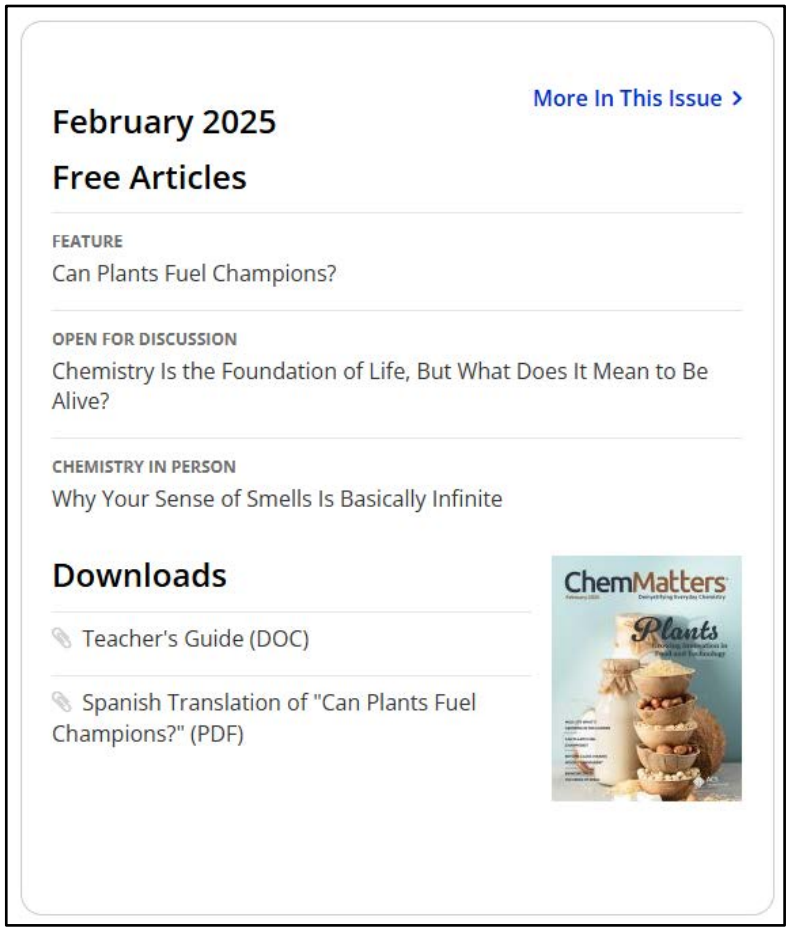
http://extension.uga.edu/programs-services/science-behind-our-food.html

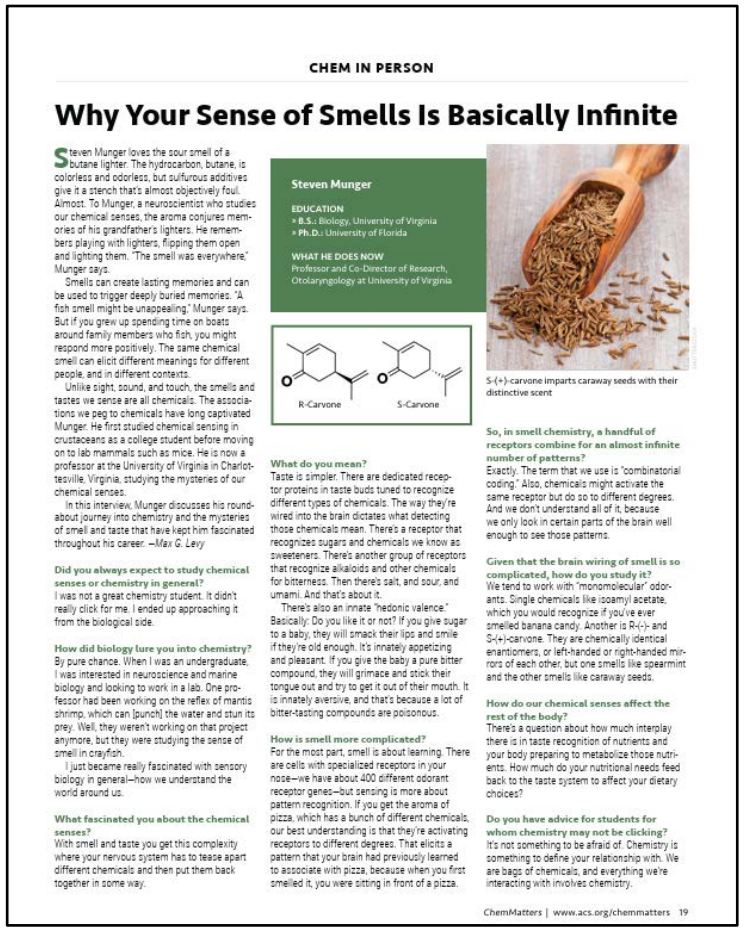


UNIVERSITY OF GEORGIA
EXTENSION

American Chemical Society-ChemMatters

http://www.acs.org/content/acs/en/education/resources/highschool/chemmatters.html




CHEM IN PERSON

Why Your Sense of Smells Is Basically Infinite

Steven Munger loves the sour smell of a butane lighter. The hydrocarbon, butane, is colorless and odorless, but sulfurous additives give it a stench that's almost objectively foul. Almost. To Munger, a neuroscientist who studies our chemical senses, the aroma conjures memories of his grandfather's lighters. He remembers playing with lighters, flipping them open and lighting them. "The smell was everywhere," Munger says.

Smells can create lasting memories and can be used to trigger deeply buried memories. "A fish smell might be unappealing," Munger says. But if you grew up spending time on boats around family members who fish, you might respond more positively. The same chemical smell can elicit different meanings for different people, and in different contexts.

Unlike sight, sound, and touch, the smells and tastes we sense are all chemicals. The associations we peg to chemicals have long captivated Munger. He first studied chemical sensing in crustaceans as a college student before moving on to lab mammals such as mice. He is now a professor at the University of Virginia in Charlottesville, Virginia, studying the mysteries of our chemical senses.

In this interview, Munger discusses his roundabout journey into chemistry and the mysteries of smell and taste that have kept him fascinated throughout his career. —*Max G. Levy*

Steven Munger

EDUCATION
- **B.S.:** Biology, University of Virginia
- **Ph.D.:** University of Florida

WHAT HE DOES NOW
Professor and Co-Director of Research, Otolaryngology at University of Virginia

R-Carvone S-Carvone

S-(+)-carvone imparts caraway seeds with their distinctive scent

Did you always expect to study chemical senses or chemistry in general?
I was not a great chemistry student. It didn't really click for me. I ended up approaching it from the biological side.

How did biology lure you into chemistry?
By pure chance. When I was an undergraduate, I was interested in neuroscience and marine biology and looking to work in a lab. One professor had been working on the reflex of mantis shrimp, which can [punch] the water and stun its prey. Well, they weren't working on that project anymore, but they were studying the sense of smell in crayfish.

I just became really fascinated with sensory biology in general—how we understand the world around us.

What fascinated you about the chemical senses?
With smell and taste you get this complexity where your nervous system has to tease apart different chemicals and then put them back together in some way.

What do you mean?
Taste is simpler. There are dedicated receptor proteins in taste buds tuned to recognize different types of chemicals. The way they're wired into the brain dictates what detecting those chemicals mean. There's a receptor that recognizes sugars and chemicals we know as sweeteners. There's another group of receptors that recognize alkaloids and other chemicals for bitterness. Then there's salt, and sour, and umami. And that's about it.

There's also an innate "hedonic valence." Basically: Do you like it or not? If you give sugar to a baby, they will smack their lips and smile if they're old enough. It's innately appetizing and pleasant. If you give the baby a pure bitter compound, they will grimace and stick their tongue out and try to get it out of their mouth. It is innately aversive, and that's because a lot of bitter-tasting compounds are poisonous.

How is smell more complicated?
For the most part, smell is about learning. There are cells with specialized receptors in your nose—we have about 400 different odorant receptor genes—but sensing is more about pattern recognition. If you get the aroma of pizza, which has a bunch of different chemicals, our best understanding is that they're activating receptors to different degrees. That elicits a pattern that your brain had previously learned to associate with pizza, because when you first smelled it, you were sitting in front of a pizza.

So, in smell chemistry, a handful of receptors combine for an almost infinite number of patterns?
Exactly. The term that we use is "combinatorial coding." Also, chemicals might activate the same receptor but do so to different degrees. And we don't understand all of it, because we only look in certain parts of the brain well enough to see those patterns.

Given that the brain wiring of smell is so complicated, how do you study it?
We tend to work with "monomolecular" odorants. Single chemicals like isoamyl acetate, which you would recognize if you've ever smelled banana candy. Another is R-(-)- and S-(+)-carvone. They are chemically identical enantiomers, or left-handed or right-handed mirrors of each other, but one smells like spearmint and the other smells like caraway seeds.

How do our chemical senses affect the rest of the body?
There's a question about how much interplay there is in taste recognition of nutrients and your body preparing to metabolize those nutrients. How much do your nutritional needs feed back to the taste system to affect your dietary choices?

Do you have advice for students for whom chemistry may not be clicking?
It's not something to be afraid of. Chemistry is something to define your relationship with. We are bags of chemicals, and everything we're interacting with involves chemistry.

ChemMatters has a lot of information on-line, full lessons with videos, activities, etc. across a wide range of food & non-food topics.

It's a GREAT Resource!!

ACS: Food & Cooking Chemistry

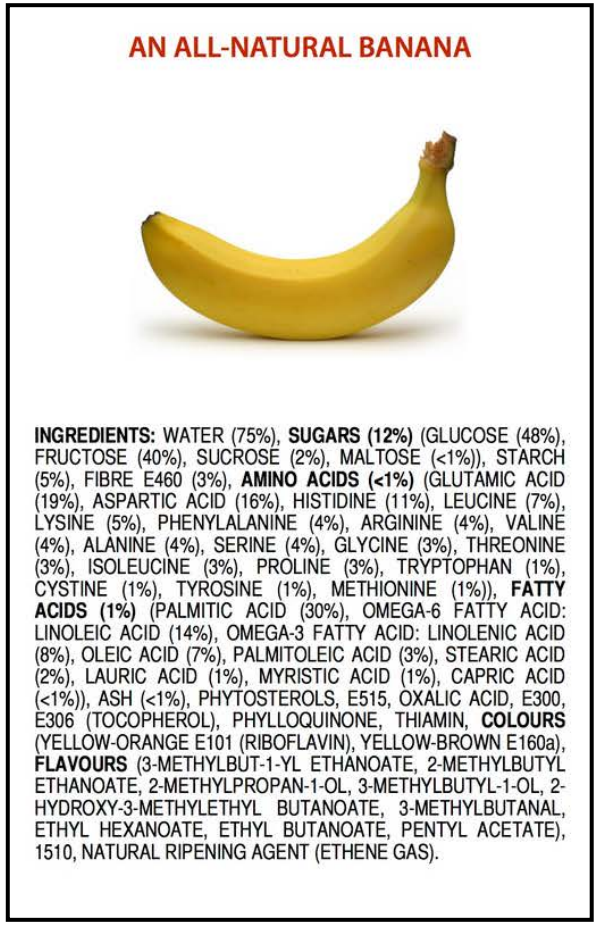
https://www.acs.org/content/acs/en/education/students/highschool/chemistryclubs/activities/food-and-chemistry.html

From ACS.org, the pathway to get to the ChemClub activities.

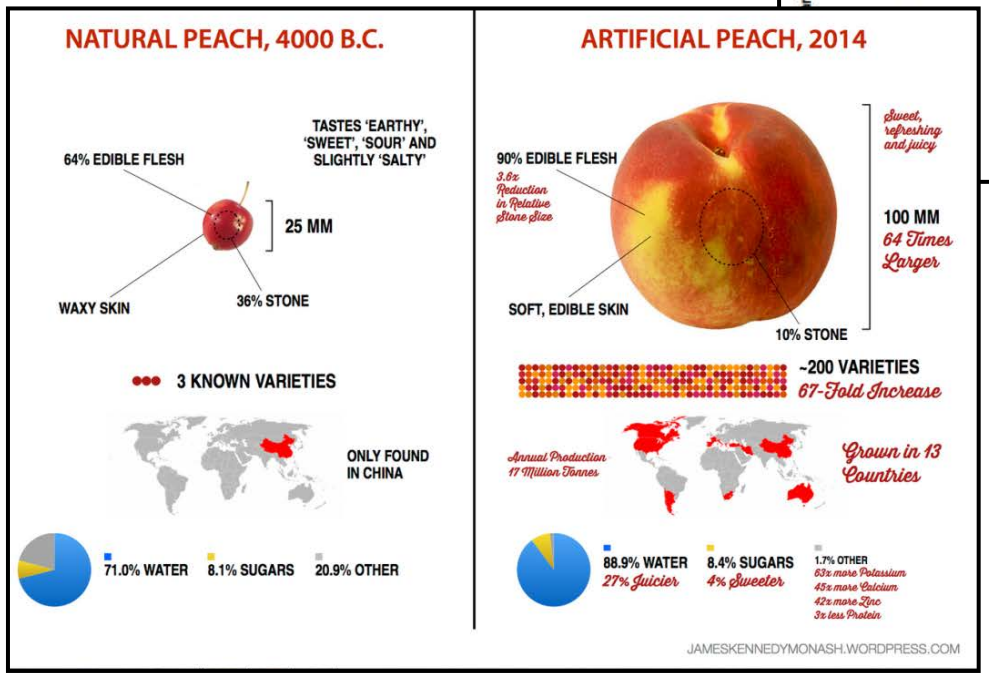
James Kennedy Blog

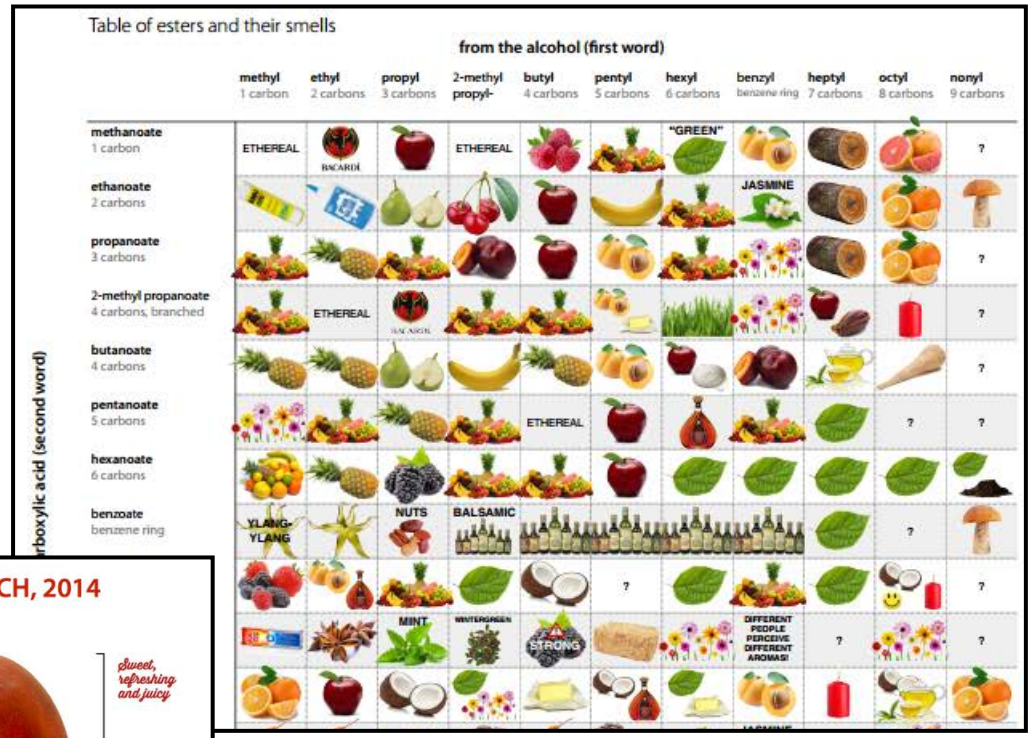
https://jameskennedymonash.wordpress.com/

Chemistry Teacher Australia



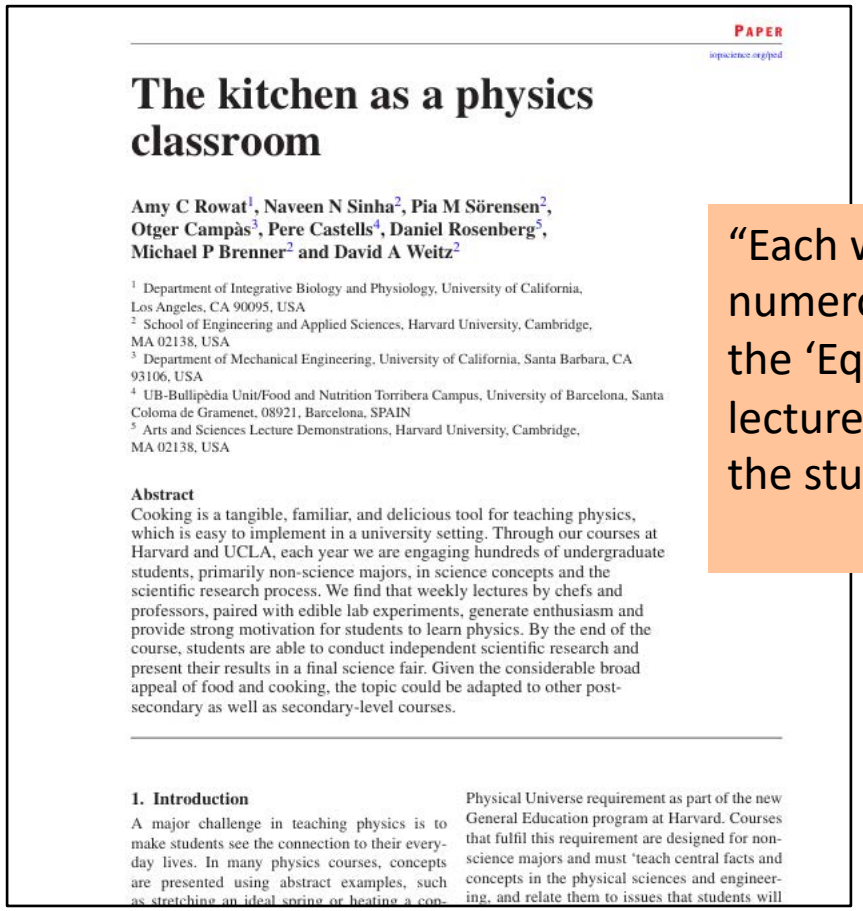
- Infographics
- Chemophobia
- Natural vs. Artificial
- Chemistry of everything!





The Kitchen as a Physics Lab!

https://legacy.ibp.ucla.edu/research/rowat/Publications_files/Rowat.Phys.Edu.2014.pdf



PAPER

iopscience.org/ped

The kitchen as a physics classroom

Amy C Rowat[1], Naveen N Sinha[2], Pia M Sörensen[2], Otger Campàs[3], Pere Castells[4], Daniel Rosenberg[5], Michael P Brenner[2] and David A Weitz[2]

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[2] School of Engineering and Applied Sciences, Harvard University, Cambridge, MA 02138, USA
[3] Department of Mechanical Engineering, University of California, Santa Barbara, CA 93106, USA
[4] UB-Bullipèdia Unit/Food and Nutrition Torribera Campus, University of Barcelona, Santa Coloma de Gramenet, 08921, Barcelona, SPAIN
[5] Arts and Sciences Lecture Demonstrations, Harvard University, Cambridge, MA 02138, USA

Abstract

Cooking is a tangible, familiar, and delicious tool for teaching physics, which is easy to implement in a university setting. Through our courses at Harvard and UCLA, each year we are engaging hundreds of undergraduate students, primarily non-science majors, in science concepts and the scientific research process. We find that weekly lectures by chefs and professors, paired with edible lab experiments, generate enthusiasm and provide strong motivation for students to learn physics. By the end of the course, students are able to conduct independent scientific research and present their results in a final science fair. Given the considerable broad appeal of food and cooking, the topic could be adapted to other post-secondary as well as secondary-level courses.

1. Introduction

A major challenge in teaching physics is to make students see the connection to their everyday lives. In many physics courses, concepts are presented using abstract examples, such as stretching an ideal spring or heating a con-

Physical Universe requirement as part of the new General Education program at Harvard. Courses that fulfil this requirement are designed for non-science majors and must 'teach central facts and concepts in the physical sciences and engineering, and relate them to issues that students will

"Each week focuses on a single scientific idea that is essential to numerous culinary examples. This idea is introduced through the 'Equation of the Week' (table 1), then elaborated through lectures by professors and chefs, as well as a recipe prepared by the students during their lab section."

The Kitchen as a Physics Lab!

https://teachersinstitute.yale.edu/curriculum/units/files/20.02.02.pdf

Yale-New Haven Teachers Institute

Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
2020 Volume II: Chemistry of Food and Cooking

The Physics of Cooking: How Energy Conservation and Thermodynamics Can Improve the Lives of Millions

Curriculum Unit 20.02.02
by Nicholas Farrell

Introduction and Rationale

Introduction

Food is near and dear to every one of us. We rely on it for sustenance and health, yet the understanding of food, the energy contained within it, and how it compares to our energy requirements, is likely limited. The number of Americans cooking at home increased from 2003 to 2016, especially among men[1] , with roughly two-thirds of all calories being store-bought and consumed at home depending on income[2,3] . Reported home cooking occurs at higher rates among those of low income[1,3] . Despite this the U.S. Bureau of Labor Statistics reported in 2015 that the average household spends $3,008 per year on eating out[4] . With a U.S. adult obesity rate of 42.4% in 2017-2018[5] , whether families are eating at home or eating out, it appears that there is a lack of understanding of, or appreciation for the science of foods.

Additionally, with about 48 million cases of food poisoning each year in the United States, leading to approximately 3,000 deaths, food safety remains a concern[6] . Many of these cases result from undercooked meat, particularly chicken. On the other end, overcooking or irresponsible cooking behavior led to 48% of home fires and 21% of home fire deaths from 2012 to 2016[7] . Physics is incredible in its ability to transform the way students look upon the world. Applying a little bit of physics can help us to better understand not only energy balance in our bodies, but also heat transfer in cooking. A few simple equations and experiments can help us to think more rationally and quantitatively about food and cooking. This unit aims to help students learn about the physics of food and cooking and apply the knowledge to act more responsibly and prevent some of the cases of obesity and food poisoning.

With the newly adopted Next Generation Science Standards (NGSS) in Connecticut and the focus on real-world connections and 21st century skills, the theme of cooking can be a great way to make physics engaging for students. Studying the physics concepts of energy conservation and thermodynamics can help make a seemingly abstract and quantitative subject more relatable and accessible for students. This unit has originally been designed for 11th and 12th graders in New Haven, Connecticut. Coming from a low-income community, many of the students will have an even greater reason to engage with these topics. According to

TEACHING

Science and Cooking

Innovation in Science and Technology

HOME / TEACHING /

Science and Cooking

Professor Weitz explains how cooking and food provide neat reference points for studying a variety of physical phenomena -- from foams to supercooling and complex phase changes.

For more information, please visit: SEAS news, Harvard online course, and EDX course.

Related Publications:

- Science and Cooking Course Companion, Kindle ebook
- Rowat, A. C. ; Sinha, N. N. ; Sörensen, P. M. ; Campàs, O. ; Castells, P. ; Rosenberg, D. ; Brenner, M. P. ; Weitz, D. A. The kitchen as a physics classroom. Physics Education 2014, 49, 512

https://weitzlab.seas.harvard.edu/science-and-cooking

Food Loss & Food Waste

http://www.fao.org/save-food/resources/keyfindings/infographics

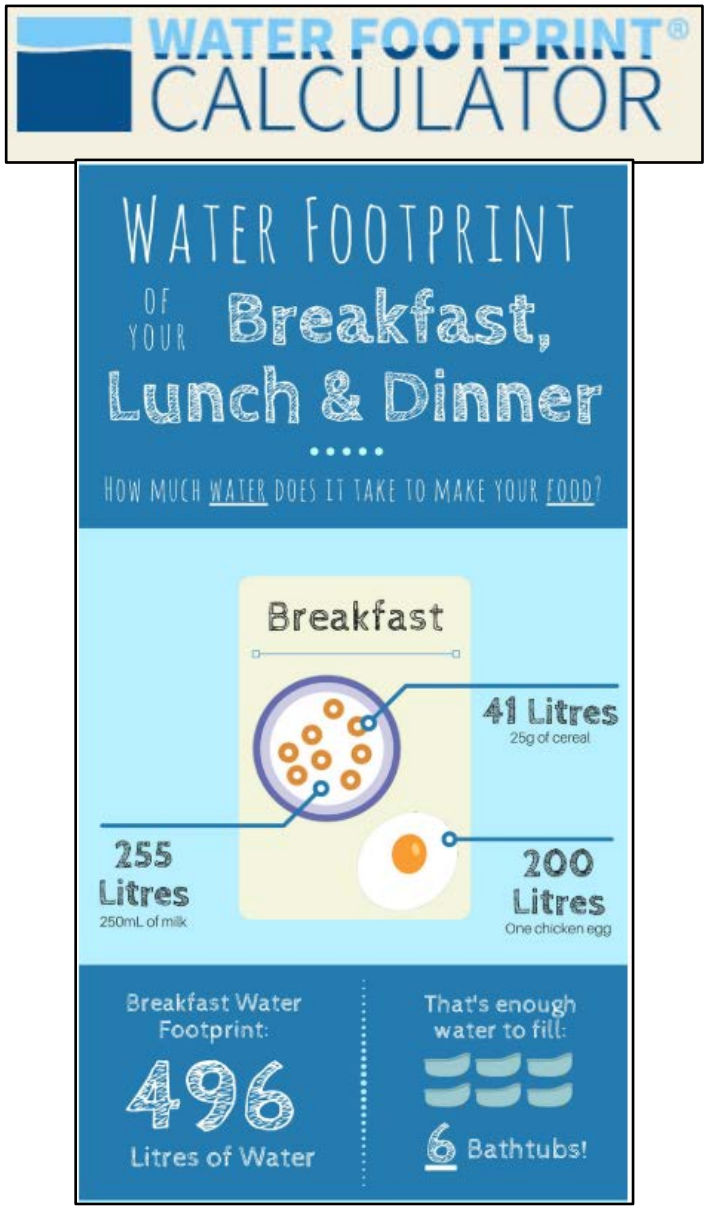
Food and Agriculture Organization of the United Nations

Global Water Issues

- Water Calculator

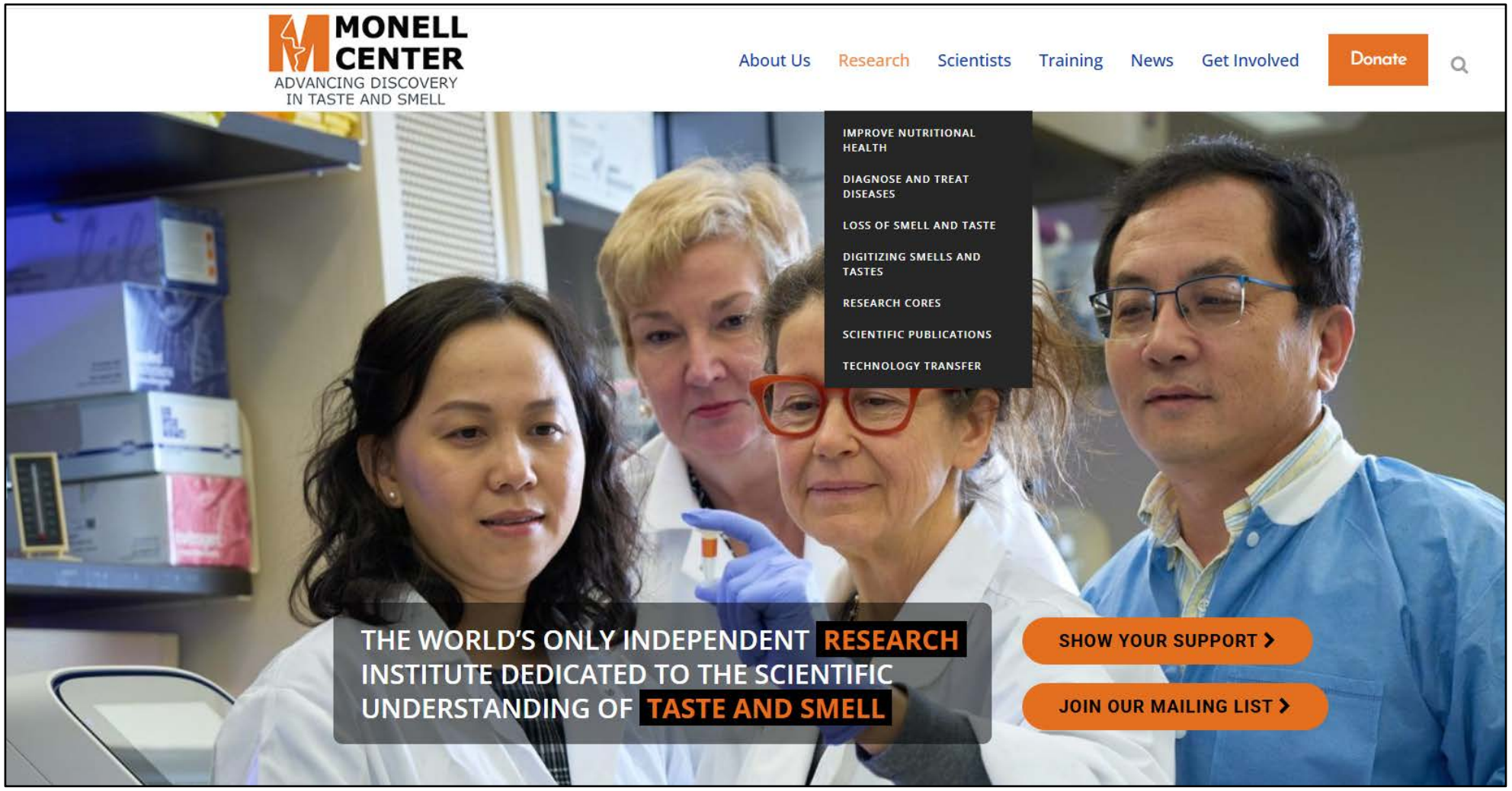
  https://www.watercalculator.org/

- Cape Town, South Africa will turn off it's Taps! https://news.nationalgeographic.com/2018/02/cape-town-running-out-of-water-drought-taps-shutoff-other-cities/
- Water Footprint, National Geographic: https://www.youtube.com/watch?v=2T_n0oi9YdY
  - 13 gal water=1 gal fuel, 30 gal water=1 glass of wine
  - Agriculture consumes about 80% water consumed.



Monell Taste & Smell Institute

https://monell.org/smellandtasteforlife/



Additional Resources

- **Alton Brown** (http://altonbrown.com)
- **FEMA Flavor & Extract Manufacturers Association** (https://www.femaflavor.org/)
- **Society of Flavor Chemists** (http://flavorchemists.com/)
- **Discovery Education & IFT** (http://school.discoveryeducation.com/foodscience/college_resources.html#careers)
- **International Food Information Council (IFIC)** offers a lot of food information related webinars https://ific.org/what-we-do-education-cpe/ (more appropriate for educators or industry professionals)
- **Research Chef's Association (RCA)** past issues of Culinology Magazine - https://www.culinology.org/education/culinology-magazine

Additional Resources

- **UK version of IFT** has some labs online for High school - https://www.ifst.org/lovefoodlovescience/resources
- **FDA** has a few older, but still appropriate labs – (Nutrition) - https://www.fda.gov/food/nutrition-food-labeling-and-critical-foods
- **Partnership for Food Safety Education** (K-12 Curriculum): https://www.fightbac.org/
- **Scientific America** – Science Buddies Experiments: https://www.scientificamerican.com/author/science-buddies/