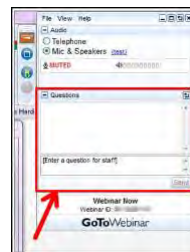




Have Questions?



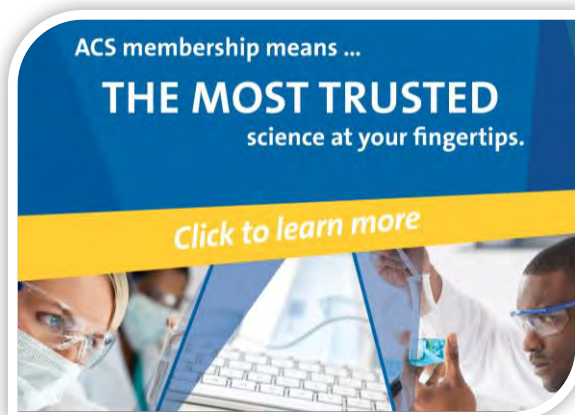
Type them into questions box!

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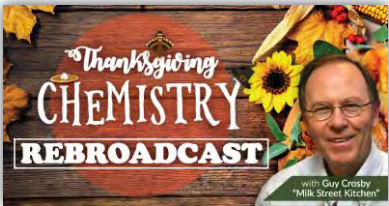


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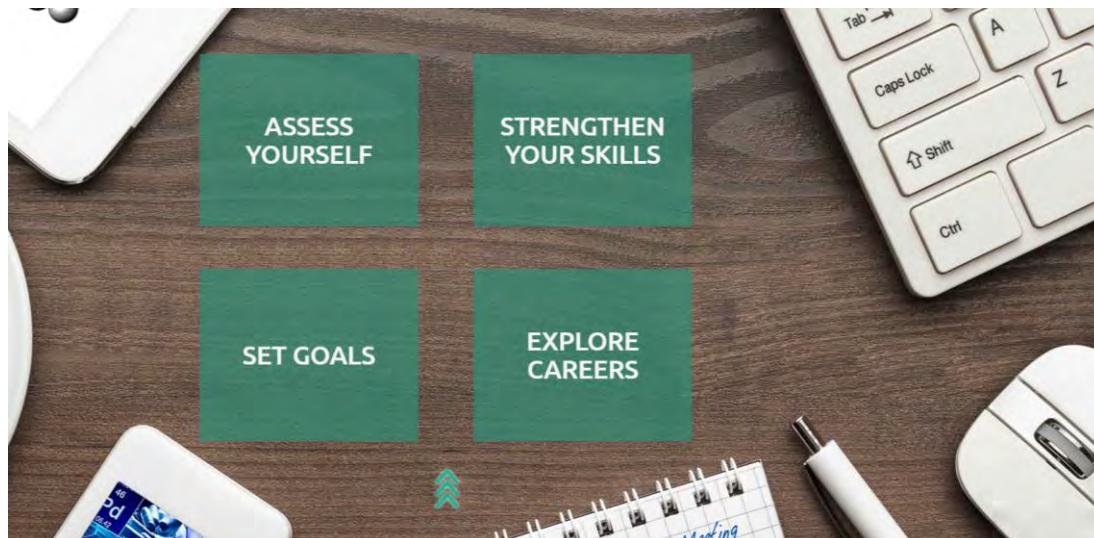


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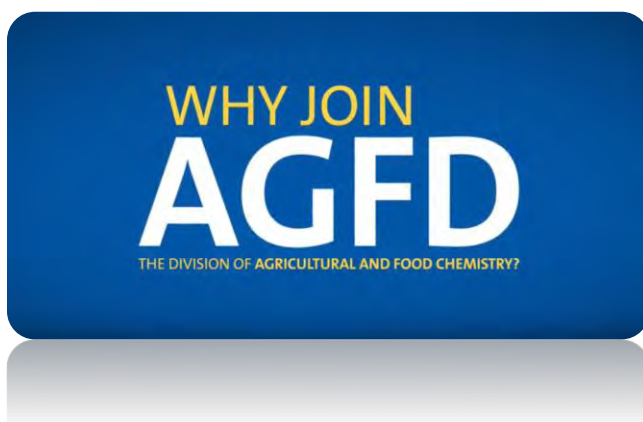
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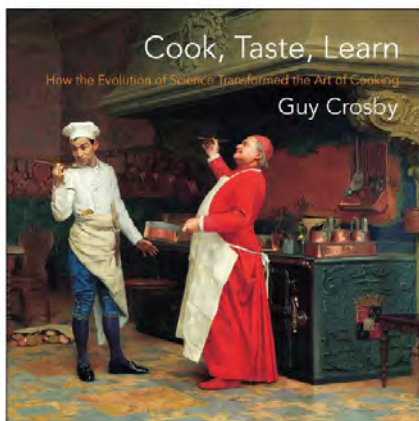
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—Richard Wrangham, author of *Catching Fire: How Cooking Made Us Human*

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**Guy Crosby**  
 Adjunct Associate Professor, Harvard  
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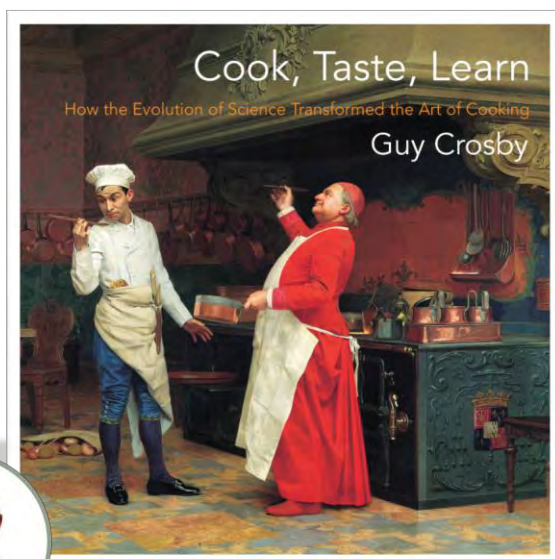
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## Only Humans Cook Their Food!



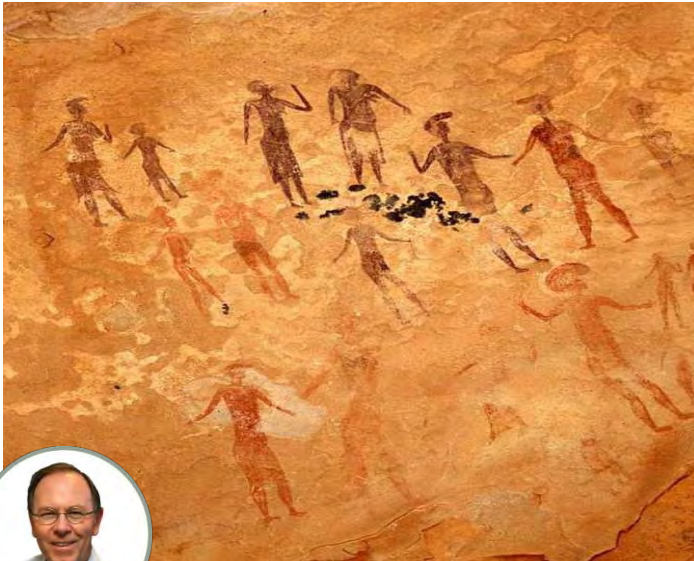
- **Richard Wrangham – Fire first used to cook food almost 2 million Years ago**

- **Cooking must have had a profound influence on the evolution of humans**





## Homo Erectus...The First Cooks



- Cooking provided more nutrients, energy, and social interaction

- Cooking Made Bigger Brains

- By 200,000 YA Human brain increased by 60%



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## The Evolution of Agriculture



- Agriculture evolved 10,000 Years ago

- Seven independent regions of the World: Nicolai Vavilov 1930s

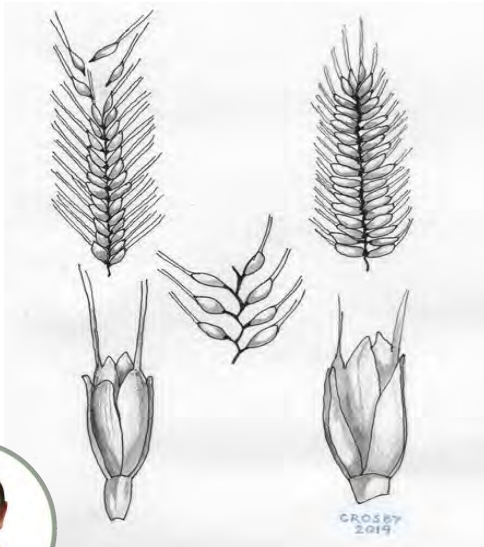
- Enough food harvested in 3 weeks to last a year



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# The Greatest Technological Advance



- **Agriculture the single greatest technological advance of all time**
- **Permanent settlements established**
- **Within 7,000 years population grew from 3 MM to 100 MM**



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## Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



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### How many basic tastes are there?

- Four
- Five
- Six
- Seven
- None of the above

*\* If your answer differs greatly from the choices above tell us in the chat!*

## Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



### ANSWER

- Four
- Five
- **Six** (Sweet, Salty, Sour, Bitter, Umami, Fat)
- Seven
- None of the above

*\* If your answer differs greatly from the choices above tell us in the chat!*

## The Art of Cooking Begins:

Clay Ovens for baking 7000 YA



Chinese clay cooking vessel 3500 YA



Akkadian Tablets 3750 YA



## Chinese Cooking Contributions



- Chinese produce Iron from iron ore 2700-2500 YA
- First cast iron wok created during Han Dynasty 2200-1800 YA
- First noodles from millet 4000 YA

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## Faux Science is King



- 2600 to 2300 YA Greek philosophers believe all matter composed of air, fire, earth, water
- Properties of matter are interchangeable
- Alchemy in search of gold is born
- Little real science discovered until 1600s



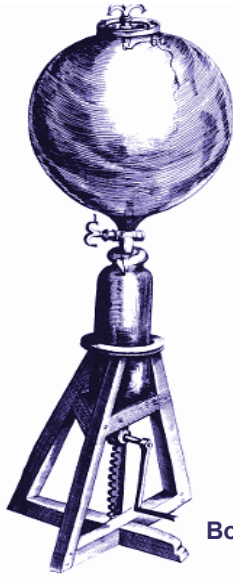
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# The Evolution of Modern Science



- **Robert Boyle Destroyed Aristotle's Concept of the Elements in 1661**
- **Boyle proved fire was a process of combustion rather than an element**
- **The evolution of modern science begins**



Boyle's vacuum pump

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## Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



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### Which method of cooking meat makes it juicier?

- Braising
- Roasting
- Either
- Neither



*\* If your answer differs greatly from the choices above tell us in the chat!*

## Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



### Which method of cooking meat makes it juicier?

Measure	Braised*	Roasted
Total cooking loss	29.6%	28.2%
Evaporation	20.0%	5.6%
Drip loss	9.6%	22.6%

*Eye of the round beef cooked to internal temperature of 158°F (70 °C) in 325°F (163 °C) oven*

*\* Braised in water*

J Food Science 39 (1974): 18-21

*\* If your answer differs greatly from the choices above tell us in the chat!*

## The Pressure Cooker is Invented



- Based on Boyle's Law, Denis Papin develops the "Pressure Cooker" in 1679

Portrait von Denis Papin, 1689



## The Law of Conservation of Matter



- Lavoisier proves Oxygen is required for combustion in 1777
- Develops The Law of Conservation of Matter
- Lavoisier tragically executed by the guillotine in 1794



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## Combustion and Heat Understood



- Until 1798 scientists believed heat was a weightless fluid substance called “caloric”
- Benjamin Thompson proved heat was a form of mechanical energy
- Combustion and heat were finally understood
- One of Thompson’s many inventions was the precursor of sous vide cooking in 1799



Benjamin Thompson painted by Gainsborough in 1783

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## The Art of Cooking and the Science of Atoms



- Atomic Theory (1805)
- John Dalton – meteorologist
- Greatest advance in science
- Understand food and cooking at the molecular level
  - *“The essence of science: ask an impertinent question and you are on the way to the pertinent answer”*
  - Jacob Bronowski (1973)



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### Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



**Which is hotter at 74°C?**

- Water
- Olive Oil
- They are the same

*\* If your answer differs greatly from the choices above tell us in the chat!*



## Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



**Water is “hotter”.** Heat capacity of water ~ 2X olive oil.  
At 74°C water contains 2x more heat energy as olive oil

*\* If your answer differs greatly from the choices above tell us in the chat!*

## The First Celebrity Chef



### Chef Marie-Antoine Carême

- “King of Chefs” creator of nouvelle cuisine, or modern French cooking in 1810s-30s
- The first ‘celebrity chef’
- His exquisite cuisine was based on science.



**Escoffier:** *“The fundamental principles of the science [of cooking], which we owe to Carême, will last as long as cooking itself.”*



## Healthy Diet Cooking



Emma Kellogg  
forges a new  
path in cooking  
science:

*How to cook  
food to provide a  
healthy diet -  
1892*



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## “The Browning Reaction”



John Edward Hodge – 1953

- USDA Chemist
- Turned the world of flavor chemistry upside down
- Maillard-Hodge Reaction



Dehydrated Foods, Chemistry of Browning Reactions in Model Systems

J. E. Hodge

© Cite this: *J. Agric. Food Chem.* 1953, 1, 15, 928-943

Publication Date: October 1, 1953

<https://doi.org/10.1021/jf60015a004>

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## Modern Instrumental Analysis



- **Modern instrumental analysis in the 20<sup>th</sup> Century makes it possible to understand food and cooking at the molecular level**
- **How are flavor and texture created?**
- **What happens to nutrients when food is cooked?**



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### Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



#### Does The Maillard-Hodge Reaction proceed faster at:

- pH 5
- pH 7
- pH 9
- pH does not affect the speed
- The speed is the same for pH 5,7, and 9

*\* If your answer differs greatly from the choices above tell us in the chat!*

## Audience Survey Question

ANSWER THE QUESTION ON BLUE SCREEN IN ONE MOMENT



**Does The Maillard-Hodge Reaction proceed faster at:**

About 500 times faster at **pH 9** than at pH 5.

That's why cookies made with baking soda are darker brown in color.



*\* If your answer differs greatly from the choices above tell us in the chat!*

## Cooking Affects Nutrients



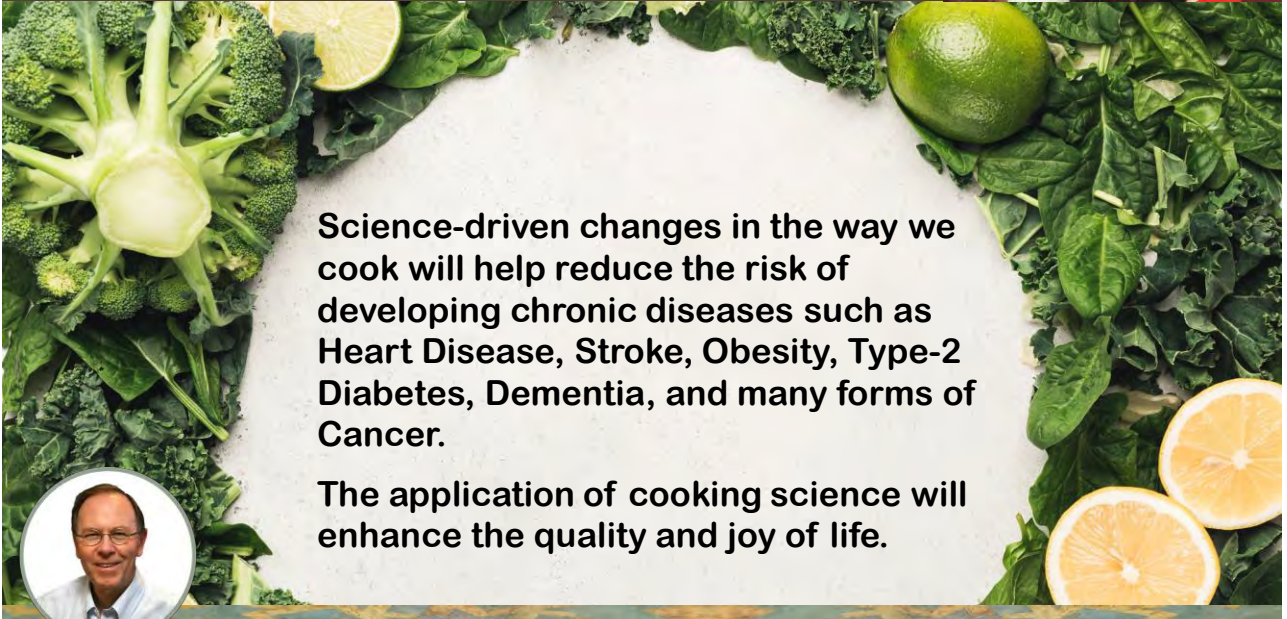
**Impact of cooking methods on nutrients in broccoli**

<u>Nutrient</u>	<u>Steam</u>	<u>Boil</u>	<u>Fry</u>
Carotenoids	+32%	+19%	-67%
Polyphenols	-73%	-38%	-60%
Vitamin C	-48%	-32%	-87%
Glucosinolates	+30%	-59%	-84%





# The Future of Cooking Science



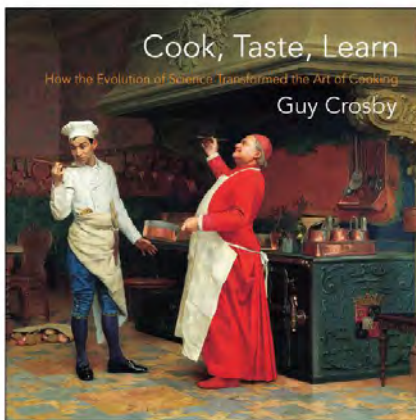
Science-driven changes in the way we cook will help reduce the risk of developing chronic diseases such as Heart Disease, Stroke, Obesity, Type-2 Diabetes, Dementia, and many forms of Cancer.

The application of cooking science will enhance the quality and joy of life.

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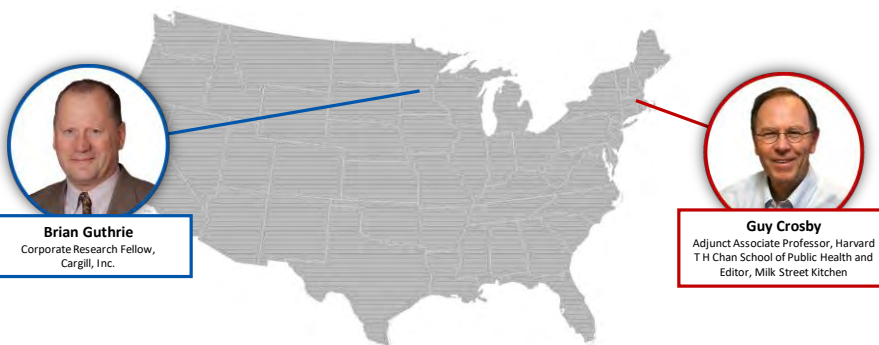
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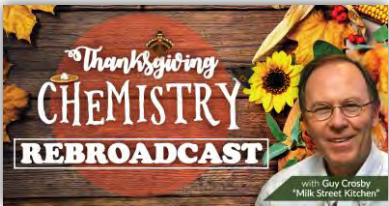
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MA Dept. of Public Health



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