



Culinary Institute
of America

Sip + Science:

The Techniques + Chemistry of
Maillard

Chef George Shannon, CEC, MPS '24

Leslie Merinoff, Founder, Distiller,
Matchbook Distilling Co.



Your Hosts

Chef George Shannon, CEC, MPS '24

Project Manager, Chef, CIA
Consulting



Leslie Merinoff, Master Distiller,

Founder, Matchbook Distilling

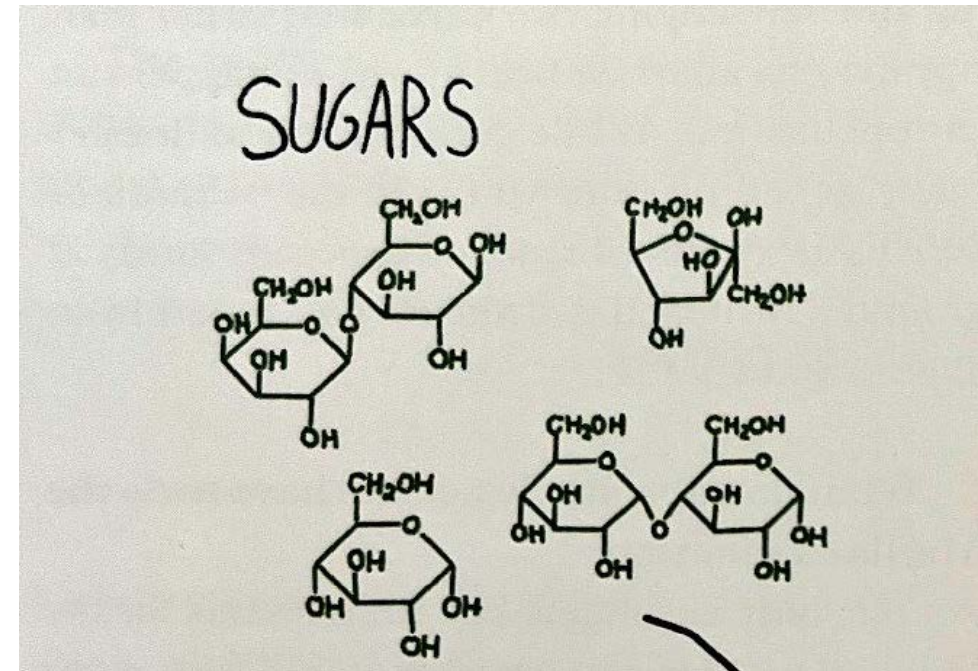
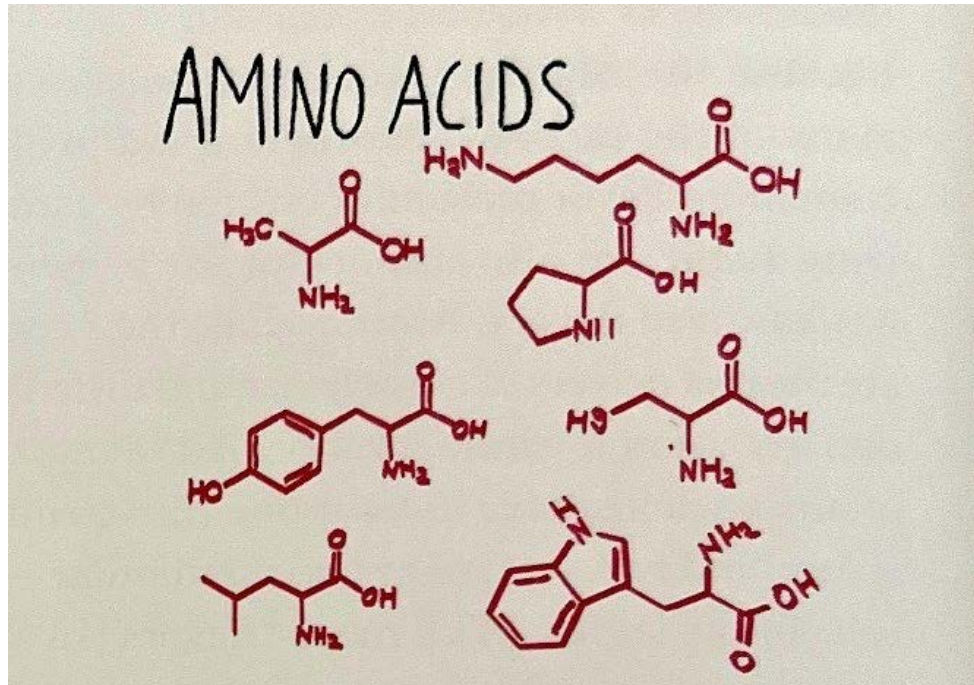


What is Flavor

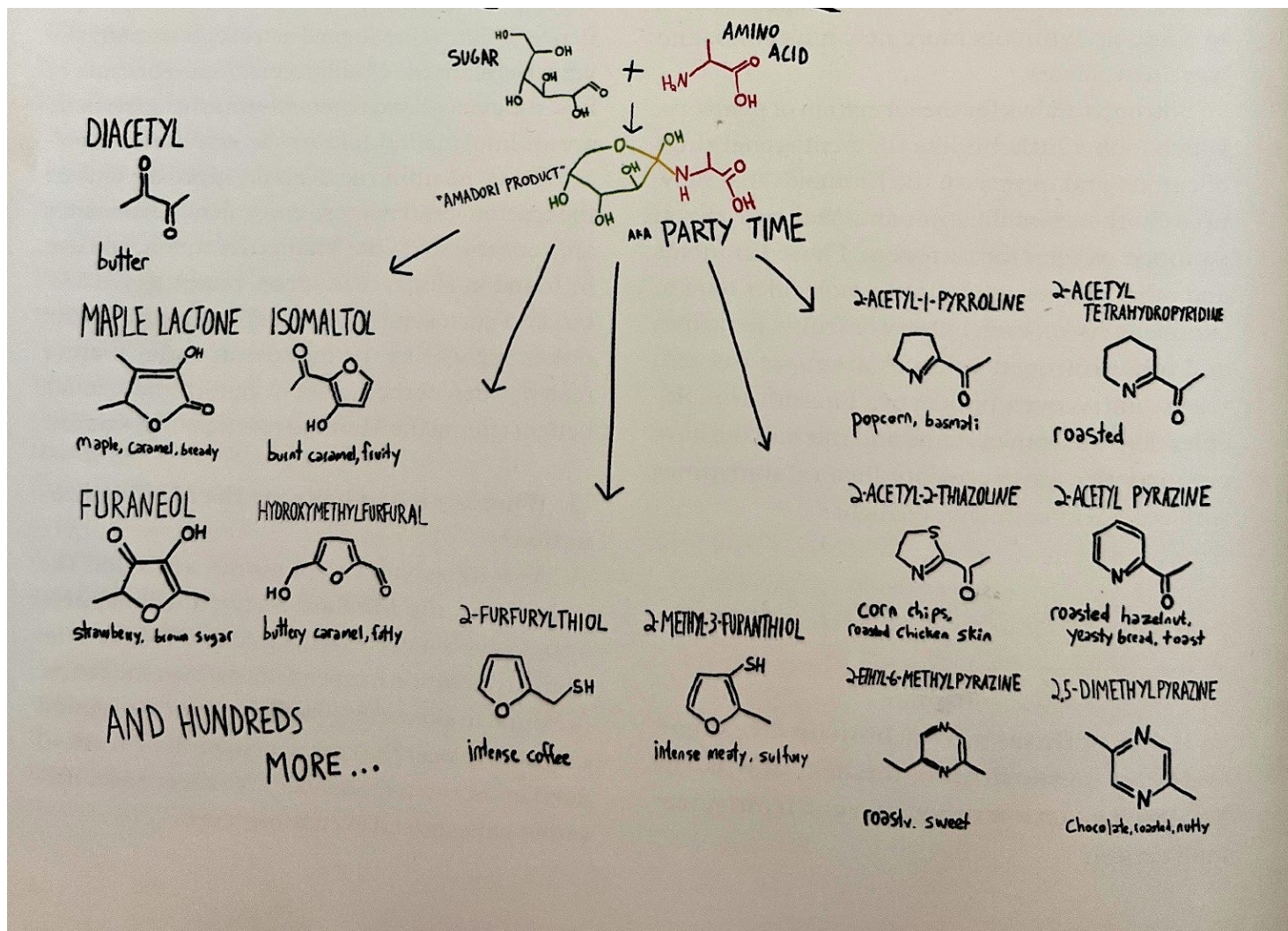
Aroma + Taste = Flavor



Flavor come from Chemistry



EQUALS



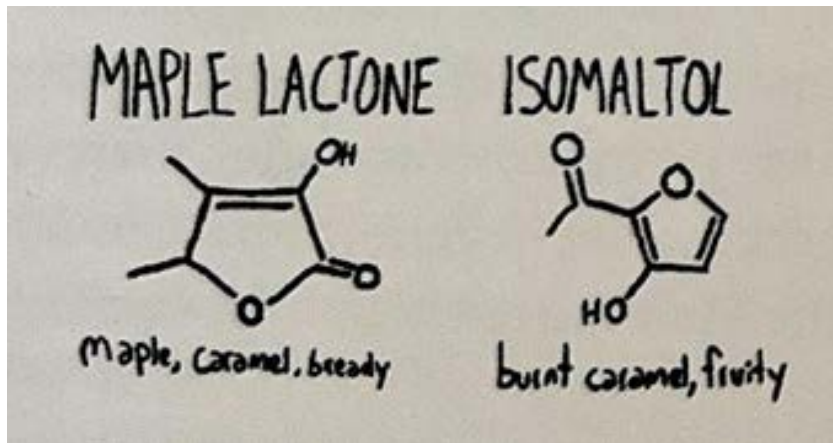
What is Maillard?

- A complex reaction responsible for the color and flavor in many foods not caused primarily by sugar.
- Louis Camille Maillard discovered and described the process proteins (amino acids) and reducing sugars reacting together to create intense flavors in many foods.



Sweet – Not Just Sugary

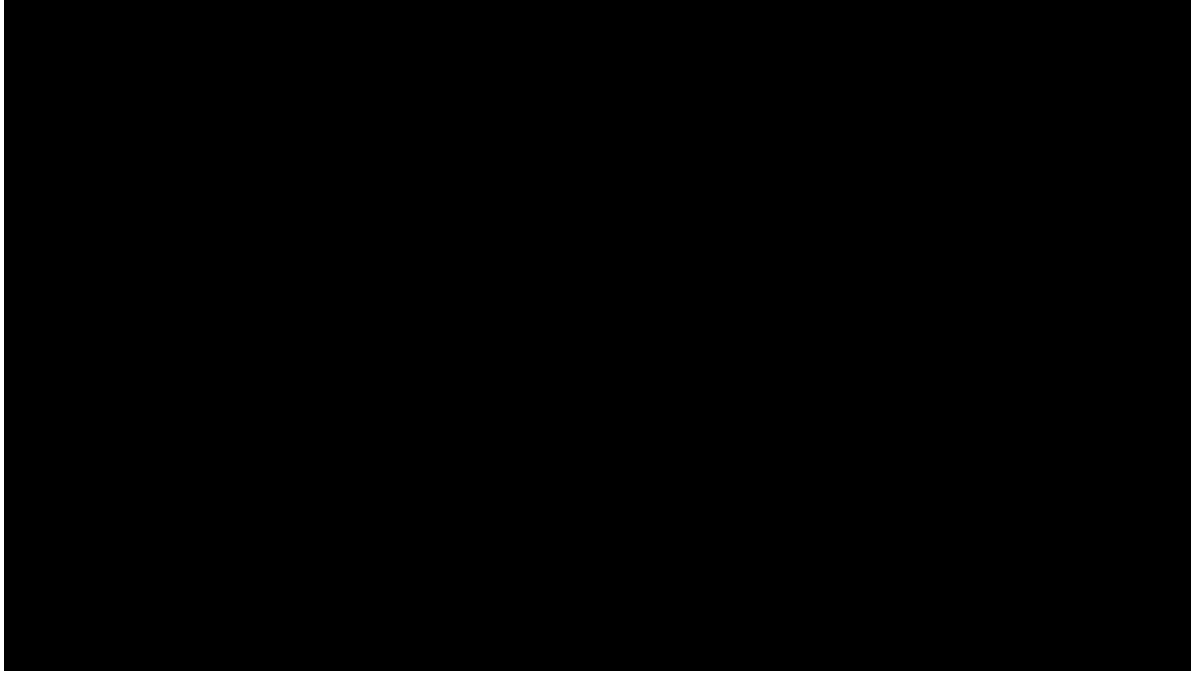
Fireside Fika and Dulce de Leche



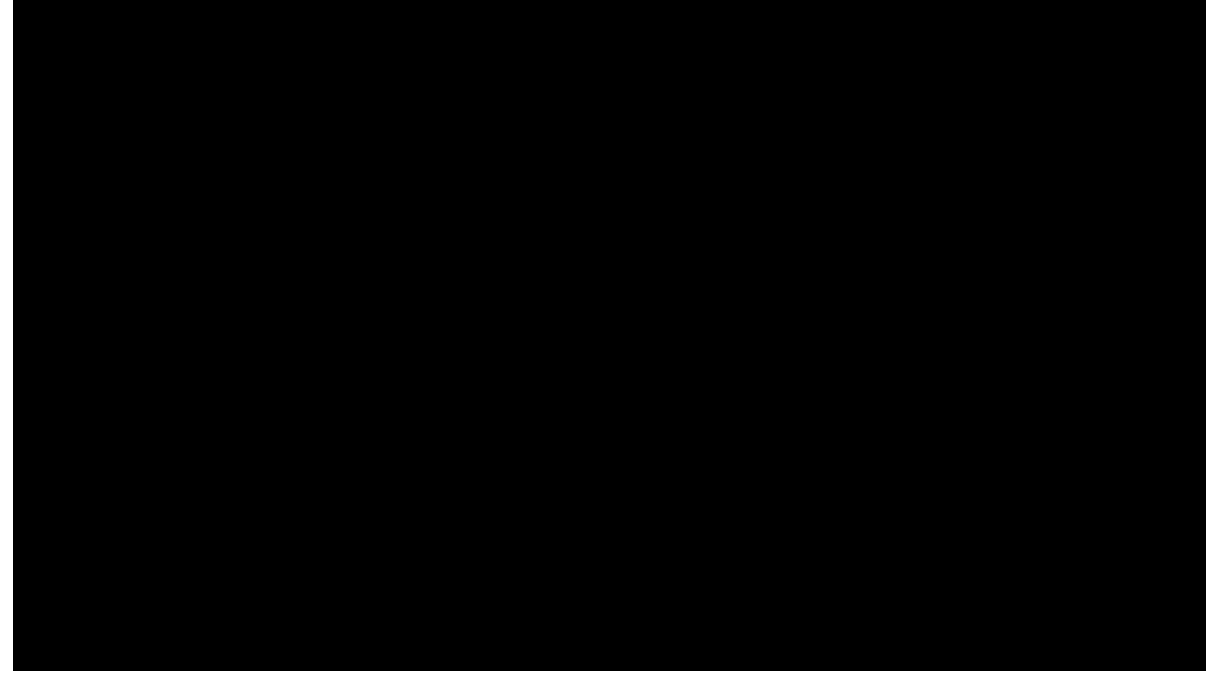
"Starting with a bigger assortment of molecules than just sugar... gives you more material to work with and more ways to un-knot and re-assemble things, like adding a new set of Lego to your toy bin."

Arielle Johnson, *Flavorama*

Butter and the Maillard Reaction



Beurre Noisette



Beurre Noir

Nutty - Trees not Required

- Gold Knot, Bread and Butter

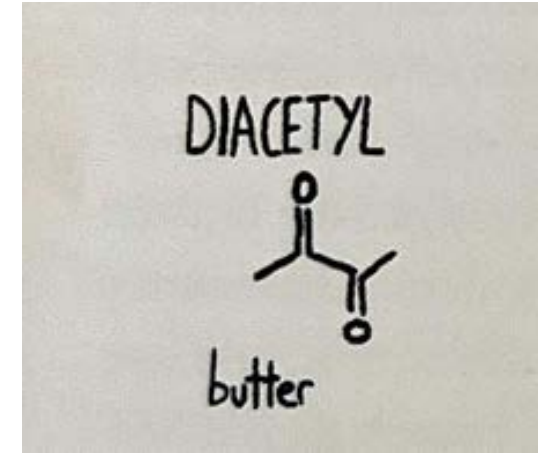


Clarified Butter

Beurre Noisette

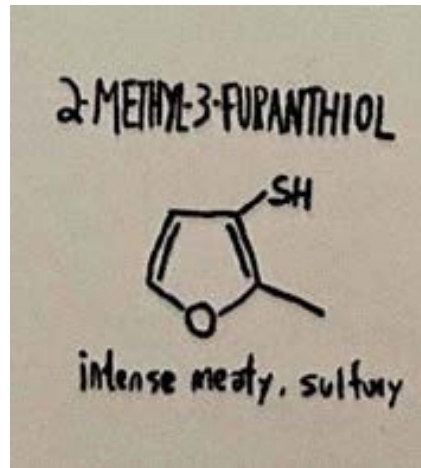


Beurre Noir



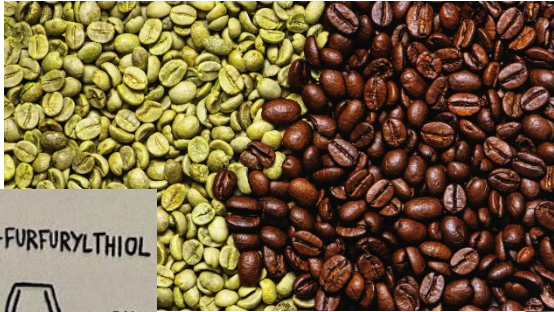
Sulfur – Not Always a Bad Flavor

Old Fashioned with Roasted Mushrooms and Garlic

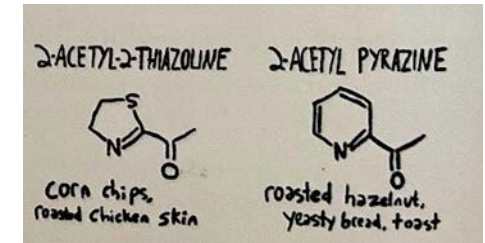
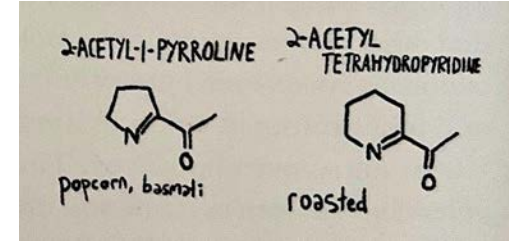


Other Maillard Reactions

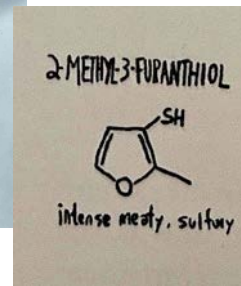
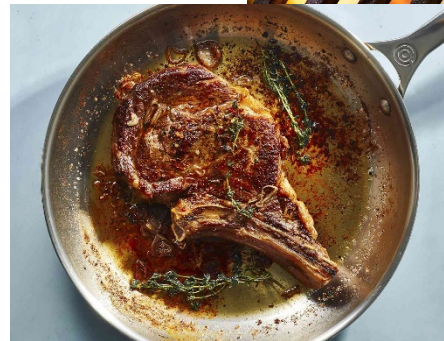
Coffee, chocolate, malt, grilled/seared meats, caramelized onions, fried fish



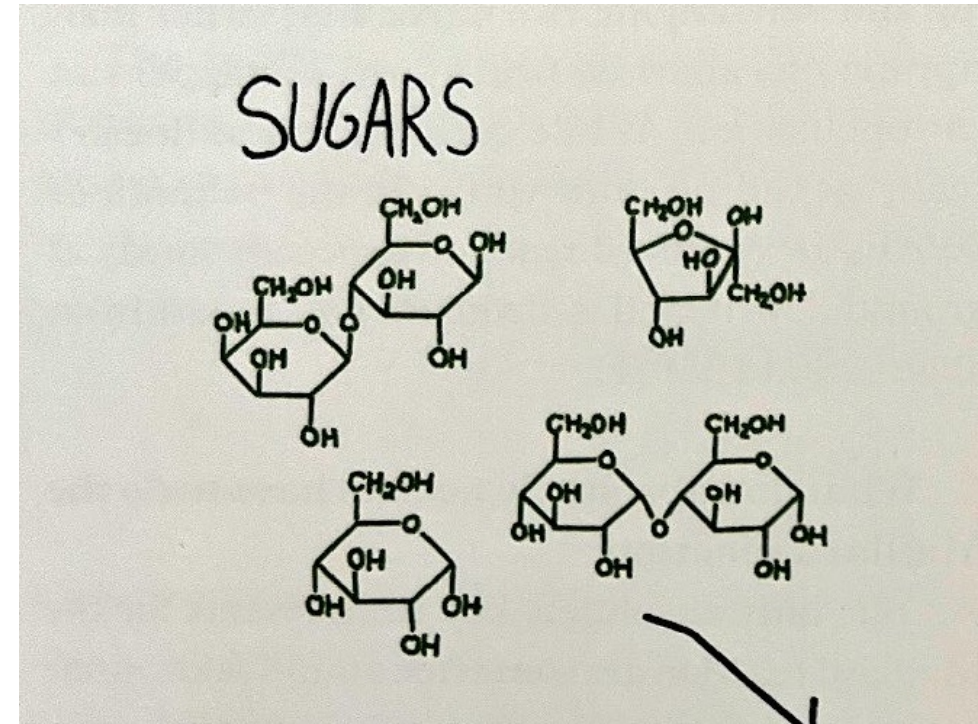
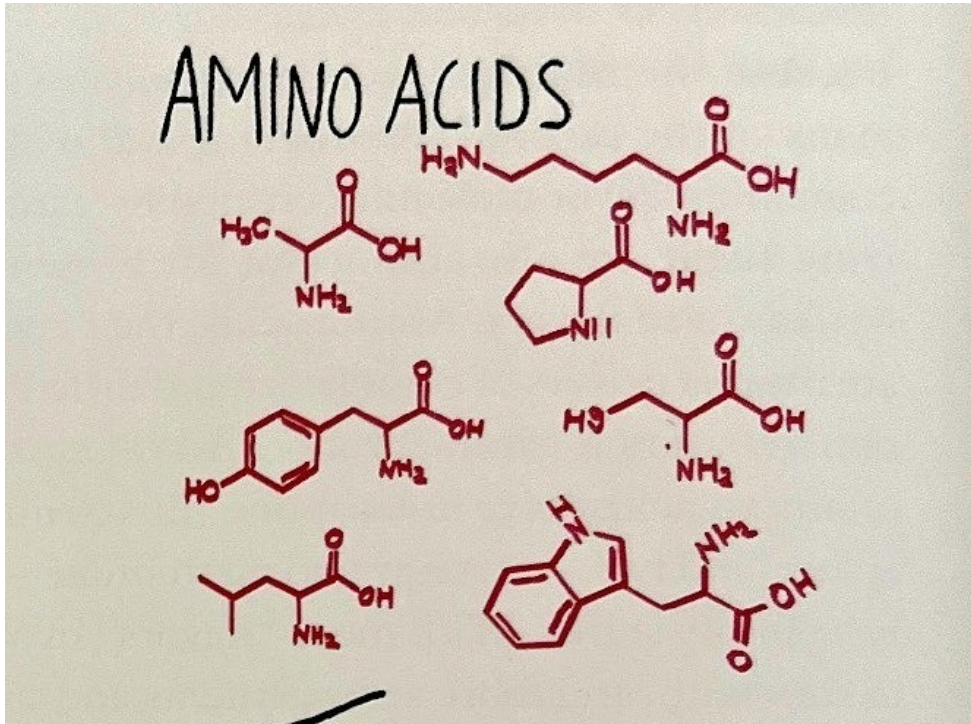
2-FURFURYLTHIOL
Cc1cc(CS)oc1
intense coffee



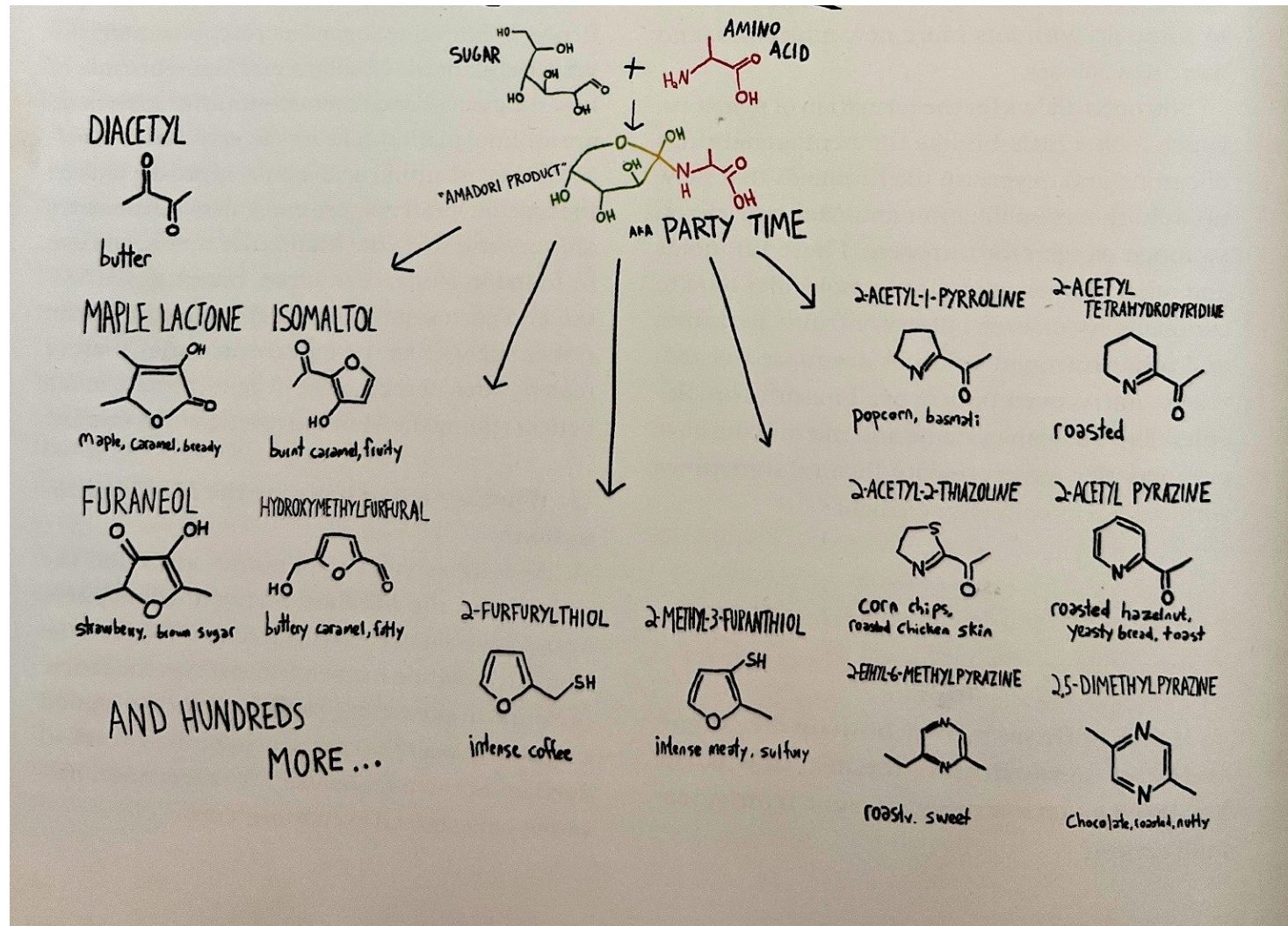
2,5-DIMETHYLPYRAZINE
Cc1nc(C)ncn1
chocolate, roasted, nutty



Flavor come from Chemistry



EQUALS



What can you do with this?

- How you cook
- Contemplate what you are eating?
- Engage your curiosity.
- Keep learning, experience the food
- Do the Maillard Lab at home

Maillard Lab	
PROJECT NAME: Sip + Solence	
TIMELINE: June 1, 2024	
LOCATION: CIA Hyde Park	
OBJECTIVE	<ul style="list-style-type: none">The primary objective of this experiment is to observe and analyze the stages of butter as it transitions from melted to browned to burnt. The focus will be on identifying the key chemical reactions, particularly the Maillard reactions, that contribute to changes in color, aroma, and flavor during these stages.
BACKGROUND	<ul style="list-style-type: none">Butter browning is a culinary process that enhances the flavor of dishes through the development of complex brown compounds and a nutty aroma. This transformation involves both Maillard reactions and caramelization. The Maillard reaction is a chemical reaction between amino acids and reducing sugars that gives browned foods their distinctive flavors. This experiment will dissect the stages at which these reactions occur and the sensory changes that result.
MATERIALS	<ol style="list-style-type: none">Unsalted butter (100 grams)Skillet or heavy-bottomed panStove or heating elementThermometer capable of measuring up to 250°C (482°F)SpatulaTimerNote-taking materials (notebook and pen)
TIMELINE	<ol style="list-style-type: none">Setup: Place the skillet on the stove and heat it to a medium setting. Ensure all safety equipment is worn.Melting: Add butter to the skillet and observe as it melts completely. Record the temperature and the time taken for the butter to melt.Heating: Continue to heat the butter, stirring occasionally with the spatula. Monitor and record the temperature at regular intervals (every 30 seconds).Browning: Observe the changes in color from yellow to golden to brown. Note the formation of foam and the subsiding thereof as the water content evaporates.Sampling: As the butter changes color, take small samples onto a white plate at various stages to visually document the color changes.Aroma Analysis: Record any changes in aroma during the heating process, noting when nutty or caramel-like smells become evident.Burn Point: Continue heating until the butter starts to smoke and turn dark brown. Record this temperature as the burn point.Cooling: Remove the skillet from heat to prevent further burning and allow the butter to cool. Collect the final sample.



Questions?

Sources

Molecule Images:

- Arielle Johnson, *Flavorama – A Guide to Unlocking the Art and Science of Flavor*

Brown Butter Images and Videos, some food images:

- George Shannon

Various other Food Images:

- Open Source Image sites