



Coffee
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The Green Coffee Lifecycle

A “seed-to-seed” presentation

Retreat

Blaine, Washington

Sept 28 - Oct 1, 2023

By: Neil Oney, Mercon Specialty Green Coffee Quality Manager

Intro and Housekeeping

At the end of class, students will leave with:

- A basic understanding of how green coffee ages.
- The primary drivers that cause green coffee to fade.
- Some tactics to apply when roasting faded coffee.

Questions? Ask whenever, we will also have discussion at the end



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About Your Instructors

Neil Oney



Neil Oney is the Coffee Quality Manager for Mercon Specialty in Seattle. He has been in the specialty coffee industry since 2005, working as a barista, roaster, consultant, and trainer.

He has been involved with SCA in one form or another since 2008, including as a lead instructor for SCA espresso, brewing, and sensory, as well as competing and judging in various competitions.



What do we mean by coffee age?

- "Past Crop" vs. "Baggy" vs. "Faded" vs. "LOOMY"
- Difference between "Aged Coffee" and PC Coffee
- Flavor Notes related to Age

IF YOU REALLY want to hear about it, the first thing you'll probably want to know is where I was born, and what my lousy childhood was like, and how my parents were occupied and all before they had me, and all that David Copperfield kind of crap, but I don't feel like going into it, if you want to know the truth. In the first place, that stuff bores me, and in the second place, my parents would have about two hemorrhages apiece if I told anything about this autobiog-raphy. They're quite touchy about pretty personal about especially my father. They're nice and all—I'm not saying that—but they're also touchy as hell. Besides, I'm not going to tell you my whole goddam autobiog-raphy or anything. I'll just tell you about this madman stuff that happened to me around last Christmas just before I got pretty run-down and had to come out here and take it easy. I mean that's all I told D.B. about, and he's my brother and all. He's in Holly-wood, and he's got a Jaguar. One of those he comes over and visits me when I go home end. He's going to drive me practically every week next month maybe. He just got a Jaguar. One of those little English jobs that can do around two thousand miles an hour. It cost him damn near four hundred bucks. He's got a lot of dough, now. He didn't use to. He used to be just a regular writer, when he was home. He wrote this terrific book of short stories, *The Secret Goldfish*, in case you never heard of him. The best one in it was "The Secret Goldfish." It was about



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ACTIVITY: Let's Cup!

Washed Nicaragua

- 2021 Crop
- 2122 Crop
- 2223 Crop

Anaerobic Natural Honduras

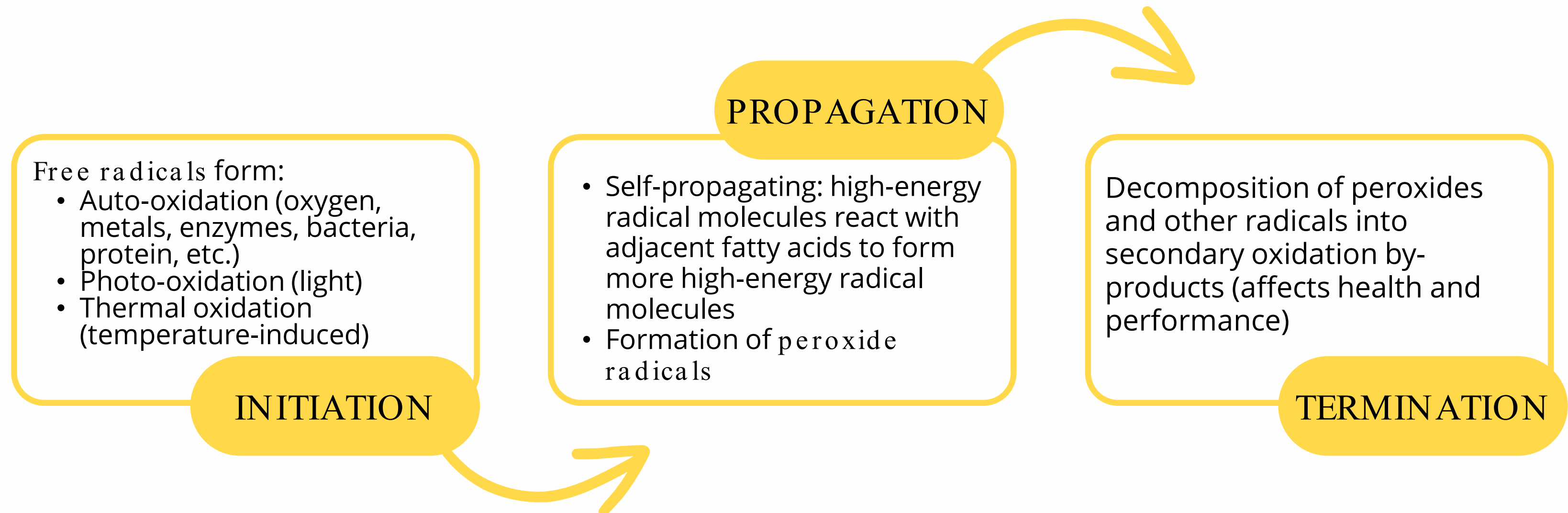
- 2021 Crop
- 2122 Crop
- 2223 Crop

How Does Coffee Fade?

- Oxidation of lipids
- Loss of volatile compounds
- Other things like heat and water damage, etc

What Causes Coffee to Fade?

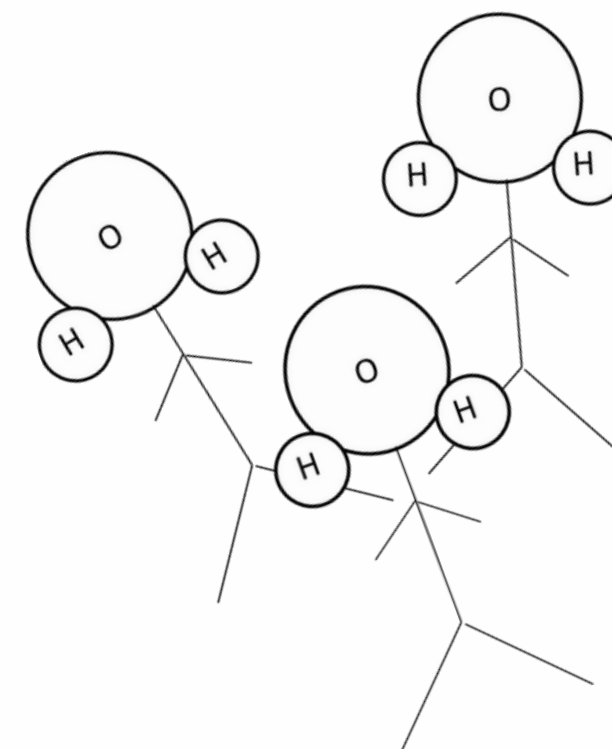
- Time
- Storage Conditions
- Maillard Reaction
- Moisture
- Embryo Death





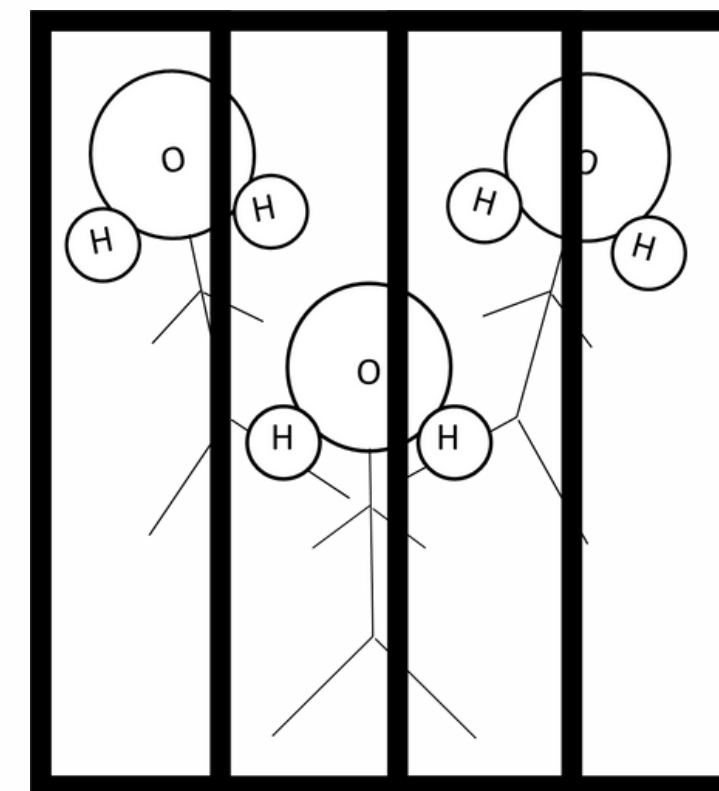
What is moisture in coffee?

- The total amount of water in a coffee seed
- Can change over time, and based on atmospheric conditions
- SCA Standard for moisture in green coffee: 10-12%



What is water activity?

- The measure of how much of the water in the seed is captive
- Can change over time, and based on atmospheric conditions
- SCA Standard for water activity in green coffee: < 0.70 aW
- Water Activity is not a commonly used measurement...yet



Moisture: 11%
Water Activity: 0.58



More "free" water

Moisture: 12%
Water Activity: 0.62



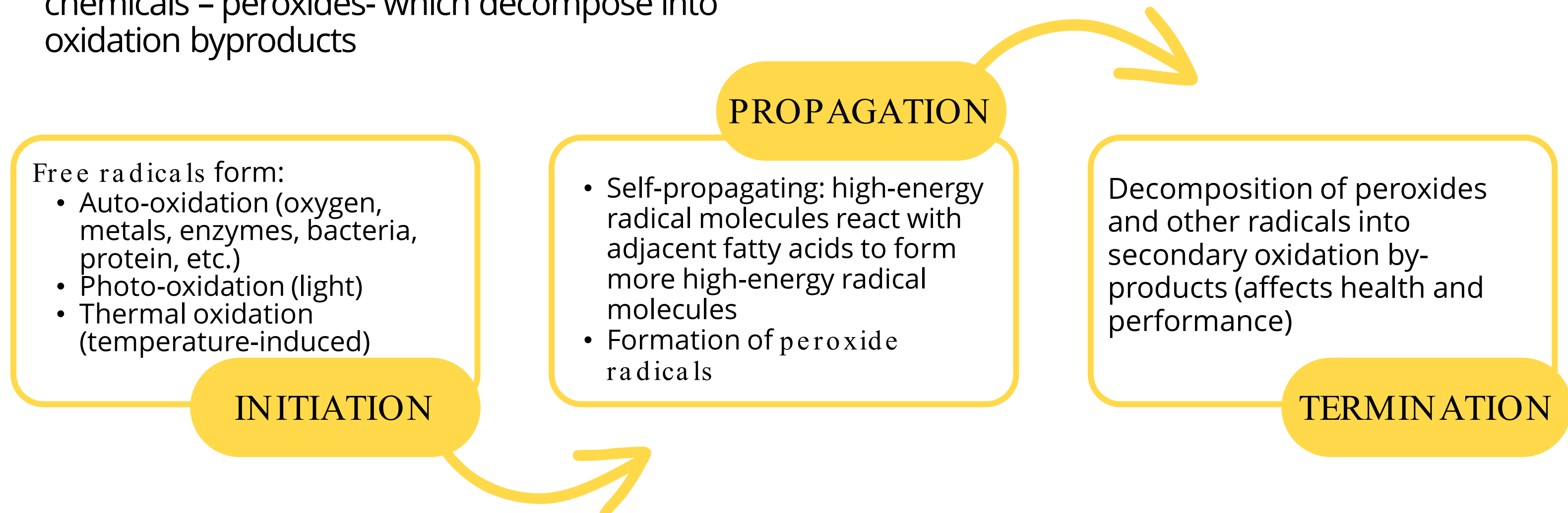
Moisture and Water Activity

- GENERALLY, as moisture rises, so does water activity
- How does WA change?
- Why does this matter?



Maillard Reaction Pt. 1

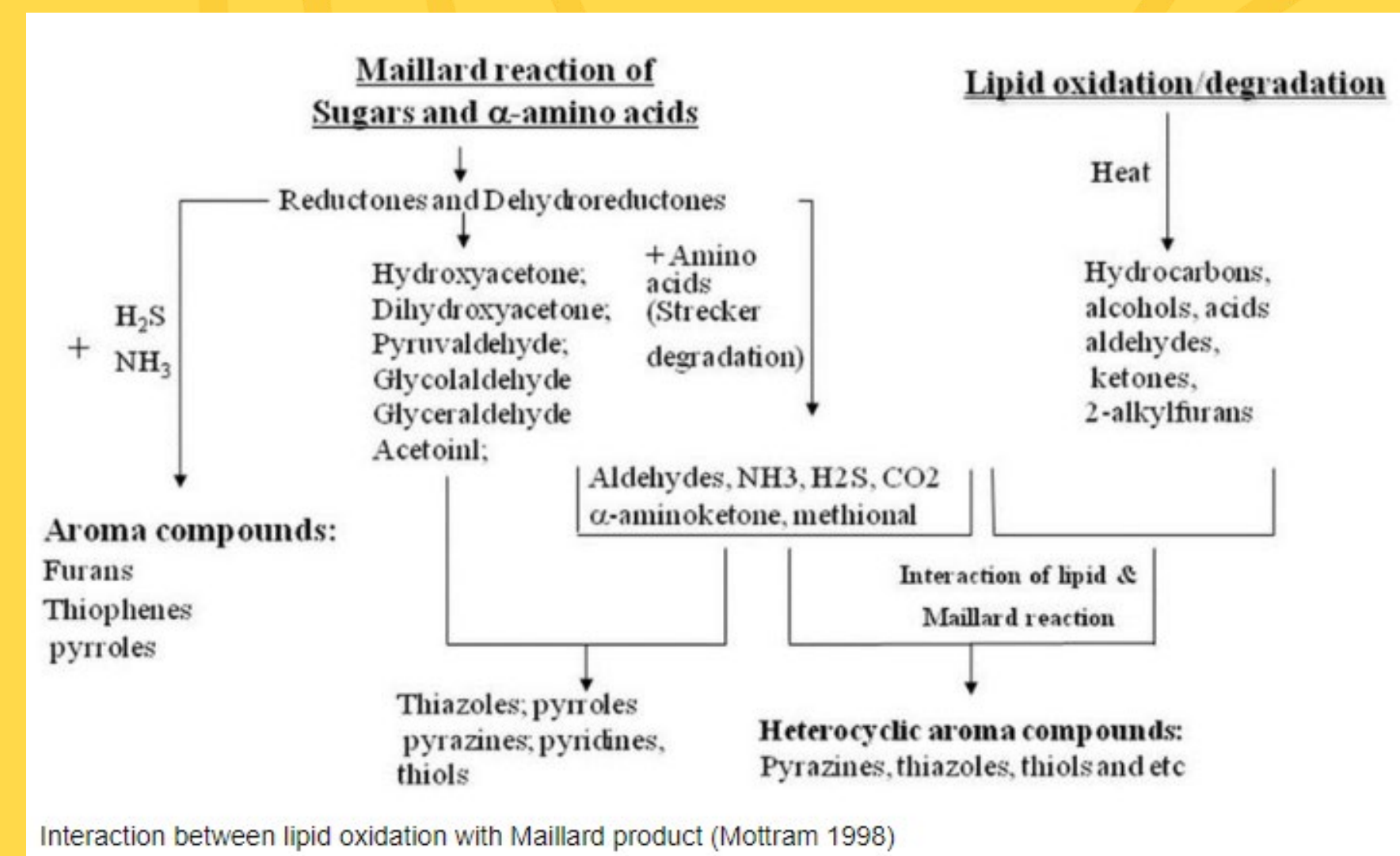
- The chemical process that causes food to brown while roasting (and cooking)
- Basic Chemistry: Sugars and amino acids (carbohydrates) interact to create new flavor chemicals – peroxides- which decompose into oxidation byproducts



Maillard Reaction Pt. 2

Lipid Oxidation

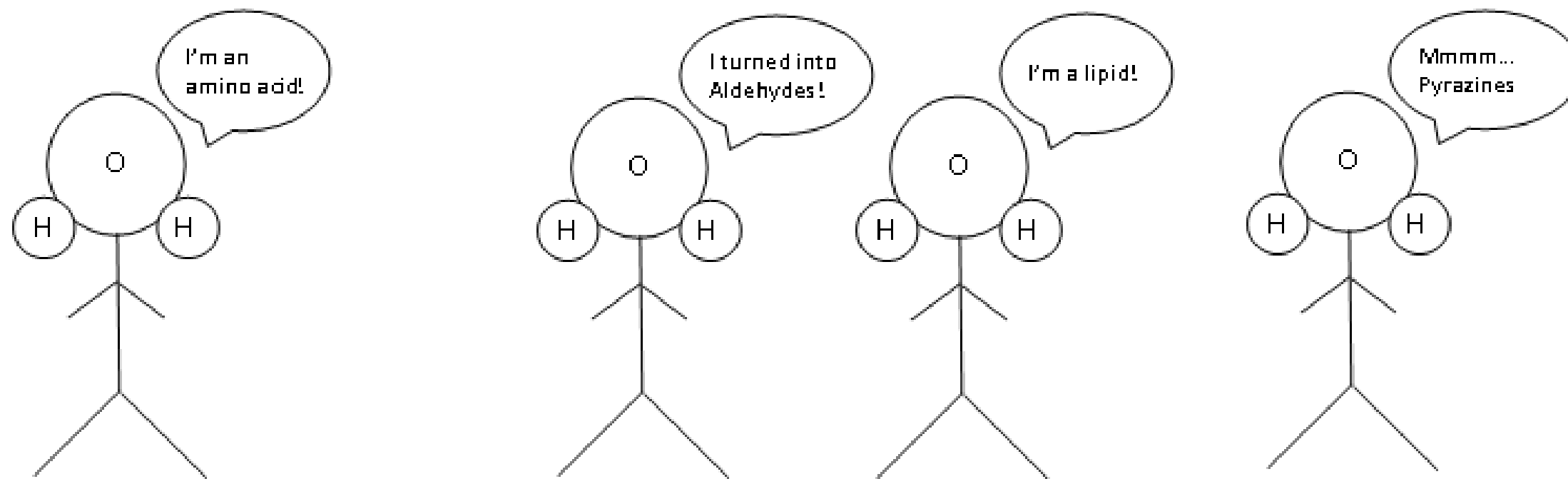
The degradation of lipids into hydrocarbons, alcohols and ketones



Interaction between lipid oxidation with Maillard product (Mottram 1998)

Maillard Reaction Pt. 3

- Maillard Reaction occurs at all temperatures, not just during roasting, albeit at much slower speeds
 - At lower temperatures, known as the browning reaction, non-enzymatic browning, or melanoidin formation





ACTIVITY: Measuring Moisture (TBD)

- Always check new samples for moisture, if possible
 - Gives a snapshot of what the coffee is doing
- Just because it's "out of spec" doesn't mean it's not ok.
Depending on use
- Re-calibrate your moisture meter often
- It's a good idea to know moisture for roast curve, higher moisture requires changes in drying time, etc



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Part 2: What Causes Coffee to Fade?

Moisture and Fade - Water

- “Universal Solvent”
- Microbes
- Higher water activity



Moisture and Fade – Outside Influences

- Packaging Delays
- Weather
- Shipping



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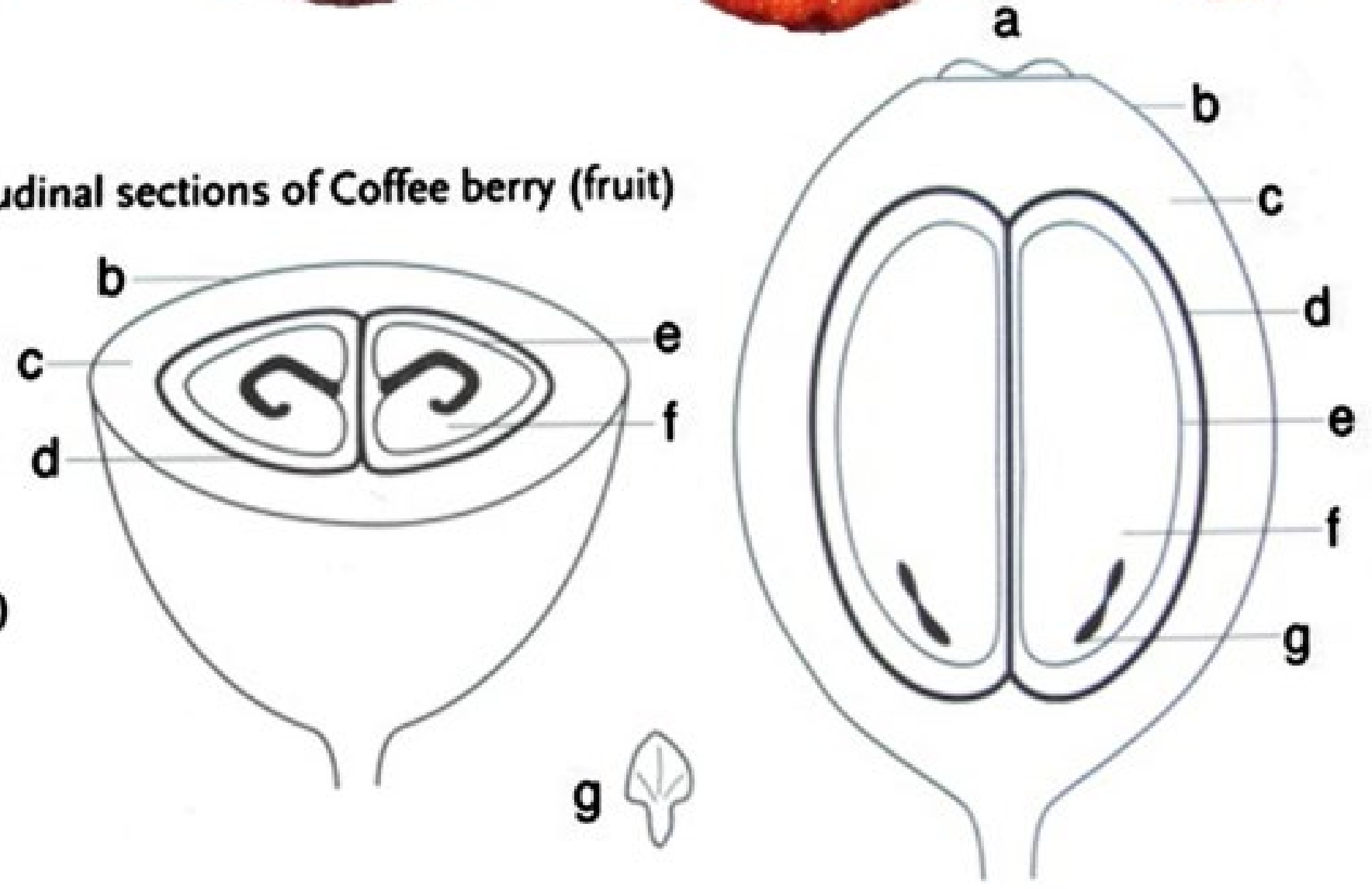


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Transverse and longitudinal sections of Coffee berry (fruit)

- a. disk (style remnants)
- b. epicarp (skin)
- c. mesocarp (mucilage)
- d. endocarp (parchment)
- e. spermoderm (silver skin)
- f. endosperm
- g. embryo

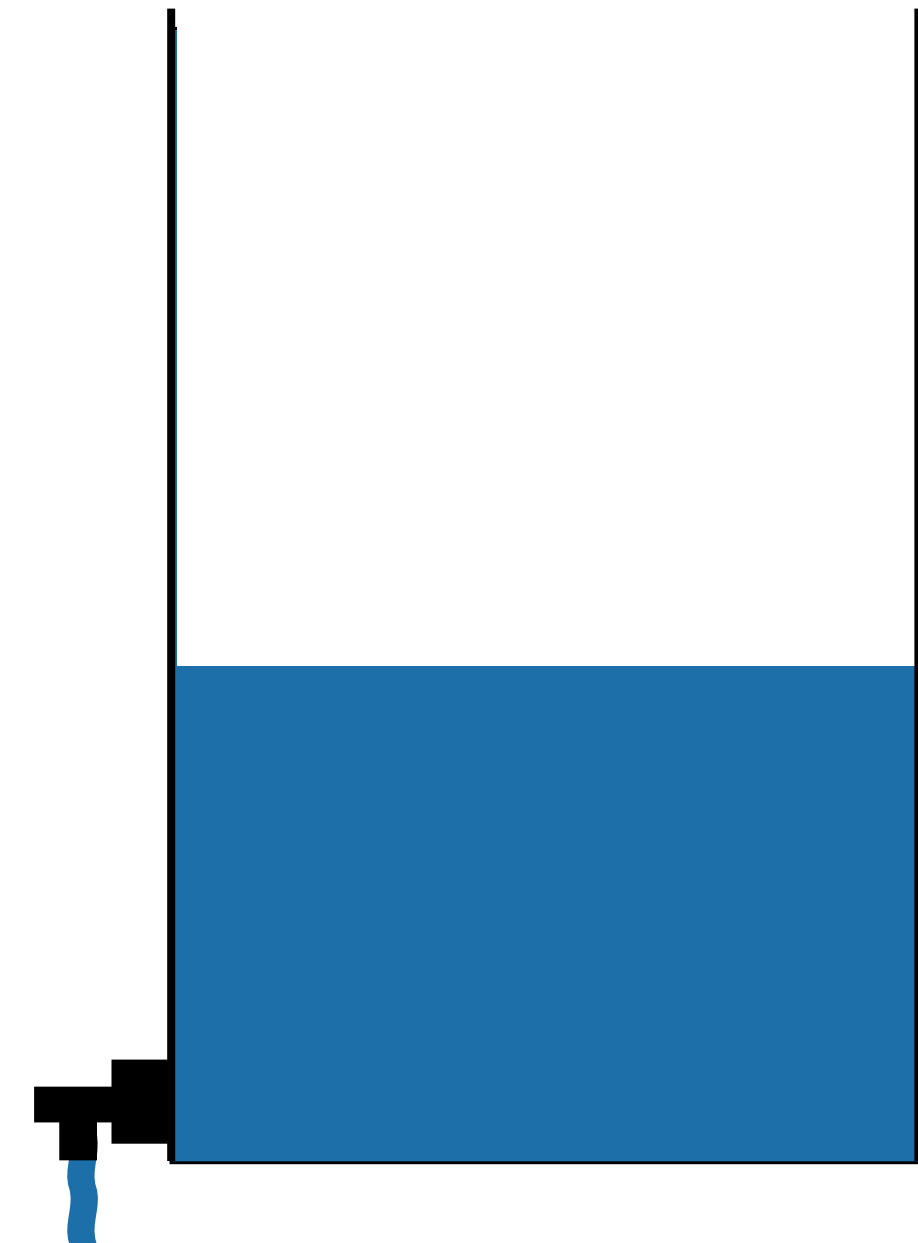
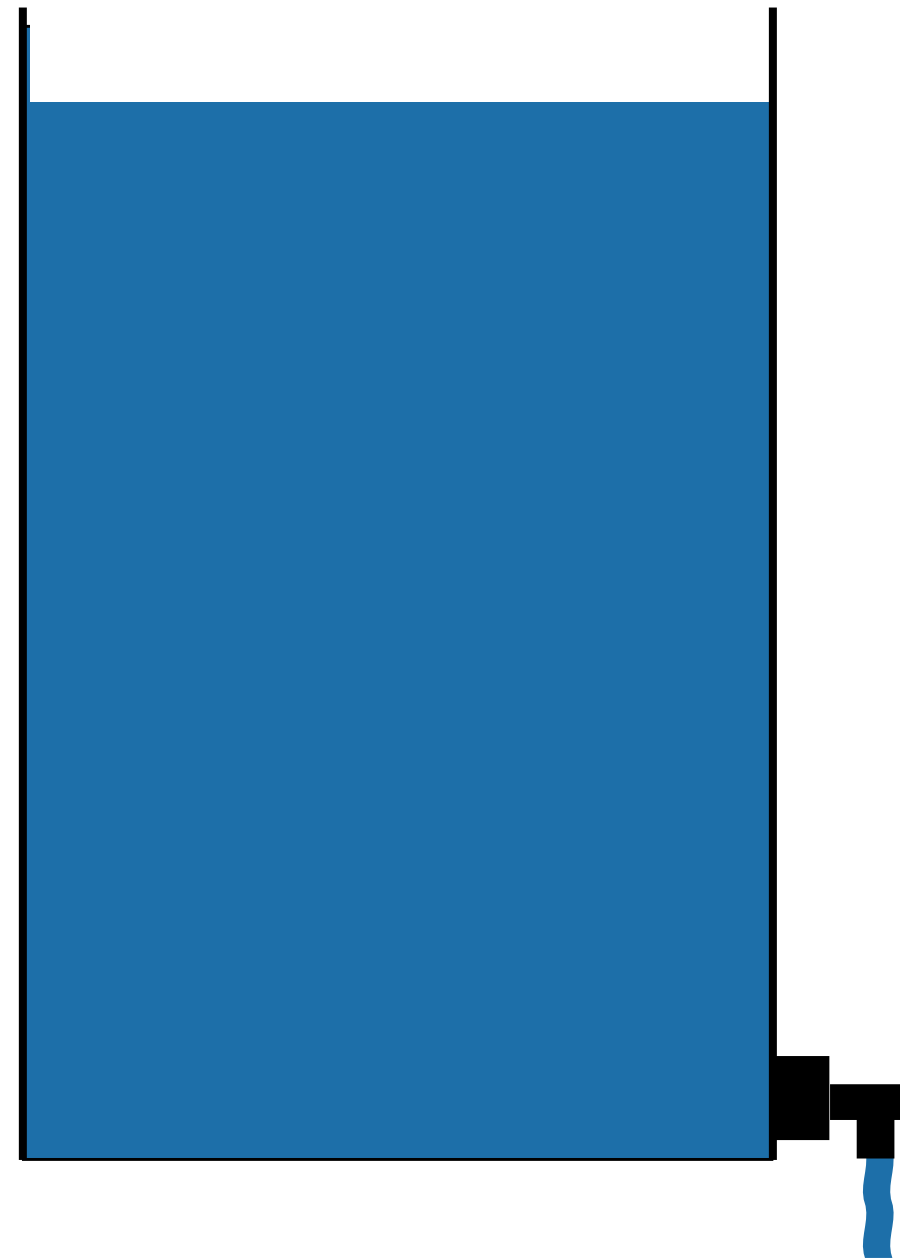


Viable Embryo & Fade



What about Naturals?

- Why do naturals and other “special process” coffees not seem to fade as fast?
- Related to the embryo conversation, assuming all coffees fade at the same rate, naturals have more “stuff” in them, so it takes longer to detect fade flavors





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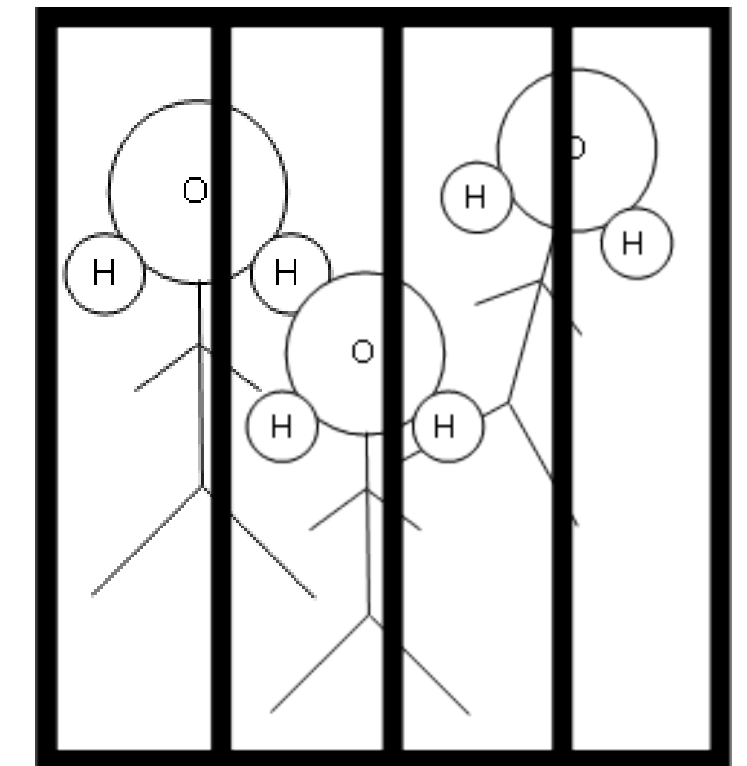
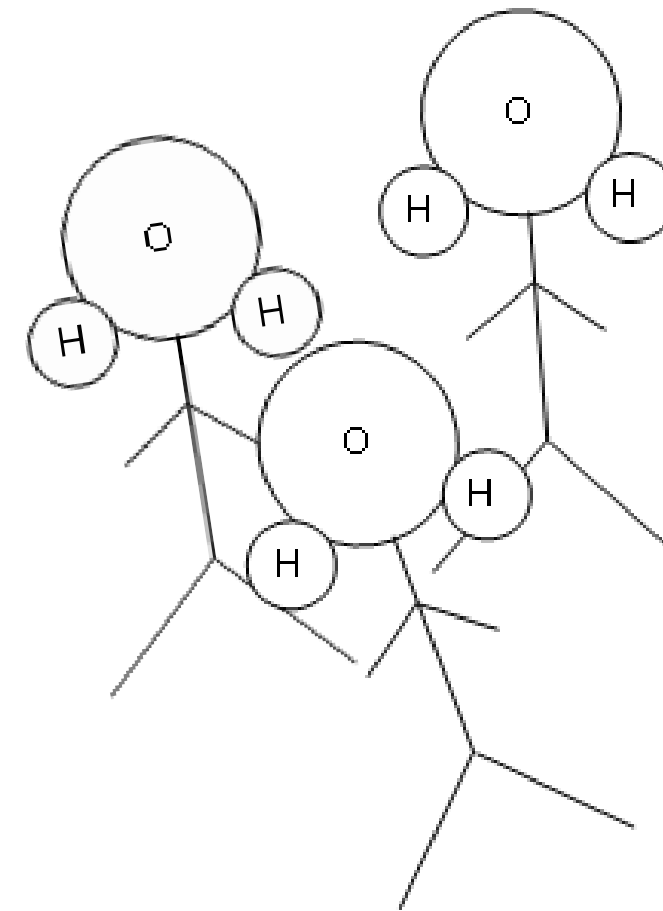
Part 3: What Can We Do About It?



How to Slow the Inevitable March of Time

Moisture and Water Activity

- SCA's limit of 0.70 aW is primarily to limit mycotoxins
- After 0.70 aW, bacteria and fungi growth expands exponentially
- Some yeast, bacteria, and fungi are still active down to 0.60 WA
- Limiting moisture to below 11%, and aW below 0.55 or so will slow aging
- This is not generally practical however





How to Slow the Inevitable March of Time

Post Harvest Processing

- Stable water activity is as important as low water activity
- (DEPENDING ON ORIGIN) Slow, lower-temperature drying, out of direct sunlight, will allow the seed to dry more evenly with firmer cell walls so it can hold the moisture it has better



How to Slow the Inevitable March of Time

Storage at Origin

- While the coffee rests in parchment awaiting hulling and shipment
- Should be kept cool, dry, and out of direct sunlight



How to Slow the Inevitable March of Time

Packaging

- Many attempts have been made to stop coffee aging through packaging
- Jute does very little
- Plastic liners like Grainpro do a good job
- Vacuum sealing limits air even more than Grainpro
- But remember Maillard still happens at room temperature



How to Slow the Inevitable March of Time

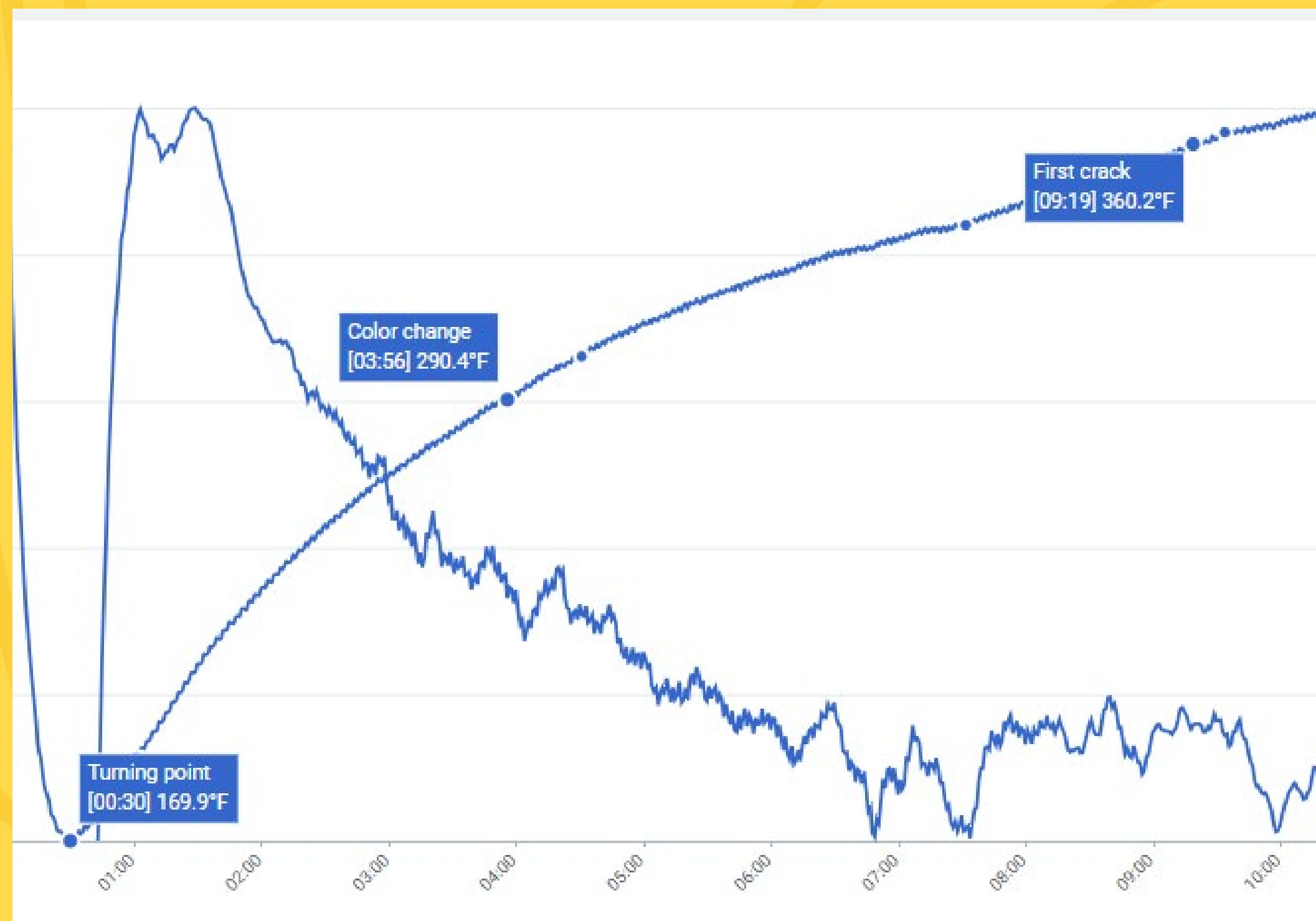
Storage at Destination

- Or, finally, what the roaster can do to limit aging
- Timeframe
 - Big Disclaimer – origin, process, use, geography and more will affect fading
- Cup Your Coffee!



How To Use Faded Coffee

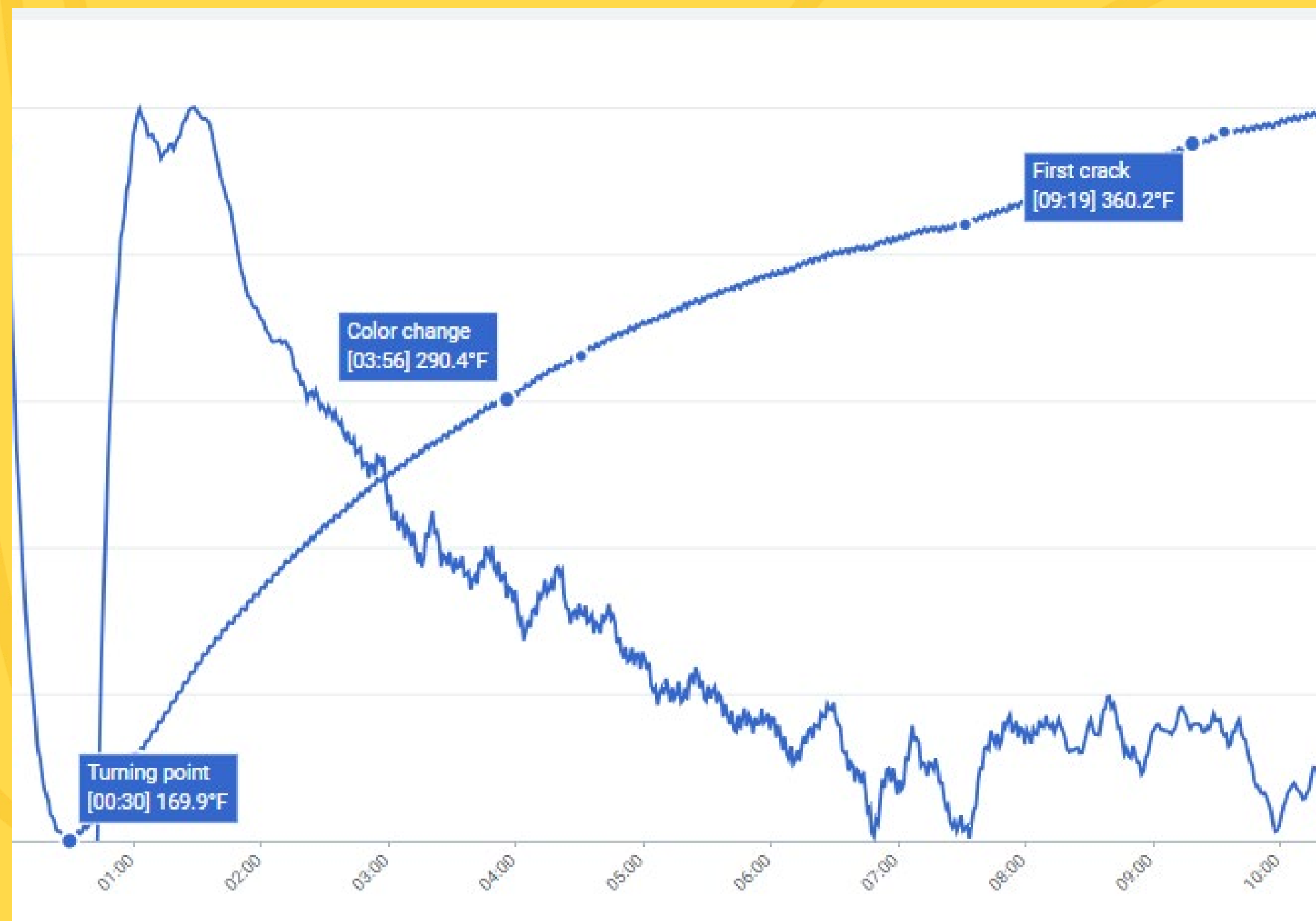
- Roast darker to replace bitter PC flavors with roasted flavors
- Change the roast curve with a quicker drying phase/slower Maillard
 - More development highlights body over acidity





How To Use Faded Coffee

- Blend with fresher coffee or with a coffee that benefits from faded flavors (Indonesia, etc)
- Cold Brew?
- Know your customer and their uses
- What Else? How do you use faded coffee in your roastery?





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Further Reading

- <https://christopherferan.com/2020/01/24/green-coffee-fade-and-cannibals-at-dinner/>
- <https://www.willfrith.com/vietnam-specialty-coffee-blog/age-and-green-coffee>
- <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/maillard-reaction>
- <https://www.sciencedirect.com/science/article/abs/pii/S153751100700267X>
- <https://www.idahomilkproducts.com/resource-center/what-exactly-causes-maillard-browning/>
- <https://freshcup.com/the-premature-aging-of-coffee/>
- <https://www.baristahustle.com/lesson/rs-2-06-storage-and-ageing/>



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Further Reading – Part 2

- <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1399-3054.2006.00666.x>
- <https://christopherferan.com/2020/03/14/under-the-blacklight/>
- https://link.springer.com/chapter/10.1007/978-1-4939-2578-0_4
- <https://www.sciencedirect.com/science/article/pii/S0260877418300219>
- <https://www.sciencedirect.com/science/article/abs/pii/S0308814619303334?via%3Dihub>
- <https://www.nature.com/articles/s41598-022-06676-9>

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Thanks!

Questions?

Discussion?

Feel free to connect with me!

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