A Primer on Coffee Extraction for the Lay-Brewer

The following post was written for a small but talented roaster in North Texas. Like all small town coffee professionals, he has the difficult job of cultivating a culture of appreciation where convenience is king. I was happy to help him out.

EXTRACTION THEORY 101

Coffee, like any other industry, has a lot of terms and concepts that can be confusing. Ask any disciple of caffeine about their coffee of choice and they are likely to wax poetic in what seems to be another language, throwing around terms like 'Extraction', 'Crema', and 'Flux Capacitors'…Well, maybe not that last one, but you get the point. It is my hope that these next few blog posts really will be an Intro to Coffee Geekery; one that propels you into appreciating all that goes on during your morning ritual.

Today we will briefly discuss the process of extraction; or what goes on when you mix coffee and water.

The Three Stages of Extraction

As the conveniently placed title heading above this sentence states, there are three stages in the extraction process:

1. **Wetting**
2. **Extraction**
3. **Hydrolysis**

1. During the **Wetting** stage, water is absorbed into the coffee particles, expelling residual CO2 left in the grounds from the roasting process. This is also referred to as the 'bloom', due to the visible swelling of the ground coffee bed that occurs.[1] Put Simply: **Water In, CO2 Out.**

2. Now that water has successfully entered into the grounds, it begins to dissolve the acids, sugars, and alkalis that gives coffee its distinctive flavors, and exits the coffee grounds. This is known as the **Extraction** stage. Put Simply: **Water Out, Coffee Out**

3. This last stage is a bit tougher to explain, so track with me for a bit. **Hydrolysis** is a chemical reaction of the coffee particles to water that can only be affected by time, e.g. you, our noble home-brewer, cannot do anything to make it happen any quicker. In short, hydrolysis is the process by which large insoluble compounds are broken down into smaller soluble compounds. Make sense? No? Ok, consider the following probably-not-chemistry-teacher-approved example: Imagine you have a cup of water and a single-serving Kool-Aid packet. If you drop the packet into the cup and immediately start stirring, chances are the water will not change a whole lot. Why is this? Because the Kool-Aid packet is not yet water soluble. Given time, however, the water will begin to break down the packet into soluble material, in this case, a neon green drink mix of questionable chemical origin. What happens when you stir now? All of a sudden, your boring non-florescent water is a piercing lime green and tastes completely different. This is obviously a simplified example, but hopefully it helps you get the point. Put Simply: …Yea, I'm going to be honest, I have no idea how to simplify this, so just keep imagining the Kool-Aid man bursting through your wall until you understand it. :)

How Does This Affect Your Cup?

Ah! The ultimate question! At the end of the day, it doesn't matter how many words you know or beakers you brew into if the end result isn't usable. There is a whole world of applicability for the at-home coffee brewer concerning extraction theory, but for now let's conclude by introducing two terms that you've probably heard your local mustache-sporting barista throw around: Over-Extraction and Under-Extraction.

Of all the material in coffee, only about 30% is water-soluble under normal circumstances. In other words, unless you at-home brewing rig includes a volcano-powered doomsday device, you will only be able to extract about 1/3 of the bean itself. Of that 30%, you only want ~18%-22% in your cup. Anything *under* 18% is *under-extracted*, and anything *over* 22% is *over-extracted*. Under-extracted cups tend to be sour and thin, whereas over-extracted cups are usually bitter, astringent, and lingering.

What's that you say? None of that was usable to you? Well, wait just one more sentence and I'll bring it home, I promise. Is your coffee consistently sour and weak? Chances are you are under-extracting it, and need to brew it longer. Is your coffee as black as oil, with a bitterness to boot? It is more than likely over-extracted, and would benefit from a shorter brew time.[2]

Well, what do you think? Did this primer peak your interest in coffee chemistry, or ground it all out? (Haha! See what I did there?) Feel free to let me know in the comments below or tweet at me @Blake_Sager.

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[1] Does your coffee not bloom when brewed? This is a good sign that it is probably older than 2 weeks, and has lost most of the aromatics that reside within freshly roasted coffee. Thankfully, [*** *****] Coffee is committed to roasting fresh every week, so you don't have to worry about it! :)

[2] Adjusting brewing variables like time, temperature, and grind size will get its own post, so please accept this quick brew-diagnosis for now.