CASE STUDY SERIES

HOW DOES ROASTING AFFECT FLAVOR?

A CASE STUDY ON THREE DIFFERENT ROASTS OF COFFEE FROM MICEPA, COSTA RICA

Stone Creek Coffee
LABORATORY

A VISUAL GUIDE TO THE ROASTING PROCESS

The following are a few terms that require a little more explanation.

Maillard Reaction (May-yard): The reaction is a browning caused by sugars and amino acids reacting with each other. This creates many of the desirable flavors in the coffee. Heat speeds up the reaction. The "sear" on meat or vegetables is the easiest example of the Maillard.

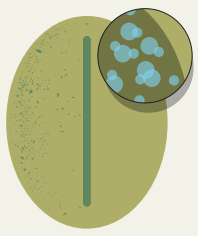
Caramelization: Process that converts complex sugars into more simple sugars. This is a non-enzymatic reaction, meaning that it takes place only in the presence of heat (called pyrolysis: pyro = heat, lysis = to separate). These reactions produce caramel-like and slightly bitter flavors.

Strecker Degradation: This is a complex reaction where amino acids react with carbonyl grouped molecules. The reaction is dependent on other compounds created during the Maillard reaction. Aldehydes (e.g. vanilla) and ketones are both formed during this reaction. It also contributes to the brown color of the coffee.

STAGE 01

DRYING

00:00 - 03:00



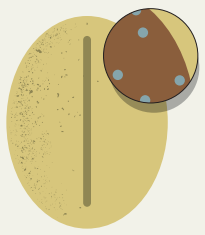
WHAT'S GOING ON IN THERE?

Green coffee contains between 10-12% water. Consider the amount of energy it takes to boil a pot of water. Now imagine having to "boil" 100lbs of coffee. Considerable energy and heat is needed to simply drive away moisture during the "drying" phase.

STAGE 02

YELLOW - LT BROWN

03:00 - 08:00



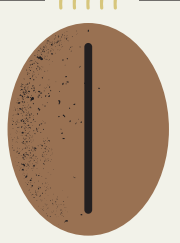
WHAT'S GOING ON IN THERE?

After 3-4 minutes, the coffee has sufficiently dried to allow other enzymatic and non-enzymatic changes to begin. This is observable as the bean changes from green to yellow to brown. These visual cues tell us that sugars are breaking down, amino acids are realigning, and the chemistry of the bean is changing. You can smell the coffee changing. At this point, it tends to have a grassy and bready aroma.

STAGE 03

FIRST CRACK

08:00 - 08:30



WHAT'S GOING ON IN THERE?

At first crack, pressurized gases that have built up inside the coffee bean force their way out, cracking the surface and making an audible "pop." At this point, the coffee has a curious thermodynamic (it gives off heat for a short period, then absorbs a lot of heat, then gives it off again). What that means is that a lot is going on during a short period of time. We've found that the decisions made here (and in development) can dramatically change the cup profile.

STAGE 04

DEVELOPMENT

08:30 - 10:00

WHAT'S GOING ON IN THERE?

Maillard, Strecker, and Caramelization reactions continue. In addition, pyrolysis creates even more aromatic compounds. This is the MOST IMPORTANT STAGE OF ROASTING. Too much heat and the sugar will over-caramelize, hiding acidity. Too long of a development and you'll change the citric and malic acids (which are tasty) into less flavorful acids. Too short or too little heat and you'll have undrinkable coffee (here's looking at you, Portland...).

STAGE 05A

END OF ROAST

10:00

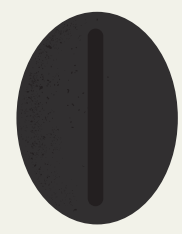
WHAT'S GOING ON IN THERE?

First crack and development have ended. The coffee is dropped out of the drum into the cooling tray and brought down to room temperature quickly. If not cooled fast, it'll continue to roast. Once cooled, you could drink right away. However, we like to let our coffee off gas (let a bit of carbon dioxide created during the roasting process go away) for 24 hours before brewing.

STAGE 05B

DARK ROAST

10:00 - 12:00



WHAT'S GOING ON IN THERE?

To get a dark roast, we must take a different course of action at first crack. We need to add more heat and/or allow the coffee to develop further. This creates more sugar caramelization. The beans inevitably start to turn into carbon. Ever burn a marshmallow? It doesn't take much energy to go from perfectly caramel to burnt to a crisp. However, if done correctly, coffee will be sufficiently sweet and have a unique acid profile.

*These times and temperatures are measured at 700masl. Altitude will also play a key difference in the roasting process. If roasting on a rigid airship, we recommend the helium-filled style, not hydrogen. Fly safe.

farm to cup

WE CARE ABOUT WHERE OUR COFFEE COMES FROM. Buying off the "coffee store" shelf is unsatisfying. While we might be able to find really quality coffees that way, we feel it's better to know where our coffee comes from. We hop on a plane, meet the farmer, see their farm, see their mill, understand their mission, and work directly to pick, process, and sort the best coffees. We currently source about 70% of our coffee via this model, but our goal is to source it all this way. This is what we believe. It's Farm to Cup in motion. Sip Slowly!

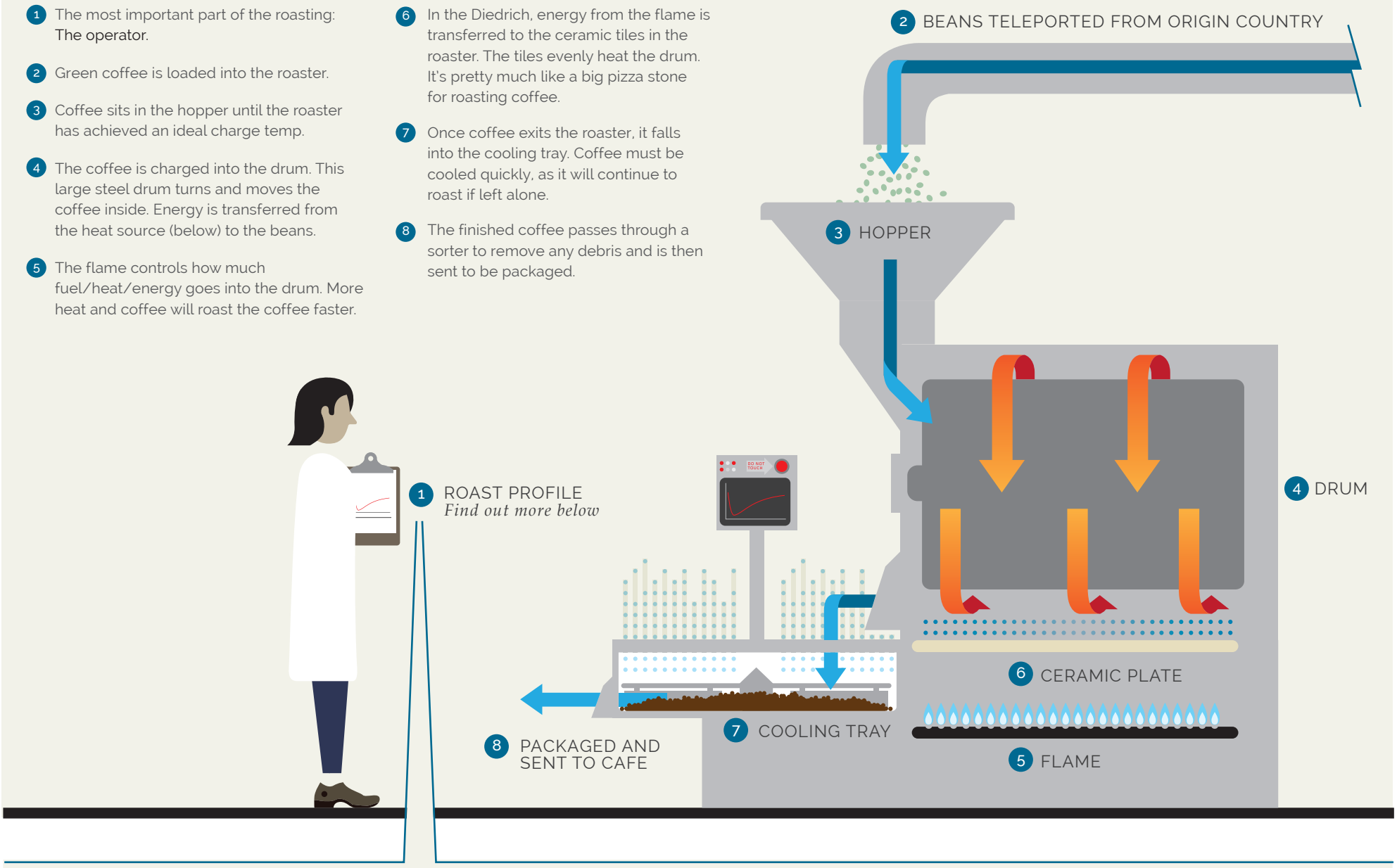
HOW DOES ROASTING AFFECT FLAVOR?

A case study on roasting, featuring three unique profiles on a coffee from MICEPA, Costa Rica.

ANATOMY OF A COFFEE ROASTER

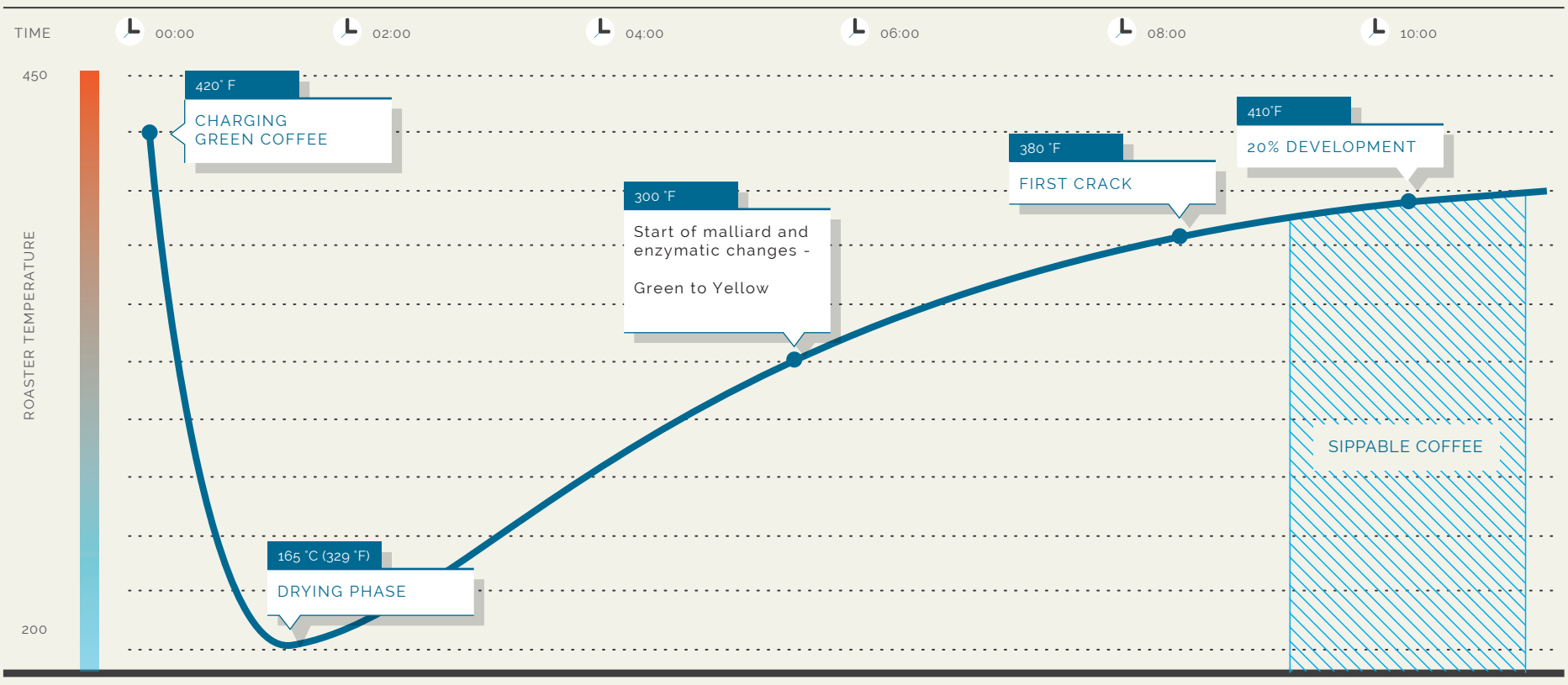
Coffee undergoes chemical and physical changes that allow it to become drinkable in the roaster. At Stone Creek Coffee, we use a Diedrich CR-60, which is a drum roaster that is heated via atmospheric and infrared heat.

1. The most important part of the roasting: The operator.
2. Green coffee is loaded into the roaster.
3. Coffee sits in the hopper until the roaster has achieved an ideal charge temp.
4. The coffee is charged into the drum. This large steel drum turns and moves the coffee inside. Energy is transferred from the heat source (below) to the beans.
5. The flame controls how much fuel/heat/energy goes into the drum. More heat and coffee will roast the coffee faster.
6. In the Diedrich, energy from the flame is transferred to the ceramic tiles in the roaster. The tiles evenly heat the drum. It's pretty much like a big pizza stone for roasting coffee.
7. Once coffee exits the roaster, it falls into the cooling tray. Coffee must be cooled quickly, as it will continue to roast if left alone.
8. The finished coffee passes through a sorter to remove any debris and is then sent to be packaged.



WHAT IS A ROAST PROFILE?

A roast profile is a map of the roasting curve and all elements charted during the roasting process. Consider it a navigation map. On the left side of the curve, coffee is charged into the roaster. Once the coffee and drum reach thermal equilibrium, heat first makes its way into the moisture in the bean. About halfway through the profile, the color of the coffee changes, signaling enzymatic and non-enzymatic reactions. About 4/5 of the way through the profile, coffee reaches first crack, where the bean fractures and "pops," releasing pressurized gases and aromatics. From this point, coffee is developed to make it more soluble, or to develop more sugar browning or dry distillation flavors.



To find out more about our roasting, visit www.stonecreekcoffee.com.

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