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# LEAVING THE DARK SIDE



## THE FORGOTTEN ART OF LIGHT ROASTING

BY  
JOACHIM EICHNER

A GOOD ROASTER, in my view, is a master at roasting both light and dark coffees, and knows how to match a good roast profile to a given batch of green coffee.

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Light roasting does justice to the subtle flavors in many excellent green coffees, flavors which are completely lost when a roast is too dark. Light roasting demonstrates a roaster's true skill in bringing out the best in a good green coffee. And yet, I see more and more roasters roasting their coffees on the dark side.

It is a trend that began on the West Coast, and now coffee roasters across the country are jumping on board. It seems the adjectives "dark roast" and "good, strong coffee" have become synonymous. This is simply not true. Some coffees, of course, do taste great when roasted dark. However, a large part of the dark roast trend is simply that: a trend. Of course there are other reasons why dark roasts are appearing everywhere. Some are untrue beliefs based on perception; for example, the belief that darker coffees are stronger and contain more caffeine. In fact, the opposite is true.

Some genuine reasons also play a role in the increase in dark roasting. Light-roasted coffees can have an unpleasantly acidic taste character or can lack body and strength. In an attempt to overcome these shortcomings, we sometimes roast coffee to a darker finish. While this is a quick fix that helps in producing a fuller body and less acidic taste, the solution seems to me to be a bit extreme. Dark roasting, when used indiscriminately, buries the true flavor of coffee in an ill-informed attempt to suppress undesirable effects.

It is time to reconsider the forgotten art of light roasting. It is an essential skill any good roaster needs to have, and a few light roasts should be a part of any roaster's line of coffee offerings.

### Who Should Join the Light Side?

If you are a specialty roaster who places a lot of value on quality and a unique product, light roasting will give you a wide spectrum of flavor possibilities. This will help set you apart from and provide alternatives to the darker roasts offered by many of the well-established commercial roasters.

Light roasting isn't just for small roasters. Large-scale commercial roasters can also benefit from roasting light. Not only does a light roast preserve the delicate flavors of a coffee, it also helps decrease the amount of bean shrinkage. Light-roasted beans typically show eight to 10 percent less shrinkage than dark-roasted beans, translating into potential financial savings.

For small and larger roasters then, light roasting offers distinct advantages and benefits.



### What Is Light Roasting?

With the advantages in mind, what exactly is light roasting? What's so great about it? Oren Bloostein, owner of Oren's Daily Roast in New

York, says, "Light roasting, light enough so there is no oil on the bean surface, or perhaps just a hint of oil after a day or so, is suitable for coffees that have a more delicate character. A great Ethiopia Yirgacheffe comes to mind. The light roast complements and supports the brilliant citrus notes, the flowery aroma, the sincerely delicate flavor that so subtly covers the palate."

cup. Most companies use an Agtron reading around 55.00. This may be great for a Central American but not an Indonesian. But to really bring out the full taste profile for a light roast, tools like Agtron and color disks are only tools of the trade. The palate should make the final decision."

### Chemistry of Roasting Determines Flavor

Roasting is a chemical process that yields different flavors at different stages. Given the complexity of coffee chemistry, we should be aware that a) one type of roasting (such as dark roasting) is not an adequate way to fully exploit coffee flavor potential and b) light roasts preserve some excellent compounds in coffee that are desirable.

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Other roasters define light roasting slightly differently. Todd Curtis, master roaster at Green Mountain Coffee Roasters, believes that "light roasting is a manipulation between green coffee character, cupping, air flow to the burner chamber, time, burner temperature, batch size and thermo couplers. It is truly an art, like mixing colors. It depends on mixing all of the above in various ways for each individual green origin to achieve the full potential taste profile a roaster is looking for."

This description might sound intimidating, but it really isn't. There are a variety of resources available to help roasters gain a better understanding of light roasts. A good place to begin is to use the SCAA/Agtron Roast Color Classification System as a guide in your light roasting and blending.

As you may have gleaned, the distinction between light roasts and medium roasts is a very fine line. "Not all roasted coffees should be treated the same," says Curtis. "The end result is in the

**Table 1. Roast Color Impact on Cup Flavor**

*(From the presentation handout of the Coffee Blending Workshop presented by Victor Allen Mondry at the SCAA Conference in 2001)*

SCAA Tile	Temperature	Roast	Weight Loss	Cup
75	420	Moderately light	15%	Bright, sharp
65	430	Light medium	16%	Milk chocolate
55	445	Medium	17%	Caramel, dark chocolate
45	460	Moderately dark	19%	Smoothly smoky
35	470	Dark	20%	Pungently smoky

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**Table 2.**  
**List of Volatile Compounds and Their Maximum Concentration During Roasting**

Volatile Compound	Aroma Characteristics	Roasting Stage of Maximum Concentration
5-Methylfurfural	Light, fruity, floral	Light and medium
Furfural	Grassy, hay-like	Light and medium
Acetic acid	Adds snap	Medium
Furfuryl alcohol	Bitter and burnt	Dark
Pyridine	Disagreeable odor and sharpness	Dark
Cyclopentanone	Sweet, fruity, burnt sugar	Dark
Phenol	Smoky, spicy, clove-like and bitter	Dark

Coffee flavor is the result of a large group of complex heat-activated reactions that occur during roasting. One main group of reactants is known as volatile aromatic compounds. These are the most researched group of compounds. We know more about how this group of compounds plays a role in development of taste than any other group of chemicals found in coffee.

Within this group, researchers have identified approximately 850 volatile aromatic compounds in roasted coffee so far. This number is more than in any other material used as food or drink, including red wine! Fortunately, it is likely that only a handful or so of these compounds are present above their respective odor detection thresholds. Those aromatics are known as aroma impact compounds. Unfortunately, this does not mean that the others play no role whatsoever. The influence of these sub-threshold chemicals on the overall fate of reactions will become clear soon.

Obviously, the aroma chemistry of coffee is highly complex, even before one considers that aroma is not due simply to an additive effect of the volatiles. Not only do individual compound concentrations markedly affect that compound's perceived odor, different volatiles also complement or antagonize each other, whether their odor is perceptible or not. Moreover, some volatiles increase significantly when roasting is prolonged, while others decrease. Strong compounds that are formed during the later stages of roasting may overpower other compounds. Some of the acids and bitter agents present in coffee play at least as large a role in flavor generation as these compounds, but relatively little is known about these agents and their specific influence. By the time you cup a batch of roasted coffee, a Trojan war of chemical compounds has just concluded.

Although the chemical pathways have not yet been mapped out completely, we know that roasting conditions have a major impact on the physical and chemical

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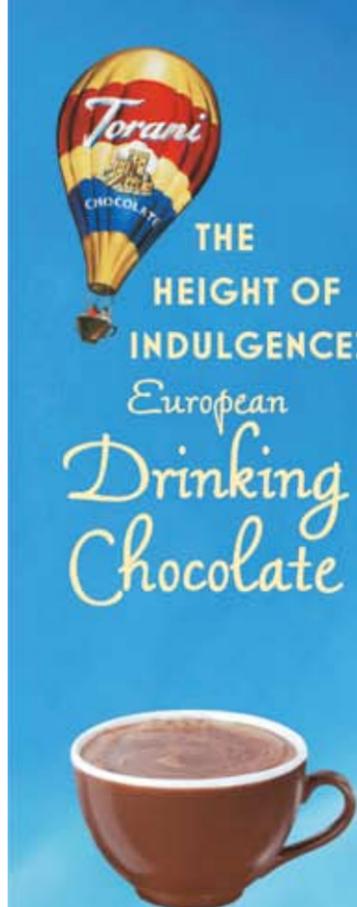
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**ABOUT VOLATILE COMPOUNDS**

THE AROMA CHEMISTRY of coffee is highly complex. To date, chemists and food scientists have a very incomplete understanding of the aromatic compounds in coffee and their interaction. One chemical group that plays an important role in determining a coffee's flavor is the group of so-called volatile aromatic compounds.

During the roasting process, these aroma compounds are formed by pyrolysis (the heat-induced decomposition) of the water-soluble components contained in the bean, such as sugars, amino acids and Trigonelline.

More than 800 different volatiles have been identified in roasted coffee. Recent research has centered on the sensory relevance of these volatiles and the identification of key odorants in coffee beans and the brewed coffee beverage.



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properties of roasted coffee beans. Different time-temperature histories lead to distinct aroma compound profiles. A dedicated specialty roaster who continually strives to optimize the flavor and quality of his roasted coffee should work on creating specific bean temperature profiles for every bean variety he uses. Profiles that provide optimal flavor development can be determined through cupping roasted coffees produced by means of different candidate profiles.

I usually advise roasters to try roasting their beans for a slightly longer or shorter time and to play around with higher or

lower temperatures during the early and later stages of roasting. Ensure that your own experiments are not a waste of your time by documenting everything you do, including seemingly innocuous parameters such as barometric pressure, room temperature and humidity. If you are using a control system, make sure it is responsive to your profile adjustments immediately in real time and that it is not just logging data. In all stages, use cupping as a guide to help you develop your roast profile. All this applies to dark roasts, too.

Table 2. on page 44 details the main compounds and reactions that occur in light roasting.

### Knowledge and Tools Get You There

Roasters always ask me how to change their roast profile to underline the flavors of the coffees while avoiding the pitfalls of light roasting. Well, simply dropping the end temperature will not do it.

Once a roaster has settled on a profile for a specific type of bean, close control of the time-temperature curve is needed to obtain consistently the required aroma quality. Achieving consistent quality of every batch is now easier through automation and profile roast systems that help a roaster to create and then exactly reproduce a desired flavor profile.

*Nearly 30 percent  
of consumers intensely dislike  
the taste produced by  
malic acid in roasted coffee.*

In the 19th ASIC colloquium, Stefan Schenker of Nestlé, Switzerland notes, “Roasting technology cannot make up for poor quality of coffee beans. However, for a given type of a green coffee bean blend, roasting is the main flavor (odor and taste) determinant. The time-temperature conditions during roasting influence the bean core temperature, dehydration and pressure, which, in turn, determine the specific conditions for aroma formation reactions. They are the major factors impinging on the potential of green coffee beans, leading to the formation of the distinct and desirable profile of aroma compounds.”

I would extend his argument further: excellent beans deserve to be appreciated in their complex subtlety, and light roasting with extreme care is the best complement to superb green coffees.

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Roasters I work with are always excited to discover just how valuable tools such as chemistry and automation can be to taste development. When it comes to light roasts, roasters can experiment with different time/temperature conditions and learn where to tweak their roast temperatures. For example, roasters need to meet the challenge of maximizing fine acidity, but avoiding undesirable acid notes. Nearly 30 percent of consumers intensely dislike the taste produced by malic acid in roasted coffee.

### The Tyranny of One Perfect Roast

There can be an optimum range of good roasting for any given green coffee batch, but there is no such a thing as a “perfect” roast across all green coffees. The roaster needs to know what flavor profiles best suit any given coffee, and what flavor profiles his customers like, and balance these two considerations.

My aim here is not to demonize dark coffees. In many areas of the United States, consumers show a distinct preference for darker coffees. Developing the distinctive flavor characteristics of dark coffees is an art in itself, requiring much more than simply extending the time of roast or raising roast temperatures. The roaster has to keep close control of the roasting process. A good espresso coffee, for example, should have a nice, smooth character, which should not be overpowered by strongly acidic notes. If the espresso shot is to be used in a latte or other mixed-coffee drink in which milk is used, however, the coffee should be given a stronger flavor profile in order to be a complement to the milky taste.

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All this is to show that a variety of roast profiles and the means to consistently achieve them constitute the skills and tools of a good roaster. And especially for light roasts.

Light roasting appeals directly to the core philosophy of the specialty coffee industry, which has built its reputation on the high quality and sophisticated taste of their coffees. Much emphasis is placed on the characteristics of coffee, such as origin and cup profile. Over the last decade, specialty coffee roasters have succeeded in teaching coffee drinkers to enjoy a cup of coffee and appreciate various aesthetic, geographic and even philanthropic aspects of the

*Now you are in a bind:*

*you need to please your customers'*

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*the full range of possible flavor.*

cup. When we have gone so far in creating space for the subtleties and individualities of various coffees, must we not maintain them in the cup by ensuring that they are not lost due to aggressively dark roasting?

### Blend In for Outstanding Results

According to Oren, "The darker a person roasts, the narrower the available flavor spectrum that is available to taste. If the coffee is truly a premium type that has all the interesting characteristics of its origin—the quirks, the subtle differences that separate the Sumatra from the Celebes, the Antigua from Huehue or Fraijanes—these would be lost in the dark roast."

Now you are in a bind: you need to please your customers' dark desires but not compromise the full range of possible flavor.

Blending offers an ideal solution for the specialty roaster who is aware of his customers' preferences for dark roasts, but nevertheless seeks to incorporate subtlety and complexity to his roast. Blends of dark and light roasts can contribute to an overall feeling of strength in coffee. They provide not only an expanded palate experience, but also a balance. This is accomplished by preserving the subtle and delicate flavor notes that are optimized in lighter roasts and by adding the improved body and bitter notes of a carefully crafted dark roast.

### Seeing the Light

A roaster's passion is to roast his green beans the best way possible. The perfect light roast will allow a roaster to develop the flavor characteristics and subtle notes contained in his green beans to perfection—this requires skill, close control of the roast process, educating the customer and cupping, cupping, cupping. The challenge of light roasting is not an excuse to hide in the dark.



JOACHIM EICHNER is the chief engineer of Praxis International Inc., a process control and automation technology company for coffee roasters and food processing companies. He can be reached via e-mail at joachim@praxisinc.biz.

### Further Reading

Clarke, R.J. and Macrae, R. (Eds.), *Coffee. Vol. 1: Chemistry*, 1985: London.

Flament, I. and Bessière-Thomas, Y., *Coffee Flavor Chemistry*, 2002: Chichester.

Schenker, S. et al. *Impact of Roasting Temperature Profiles on Chemical Reaction Conditions in Coffee Beans*, Proceedings of the 19th Colloquium of the Association Scientifique Internationale du Café (ASIC), 2001: Trieste.

### Resources

Specialty Coffee Association of America/Agtron Roast Color Classification System (R400100)—this can be ordered directly from the SCAA.

Lingle, Ted R., *The Coffee Cuppers' Handbook: A Systematic Guide to the Sensory Evaluation of Coffee's Flavor*, 1992: Washington D.C.



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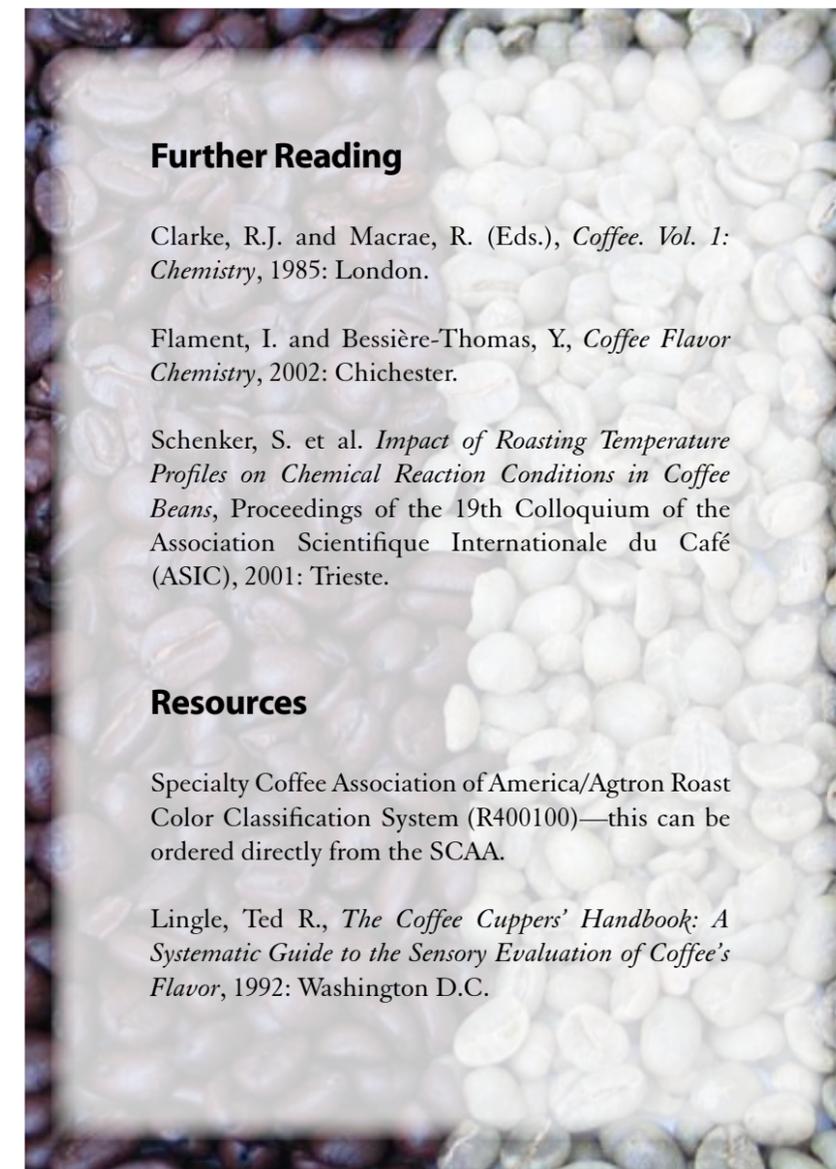
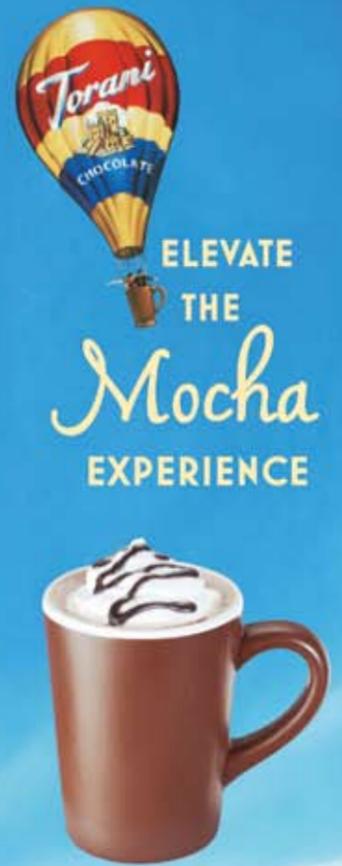


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