THE LANGUAGE *of* COFFEE FLAVOR

A Century of Tasting in Review

By Kat Melheim

THE CURRENT ITERATION OF THE Coffee Taster's Flavor Wheel, now ubiquitous at coffee events and on the walls of cupping labs worldwide, celebrated its sixth anniversary this past June. It was less than 30 years ago, in 1995, that the first edition was released by the Specialty Coffee Association of America (SCAA, now SCA). Before that, there was no visual representation or common language for flavor in the coffee industry. In the grand scheme of a centuries-old coffee trade, we have seen a massive amount of innovation within a relatively short time.

In this article, we explore the history of coffee vocabulary, recent scientific and technological advancements (including the Sensory Lexicon and the Coffee Taster's Flavor Wheel), the limitations of the current system and opportunities for future development. So, grab a spoon and come along for the ride as we explore this beautiful, yet sometimes controversial, resource.

BEFORE THERE WAS FLAVOR, THERE WAS…

In the early days of the global coffee trade (prior to the 19th century), consumers purchased raw coffee and roasted it at home. Coffee was used for its cognitive effects and supposed medicinal benefits, rather than how it tasted. The vocabulary and literature of the time reflect that. In a 1722 book, *The Domestick Coffee-Man*, English coffee merchant Humphrey Broadbent uses words like sour, flat, distasteful, smooth, pleasant and strong to describe coffee's flavor. He was primarily instructing people on how to roast and brew coffee in their homes for the best (or least-worst) results,

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but there wasn't much nuance. Medical doctor Benjamin Moseley used words like excellent, superior, disagreeable, delicate and exhilarating in his 1792 book *A Treatise Concerning the Properties and Effects of Coffee*. Again, a slew of adjectives, but no specific flavor notes that tell the reader what the coffee would actually taste like.

By the 20th century, large-scale manufacturers had created a booming global business in coffee roasting. Green coffee was bought and sold in large quantities—generally differentiated only by origin country—and price was based on a coffee's physical appearance (i.e., bean size, presence of defects or physical damage), rather than specific flavor characteristics. Coffee was being marketed by these roasters as a ground, pre-packaged product, thus buying by taste rather than appearance gave the roaster more quality control over the taste of the finished product.

A CENTURY OF COFFEE FLAVOR NOTES

Then, in 1922—100 years ago—William Ukers, editor of the American publication *The Tea and Coffee Trade Journal*, released a comprehensive reference book titled *All About Coffee*. And it was just that. The 800-page pseudo-encyclopedia is a conglomeration of the recorded information available at the time on coffee's history, cultivation, preparation, social significance, trade/industry and more. The book was released when "cup-testing"—the precursor to what we know as coffee cupping—was becoming a universal practice for evaluating green coffee's potential value. A much more reliable system than judging green coffee solely by its appearance, this process introduced the concept that green coffee's value should also be determined by the flavors that were present in the cup. Ukers explains that cup-testing was used by the buyer "to determine the merits of the coffee he is buying, and [by the seller] to ascertain the proper value" of the coffee.

Nestled in a paragraph on cup-testing in a chapter titled "Green and Roasted Coffee Characteristics," Ukers notes that an experienced cup tester might taste several things in the coffee. He lists 17 flavor characteristics: "If the drink has body and is smooth,

rich, acidy, or mellow; if it is winy, neutral, harsh, or Rioy; if it is musty, groundy, woody, or grassy; or if it is rank, hidey (sour), muddy, or bitter." It is worth noting that most of these flavor attributes are more negative than positive, and none exactly specific. But they weren't meant to be. Remember, the cup-testing method was used by coffee buyers and sellers to determine the value of a coffee largely based on the presence or absence of defects.

Over the next 60 years, the coffee industry expanded and, along with it, so did the vernacular of the industry. In 1974, Erna Knutsen coined the phrase "specialty coffee" to describe the better-tasting beans she was buying and selling. The term indicated that some coffee was better tasting than the rest, but the industry still lacked a universal language for conveying specifics. Early pioneers such as Alfred Peet (Peet's Coffee & Tea) and Jerry Baldwin (Starbucks) could be credited with beginning the commercialization and popularization of these specialty coffees, bringing their attributes to public awareness.

INVENTING THE WHEEL

The first recognizable "flavor wheel" was developed, not for coffee, but for beer. In the 1970s, M.C. Meilgaard created the eponymous Meilgaard System, a written

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classification system that sought to link certain styles of beer with consistent flavor characteristics. In 1979, Meilgaard harnessed the vocabulary of his system and released a Beer Flavor Wheel in an attempt to disseminate this knowledge to a wider audience through this visual representation.

Shortly thereafter, in the 1980s, Dr. Ann C. Noble, a flavor scientist and professor at the University of
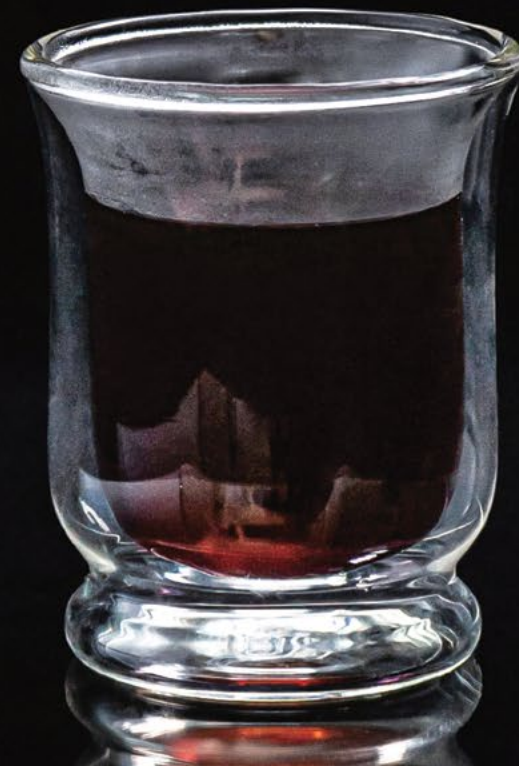

SCA — Coffee Taster's Flavor Wheel
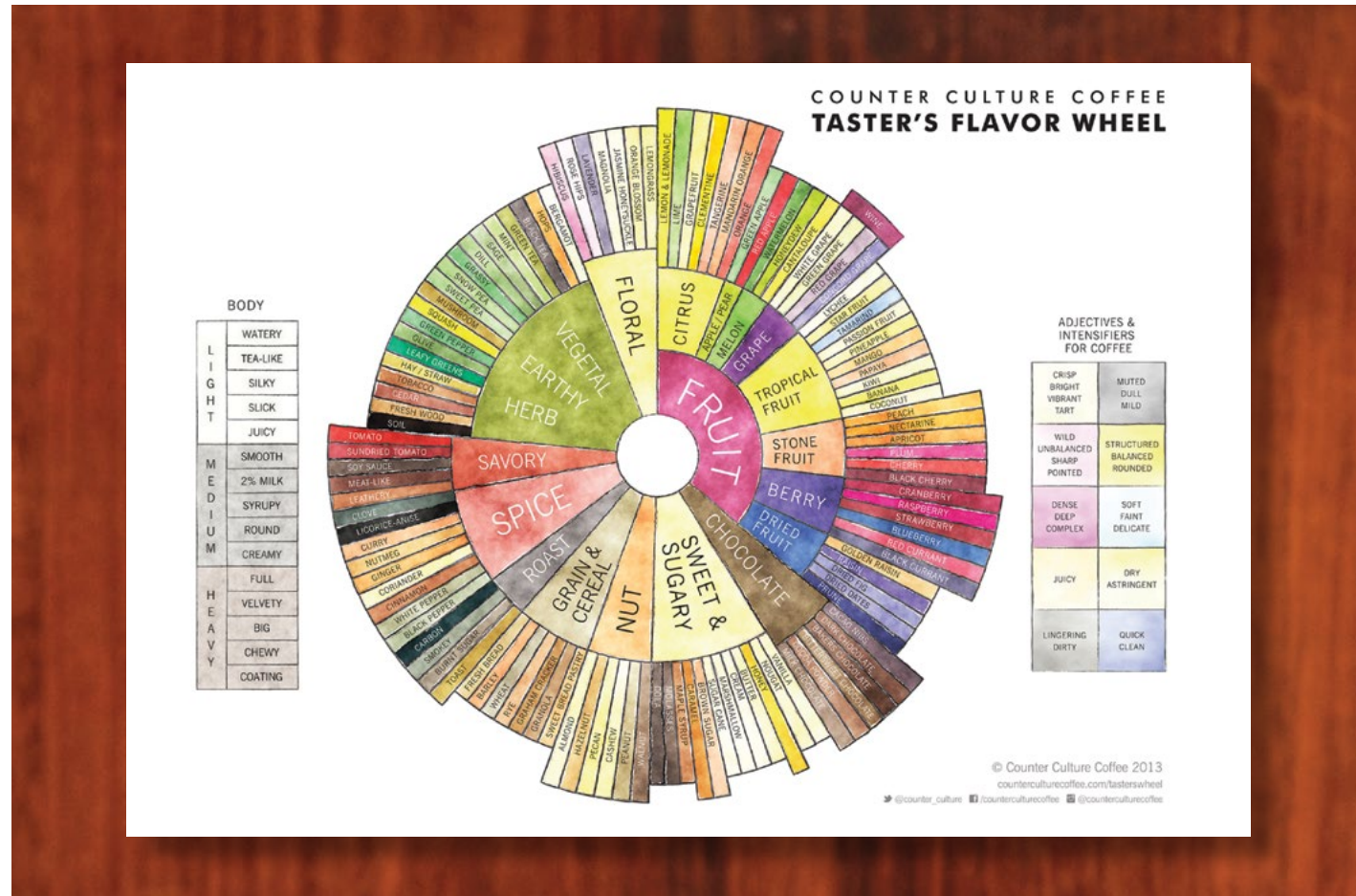
COFFEE TASTER'S FLAVOR WHEEL CREATED USING THE SENSORY LEXICON DEVELOPED BY WORLD COFFEE RESEARCH
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California, Davis, developed the Wine Aroma Wheel. Dr. Noble taught wine sensory evaluation and conducted research on the flavor attributes of different wine varietals.

It was on the heels of these innovations that the first Coffee Taster's Flavor Wheel was created. In the mid-1990s, Ted Lingle, executive director of the SCAA at the time, led the creation of the first iteration of the Flavor Wheel or—more accurately—Flavor Wheels (one for taste/aroma attributes and one for defects). With words for 82 defects, 28 tastes and 66 aromas, these wheels standardized 176 flavor notes throughout cupping labs worldwide.

Almost two decades later, in 2013, Counter Culture Coffee—a specialty coffee roasting company in Durham, North Carolina—released its own Taster's Flavor Wheel, a project driven by the company's then-coffee buyer and quality manager, Timothy Hill. It was designed to be applicable for coffee education and approachable for the coffee drinker. This wheel was built not on green coffee chemistry, but from practical experience working in a roastery. "Over the course of maybe like eight months or a year, we pretty much started writing down every descriptor we used in the lab, and if they were outlandish, we would eliminate them," Hill says. He then reached out to other roasteries and shared the list, asking if any critical notes had been omitted or if any were unnecessary. Like the SCAA, Counter Culture actually developed two wheels—one for flavors and one for faults. Additionally, the company added a column for body (also referred to as tactile), and a word bank of adjectives and intensifiers, both of which provide sensory descriptors not captured by flavor itself. All in all, this wheel called out 223 characteristics—a 26 percent increase over the SCAA's 1995 model.

Hanna Neuschwander presents at Roast Summit in Portland, Oregon, in January 2020, displaying a Spanish-language version of the Coffee Taster's Flavor Wheel. *Photo by Juan José Sánchez Macías*

A NEW ERA IN SENSORY SCIENCE: THE SENSORY LEXICON

These wheels, along with updated cupping protocols and other programs developed by international coffee trade organizations, have provided standards and a common vernacular for the global coffee industry. The early 21st century saw accelerating growth and change: Coffee flavor was further differentiated through innovations in processing methods at origin and a growing number of micro-roasters in consuming countries; the consuming public developed a taste (and budget) for higher-quality coffee; and the implications of climate change became more apparent to coffee scientists working at the farm level. While the existing flavor vocabulary was relatively useful, educational and pervasive, the industry recognized that a more robust tool was needed to address the challenges that climate change is presenting to coffee.

Founded in 2012, World Coffee Research (WCR) is a "collaborative research and development program of the global coffee industry to grow, protect and enhance supplies of quality coffee while improving the livelihood of the families who produce it." The organization's research is vast, and one major project focuses on longitudinal studies of coffee trees in a variety of countries and climates worldwide. WCR evaluates, among other things, plant growth, crop yield, and—yes—flavor characteristics. A yardstick for growth. A weight scale for yield. But what could be used to measure flavor?

When WCR began its research, no such tool existed, so it set out to create one.

In collaboration with sensory scientists at Kansas State University and Texas A&M, WCR worked with professional tasters to test a wide variety of coffees to determine all the possible flavors they could detect. The team then consolidated that list into around 100 specific and measurable flavor attributes that became the organization's Sensory Lexicon.

Released in 2016 and revised in 2017, this 54-page flavor dictionary lists, describes and provides specific references for 110 aroma and flavor attributes detected in coffee. (It is worth noting that, though 110 flavor attributes were chosen to be represented in the Sensory Lexicon, it is by no means comprehensive of all the flavors that can be experienced in coffee. It was not meant to list all possible flavors that a person could taste, but rather to provide a reference bank for scientific sensory analysis.)

In a session presented at the SCA's 2019 Re:co Symposium, Hanna Neuschwander, director of communications for WCR, explained:

"Another tool that we need is an objective, repeatable, measurable system for looking at what are the actual flavors and aromas present in a given sample of coffee. Cupping is a really wonderful tool, but we now know through good, rigorous research that it's not very replicable. Different cuppers give different answers. Sensory descriptive analysis is a process where trained tasters, professional tasters who are trained and calibrated on a particular methodology, use a tool, the World Coffee Research Sensory Lexicon. … They can take a coffee sample and they can evaluate

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what flavors are present in it and at what intensity level. ... It works because they taste the samples next to reference materials for those different flavors and aromas."

The intended use case for this lexicon was not to allow the casual coffee drinker, or even a professional cupper, to taste coffee more accurately. It was developed for specific research into the flavor characteristics created by the interaction of a coffee tree's genetics and the environment where it was grown. It was created to be used in a research lab, not a cupping lab.

REINVENTING THE WHEEL (WITH SCIENCE)

Though the Sensory Lexicon was created for scientific research, the leadership of the SCAA recognized the potential to revamp the Flavor Wheel using this new dictionary. So, using the Sensory Lexicon as a database, the organization partnered with the University of California, Davis—working with food scientist Dr. Jean-Xavier Guinard and Molly Spencer, a Ph.D. candidate at the time—to turn this lexicon list into a compelling visual representation of the flavors available in coffee.

The process involved complex computer programs and mathematical modeling software, using the latest in sensory and data technology. In order to ensure this tool would be scientifically accurate and applicable to the coffee industry, the SCAA recruited both non-coffee sensory descriptive experts as well as coffee industry professionals. In total, 72 tasters were involved in the study. Their job? To evaluate 99 flavor attributes and give input on how closely related to one another they were. Each person in the study completed their own wheel of sorts, placing flavors they thought of as similar together. The team took all that individual input and ran an agglomerative hierarchical cluster analysis—a high-powered statistical model that crunches all the numbers and creates a flowchart based on averages. This produced a detailed view of what flavors were similar to each other and how similar they were, according to the group. Finally, they picked out nine major flavor categories from which all the other flavors flowed.

After the science came the art. The SCAA hired UK-based design firm One Darnley Road to create a visual interpretation of the data. The design firm laid out the wheel in concentric circles, starting with those nine major flavor categories in the middle and working outward toward more specific descriptors. The designers played with spacing, ensuring that flavors recognized as similar were touching and flavors recognized as less similar were further apart. And they used color, performing Google searches for each

of the flavor attributes and mixing a shade that would be most appropriate to each. The result of this work is the iconic kaleidoscope of flavors we call the SCA Coffee Taster's Flavor Wheel.

LIMITATIONS, SHORTCOMINGS AND CRITICISMS

Though the Sensory Lexicon and resultant Coffee Taster's Flavor Wheel were the result of rigorous sensory science and technology, these tools are by no means infallible. Both resources have come under criticism for being American-centric and inaccessible to many coffee professionals, particularly in producing countries. Peter Giuliano, executive director of the Coffee Science Foundation, notes that listed flavors blueberry and maple syrup are nearly nonexistent in many parts of the world. Meanwhile, mango—a fruit that is nearly ubiquitous in tropical regions—is not

included. And the smell of potato, the unmistakable indication of potato flavor defect in some African coffees, also was omitted.

The authors of the Sensory Lexicon address these critiques in the introduction section of the lexicon itself. Listed under the heading "A Note on What the World Coffee Research Sensory Lexicon is Not," they note that this tool is *not*:

A replacement for cupping or other sensory tools: Rather, it can be used as a compliment to cupping for coffee producers, buyers and other professionals.

Truly global: The lexicon authors are upfront about the fact that many of the flavor references are "only widely available in mass market grocery store chains in the United States," explaining that this is due to the fact that most coffee-related research applications will be conducted in labs within the United States. It also notes that version 2.0 of the lexicon does include flavor references that are more widely available around the world.

Finished: Instead, it is meant to be an evolving document that can, should and will change as the landscape of coffee changes. New varieties, processing methods and brew techniques will impact the flavors available in coffee, which will be taken into account for future versions.

A tool for evaluating defective coffees: The lexicon is purely a descriptive tool and thus "value-neutral." It does not seek to label good or bad flavors, but rather to identify objective flavor attributes that either are or are not present in a coffee.

"The problem is, you've got to choose 110 words, and every coffee taster probably has a sensory vocabulary of thousands of words that are very important to them, both personally and culturally," Giuliano says. Of course, we could continue to list and map more and more descriptors until every possible flavor note was included, but at what point would that tool cross from being more inclusive to less useful? Both WCR and the SCA have been transparent about the original intended uses for the Sensory Lexicon and Coffee Taster's Flavor Wheel—to objectively identify and quantify flavor attributes in a research lab setting. These tools, though spread widely, were not developed

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to be universally applicable or culturally transcendent, even if we wish them to be.

There are companies, organizations and people around the world creating their own versions of a flavor wheel to accomplish their own particular goals. Mare Terra Coffee, a green importer based in Barcelona, Spain, released a Coffee Descriptors Wheel in 2021, available in 25 different language-specific versions, describing it as "a common language for the whole coffee chain" with "an adaptive model, involving the subtleties of a language in each of the different translations." Keen Coffee in Amsterdam created a hyper-local flavor wheel, including only flavor notes the company sees in the coffees it roasts and releases.

Hill says he's seen non-English translations of the Counter Culture wheel—some that try to translate word-for-word and others that adjust the vocabulary based on cultural and gustatory context. And a featured video on James Hoffmann's YouTube channel by India-based creator Aramse titled "Decolonizing Coffee Through Flavor" encourages viewers to use proper scientific channels and flavor analysis to create more localized flavor wheels for their own communities.

THE FUTURE OF FLAVOR

The Sensory Lexicon was last updated in 2017, SCA's Flavor Wheel hasn't changed since its initial release in 2016, and the Counter Culture Flavor Wheel has been the same since 2013. These tools were created as living documents—resources meant to evolve and change as coffee itself changes. So, what comes next?

For Hill, it's about recognizing the pitfalls but not allowing those limitations to paralyze innovation. Because flavors are so contextual and culture-based, he says, there is no way to have one wheel that is universally applicable. He questions how our industry can keep an infinite amount of flavor notes organized, updated and representative of the myriad cultures and people it attempts to cover. His answer: "To a certain extent, I think you have to take some control away from it and let it be as close to a living document as you humanly can. There are going to be mistakes that happen, but the goal of these flavor wheels is to help guide people through tasting coffee. They're never going to be perfect. How do you make a living document for as many cultures as you humanly can? That's the thing that I want to see and has always been the challenge of these tools that we put out."

Giuliano believes the next step lies not in the Flavor Wheel itself, but in how it is used. He says the industry should focus more on consumer research and data analysis to detect regional trends and country-specific preferences for coffee flavors. "If we can conduct research about which sensory attributes are more valuable in the marketplace ... and then publish that data so that people can make better decisions about how to market their coffee and get the best possible prices for their coffee," he says, "that's the next big thing."
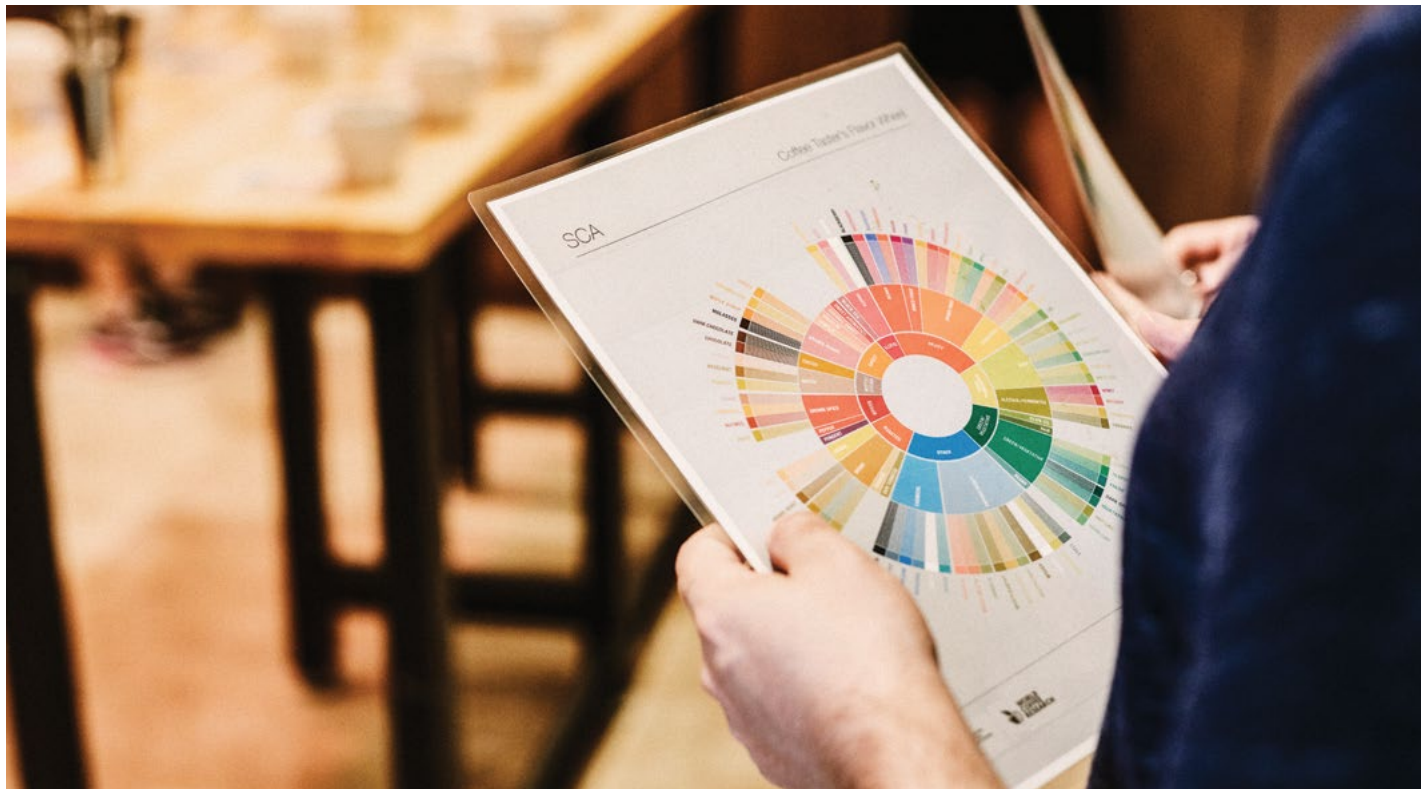
Greater Goods
Coffee Co. training
lab in Austin,
Texas, uses a Coffee
Taster's Flavor
Wheel for training.
Photo courtesy
of Greater Goods

WHAT'S NEXT?

As we reflect on the past century of coffee flavor descriptors and tools, we have come a long way—from the imprecise "disagreeable, delicate, exhilarating" to the specific, replicable and measurable "Oregon Fruit Products Blueberries in Light Syrup (canned); Aroma: 6.5; Put 1 teaspoon of syrup from canned blueberries in a medium snifter. Cover" (the Sensory Lexicon's reference for blueberries). Innovations in sensory science and technology, developments in processing and biology, and a growing market for high-quality flavor-focused coffees have all impacted how we talk about the taste of coffee. And they will continue to do so.

When all is smelled and done, we must remember to keep things in perspective. Hill notes that, though we can get caught up in the technicalities of flavor and the cultural biases implicit in the system, the thing that pushes this industry forward is our appreciation of flavor itself. "That's why specialty coffee exists," he says. "That's why most of the people are doing what they're doing, it's because of the way the coffee tastes. The Flavor Wheel is such a staple at this point in coffee, and it's just there, and it's been there. We don't think about it that much. You can roll your eyes at this tool because it is so ubiquitous and has become an industry standard. But I don't want coffee to lose sight of how important focusing on this element is, because I think it's the thing that draws everyone in."

The words we use are important. The way we talk about flavor matters. But above all, we must remember why we're here in the first place—to experience, enjoy and share great coffee.

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