The Honey Flavor Wheel

A device to identify the complexities of honey, and how it came to be.

By M.E.A. McNeil

If you name it, they will come. The wine world has long known that putting words to tastes creates a memory palate that enhances experience. Wine tastings have transformed public discernment, with production more than doubled since 1995. Olive oil is following in what is a growing awareness of what we eat. Next up, beekeepers would like it to be honey.

For wine, it is still argued whether place really does impart flavor, the idea of terroir, but it is an indisputable fact that honeys are tastes of their environments. A world of bloom and season opens when a taster learns how varied the honeys are that come from different nectars. Most people have never had the opportunity to pause and savor the rich profusion, and when they do, where do they start? At this stage, few have descriptors beyond “sweet.”

Amina Harris has been evaluating honeys for 35 years; she and her husband Ishai Zeldner were very likely the first to promote and market American varietals as such -- which they continue to do with their son and daughter, Josh and Shoshana, as Z Specialty Food in Woodland, CA. “Over the years we have all learned the major characteristics,” said Harris. She was determined to share that depth of experience when she became the director of the U.C. Davis Honey and Pollination Center at the Robert Mondavi Institute for Wine and Food Science.

Her working committee includes members from the worlds of cuisine, ecology, sustainable agriculture, beekeeping, journalism, entomology, food marketing and nutrition. One of their missions is to promote the use of “authentic, high-quality honey.” Harris wanted to go beyond a publicity campaign by developing sensory criteria. She set about creating a codification, a cheat sheet for learning to taste honey in the form of a wheel.

The grandmother of all such wheels, a chart with radii expanding from the most generic terms to more specific around the rim, was developed for wine aromas at Davis by Ann Noble, now an emeritus professor. Before that, the great grandparent wheels were created for beer and Scotch. Of course, tasters of tea, or chocolate and sniffers of perfume have been at their jobs as long as those products have had mercantile value. Trained sensory panelists are commonly employed for many manufactured foods – everything from anchovies to yogurt.

Noble started her wine wheel in the ’80s by recognizing that market base could be increased by demystifying a product. “There has to be a way of educating the consumer so he has a clue as to what’s there.” She broke from the pattern of previous wheels by removing the causes for various flavors, which, she said, is more a professional concern. “If you demystify it you are less afraid of it. Everybody understands pineapples and everybody understands melons. That is not vague. On the other hand if you go on about complex, wonderful, the mystic afterglow, using all kinds of hedonic terms, what the hell are they talking about? Simply applying general communication skills to tasting is exactly the goal -- specific terms.” In her intensive sensory

Amina Harris is the director of the UC Davis Honey and Pollination Center at the Robert Mondavi Institute for Wine and Food Science. She sniffs the aroma of a honey. Photo Kathy Keatley Garveyhoney
evaluation class at Davis, Noble’s students learned to “listen with their noses.” She wanted a taster to be “like an explorer discovering a new ocean.”

A statue of Noble’s aroma wheel stands in the garden of The Mondavi Center at Davis, which has become a mecca for the evaluation of wine, beer and olive oil. Harris’ office is an orientation flight from the Sensory Evaluation area, where she sought out the doyenne of much of the smelling and savoring that goes on there, Sue Langstaff. She has been a consultant to the wine and brewing industries for over 20 years, identifying, guiding and calling out hype – sensory forensics.

When the Olive Center was added recently to the Institute, Langstaff created an olive oil taste panel, or, more accurately, a flavor panel. Such panels are typically made up of industry professionals, but Langstaff has another approach. She does not discount genetic ability, but the individual who can taste a pepper at one part per billion, like discerning a grain of sand on a beach, is unusual. She believes that sensory analysis is a skill acquired with practice; she has found know-nothings easier to train than know-it-alls. Average training, however, for a sensory panelist is 60 hours. Her screening process is entertainingly recounted in the popular book “Gulp” by Mary Roach, who tried for a seat as a taster but did not make the cut – more because she didn’t believe she could do it, according to Langstaff.

The olive oil panel is germane to this story because so many people trained for it were subsequently selected for a honey flavor panel. “From the standpoint of descriptive analysis, it doesn’t matter what you are tasting,” explained Langstaff. So it was that an eclectic group gathered at the Institute last April: Among them were 13 tasters that she’d trained for analyzing olive oil, with others experienced with wine, beer and chocolate. They sat expectantly at long tables, together with chefs, beekeepers and a restaurant critic, making 21.

Amina Harris began: “What we are trying to do here when we talk about honey, is to move the discussion from ‘It’s sweet or it’s dark-colored’ to a set of words that people can use to describe honey that other people can understand. This is our goal.”

Harris and Langstaff had gathered descriptive terms from the literature as well as from a mailing list of over a thousand beekeepers and bee clubs. They then eliminated vague or emotive terms, such as “perfume” or “fresh”, to come up with over 100 words...
for the panel to expand on or pare down. Harris drew on her experience to select honeys from around the world that display a wide range of aromas and flavors.

Langstaff made clear the seriousness of the participants’ commitment to concentrated attention. “Analytical sensory evaluation is what we’re doing here, and you are being trained to be analytical tools, instruments, measuring devices” she said. “We don’t care about the other part of this work, consumer testing that relies on subjective feelings, opinions -- how much you like the honey. So if someone smells jasmine, another smells straw, and another says it’s lovely, we only care about jasmine and straw. They are referential terms: they refer to specific objects that you can actually touch and smell. This is not easy to do. The task we are doing today and in the next few days is descriptive analysis – using words to describe the attributes of aroma, taste, flavor, texture and after-flavor of honeys.”

Noble said, in an interview 25 years ago, “The more precisely you file the information, the more easily you can retrieve it: That is the crux of learning.” To that end, Langstaff first established that each person had a basic tasting vocabulary.

Although humans smell thousands of aromas, they perceive only five tastes – sweet, bitter, salty, sour, and umami (a savory, broth-like flavor). Because all the honeys were assumed to be sweet, that descriptor was not to be used, even though there are variations in degrees of sweetness; Langstaff suggested that those could be evaluated in a more advanced session, “when we get better.” Salty and umami were set aside as irrelevant to honey for this purpose. So, testing samples for bitter and sour were placed in front of each panelist together with an additional sample to illustrate astringency. “We are learning a foreign language here, the language of honey. If I’m calling something bitter and you are calling it sour, we’re not communicating.”

**Sourness:** Citric acid brought on salivation to dilute the acid, followed by tartness and a distinctly sour taste. Because honey has acid in it, acidity and sourness are important descriptors.

**Bitterness:** Caffeine provided a strong experience of bitterness, first at the back of the throat and then throughout the mouth. Although humans are programmed not to like bitter tastes because poisonous plant alkaloids are bitter, the flavor adds interest to chocolate, coffee, beer and coffee. Almond honey is among those known to be bitter.

**Astringency:** Alum felt like eating the skin of a persimmon, described as though the inside of the were mouth being tanned, with the moisture drawn out of the skin – a dry, constricting, tactile sensation.

“‘Astringency is a touch, and bitterness is a taste,’” Langstaff explained. Mouth feel also involves temperature, viscosity, duration.

With the tastes explored, the group was directed to address the vastly greater vocabulary of aroma. At the back of the room stood “reference standards”, 64 wine glasses that Harris and Langstaff had painstakingly filled with physical samples that illustrate some words from the literature, grouped into categories. Some examples: the floral group had blossoms of jasmine, rose, honeysuckle, orange, peony; among nuts were almond, hazelnut, walnut, pecan; fruits included banana, cantaloupe, grape, mango; some spices were cinnamon, black pepper, nutmeg, clove, mint. Others ranged from mushroom to fir branch to green tea. None were defect aromas, since microbiological issues were not part of the inquiry.

Why such assiduous attention to putting words to scents? Olfaction accounts for 80 to 90% of the sensory experience of food. The nose functions like a gas chromatograph: aromatic volatiles are released by chewing, and they waft up to the upper reaches of the nasal cavity where they bind to nerve receptors that send a signal to the brain. Each receptor acts as a key to the lock of a particular kind of molecule; an odor can involve many molecules and therefore many signals that are perceived as a smell. This process is called retronasal olfaction.
About three percent of our genome is devoted to genes involved with scent, and each gene makes a receptor for an odor molecule. The number of these genes has increased through evolution; mammals, highly specialized smelling animals, have over 1000. But in humans, 300 or so have become dormant by mutation, although they are still active in other mammals -- the difference between ourselves and our dogs. Primates that have developed color vision have large numbers of these functionless scent genes, having traded smell for sight.

One reason that not many people notice the aromas of honeys may be that active sniffing is crucial to smell. Only five to ten percent of scent molecules floating in the air reach the roof of the nasal cavity. And it is difficult to dice out words for smells because smell, unlike other senses, is not consciously processed. In an ancient pattern, it is the only sensory information that is integrated directly into the cortical regions, to the centers for emotion and memory. So it is that a bite of Proust’s classic madeleine brought back a rush of childhood images. Langstaff said that her first impression of a flavor may be a color, an image, or a sense of warm or cool before she comes up with a word she has learned to name it.

“You have to train yourself to associate this way”, said Noble. “You can identify smells, but out of context is hard. People in her class learned to “listen to their noses. It’s so simple to do. It doesn’t require spending much time to just change focus a little bit. Not only have I given them the word peach, I have said this is a peach, smell it. It’s the kindergarten of the nose.”

Why not use lab equipment for this analysis? Langstaff points out that without a human, it would be impossible to assign sensory relevance to, for example, the 716 aroma compounds in pineapple. And “you can’t ask the consumer,” she said: “Their lexicon is ‘yum and yuck’.” The sensory evaluator needs to be as neutral as a gas chromatograph, “as analytical as Mr. Spock.”

Seated at their stations, the tasters were each presented with a tray on a heating pad holding six unnamed, numbered honeys in opaque containers. It was intentionally impossible to see the color of the honey. “We are focusing on only aroma, flavor and texture, not color”, said Langstaff, pointing out that humans rely more on sight than smell. “We don’t want to bias you with the color of the honey.”

It may be a puzzling step, given that the color of honey is standardized and used to value price. The Pfund grader gauges a sample on a scale divided into colors, which can range from water white to nearly black, with some red, green or even blue tints. Eva Crane found “a rough connection between color and flavor, in that honeys with delicate flavor are light whereas dark honeys normally have a strong flavor, but the reverse can also be true.” What it comes down to is that color is much easier to quantify than flavor, but blondes don’t necessarily have more fun.

Visual clues trump olfactory information, in part because visual input reaches the brain ten times faster. Olfactory neuronal transduction, messaging, is the slowest in the nervous system, and it is the sense most difficult to verbalize. The dominance of sight data was demonstrated in an experiment at the University of Bordeaux, where white wine was disguised as red and tasters used different descriptors than when they had tasted the same wine as white. Noble said she almost never looked at the color of wine when evaluating it.
The heating mats under the honey trays were there to concentrate the aromas. “For you to smell something the chemical has to be volatile,” said Langstaff. “It has to be able to adhere to your olfactory bulb. The heated volatiles rise to the headspace in the cup.” She instructed the tasters to tip the first lid to smell the gas above the honey. “What comes off is esters, floral compounds.”

Some began filling in notes, others closed their eyes and sniffed again, reaching for the words. Then a small spoonful held on the tongue and slowly swallowed produced more silent reverence, more jotting and some ohhhs. Brows furrowed: Restaurant critic Blair Robertson, asked himself: “Did I detect molasses? Or was it more like maple syrup?”

Tasting is the word used here, but what happens in the mouth and nose is both taste -- sensory input from the tongue -- and smell to combine as flavor. A sort digression, leaving the tasters to their ruminations, on the subject of supertasters: “It is an extremely misleading word,” said Langstaff. “They are not better tasters.” The popular concept came out of 1990s research on cancer patients with a drug, no longer used, that various patients found to be bitter, neutral or tasteless. It was found that the differences correlated to numbers of taste buds. So, as belief often gallops off with a small scientific fact, articles and television hosts exhorted the public to dye spots their tongues blue and count the papillae to determine how super they are. It went so far as to produce wine tasting panels with representatives of each taste group. There may be other characteristics of those called supertasters, but, said Langstaff, the taste measured is a particular bitterness, not a general genius of taste.

After quiet tasting, Langstaff led a discussion of what panelists found. “It tastes different than it smells,” was often agreed, as was “It changes as you hold it in your mouth.” Many descriptors were similar and often colorful. One, which later turned out to be meadowfoam honey, garnered: butter, marshmallow, almond, date, banana, toffee, bergamot and more.

The after-taste of each honey was considered. A honey with a clean finish was described has having “Enough acid to wipe away lingering sweetness.” Sommelier Orietta Gianjorio described a honey with a short finish as “Like a good-looking man with no brains.”

Additions were made to the word list, like “propolis,” from beekeeper Ann Beekman. “It’s good to have people from the honey world to add words that were not in my memory bank,” said Langstaff, who herself added “linoolool”, a spicy, floral aroma. Hoby Wedler, a graduate student in chemistry, who is blind and leads tastings at Coppola Winery, offered more words from his trained palate. Some opinions were diverse – setting off a round of retasting. “We don’t all live in the same sensory universe,” she remarked, as she moved the group on to the next in the group of 12 honeys, set up in groups of six.

A couple of weeks later, the panel reconvened to taste the second group of 12 honeys. At the end of each session, the numbers were replaced with names of the honeys: orange, macadamia, cotton, eucalypti, lehua, sage, mesquite, umo, clover, viper bugloss, pomegranate, wildflower from different locations, unspecified Costco and grocery store brands. Tasters responded with another round of curious sampling, now that they knew the identities, remarking on how different the tastes were from their floral sources. Langstaff closed the exercise, which was restricted to flavor perception, leaving the conversation about favorites to go on informally.

Each taster left the Center with some surprise at the depth of the experience – none more surprised than Harris. “I thought of honey as just that first taste. I gave it a lot more time. I was astonished after so many years; it starts in one place and can end up totally different. I taste so differently than I did. Now I watch people develop and start to think about it, see what else is out there.” A video of Harris tasting wildflower honey, sold by the University as a fundraiser for the Honey and Pollination Center, can be seen at: https://www.youtube.com/watch?v=phkEz-bhxI8.
It is hoped by many that other kinds of identifiers for honey can be made by creating government standards -- as there is no established national definition in the U.S. Europe has had even regional standards for food since the 15th century, and some honeys there now have an official geographic identity that signals their floral content. American trademarks are all we have, and they are not tied to location; to create their own designations, some beekeepers now label jars with zip codes or foraging area. Country of origin labels are rarely enforced here, and US Grade A is a voluntary, un-inspected designation that does not mean domestically produced – which it is often mistaken to mean.

The new “Honey Flavor Wheel”, created with the results of the panel tastings, is available for $10 at the UC Davis bookstore and online at: http://honey.ucdavis.edu/products. Proceeds help the Center continue its work and fund the campus’s Harry H. Laidlaw Bee Biology Laboratory.

Harris announced that a future round will be designed to identify particular characteristics of varietals. A visiting Finnish researcher, Maaria Kortesniemi, will be analyzing honeys with nuclear magnetic resonance (NMR) spectroscopy, which will no doubt create some interesting tastings as well at the Center.

The hope in all this sniffing and savoring is that an educated clientele will emerge with the ability to distinguish varietal and local honeys from the sub-standard – like the Mona Lisa from a cartoon, to borrow from Ann Noble.

Langstaff said, “It adds quality to life when you stop and taste. When most people slow down and pay attention, they can do it. It is a wonderful gift.”

M.E.A. McNeil is a member of the Honey and Pollination Committee and participated in the tasting panels. She is a journalist, Master Beekeeper and farmer.

REFERENCES