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# Tasting Bread

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Editors note: *This publication contains the video of the talk from the Fermentology webinar series, as well as a lightly edited transcript of the lecture.*

## Abstract

When we evaluate a slice of bread, we don't start with the crust—we have to set that aside for now. It's the inside, the crumb, that reveals the nuances of fermentation the crafter has manipulated to deliver the bread's aromas and flavors. In a unique online tasting session, [Michael Kalanty](#) invites you to bake up a loaf of your favorite bread, sit down, and taste along with him. Learn basic steps to evaluate and describe bread's sensory qualities of aroma, flavor, and texture. (No time to bake? Pick up a fresh loaf and support your local craft baker!) Michael is a bread baker, sensory scientist and certified master taster from San Francisco who has developed [a bread-tasting chart](#) similar to the wine wheels used by oenophiles to describe the aromas and flavors in their wine glass. He's written several books on baking, including one, [How To Bake Bread: The Five Families of Bread®](#), that has a cult following among young bread bakers of all ages. (Yes! We will be tasting the crust, too!)

## Watch the talk

Visit the web version of this article to view interactive content.

Tasting Bread | Fermentology mini-seminars

Image attribution: “Lachha bread is a round sweet bread found mostly in West Bengal and all over India and Bangladesh.” Rajeeb Dutta, [CC BY-SA 4.0](#). Accessed from [Wikimedia Commons](#).

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This is the first of its kind online bread tasting with Fermentology.

Editor's note: *We recommend that you engage with this enriched transcript with a piece of bread to participate in the exercises and activities that Michael outlines.*

## Prepping our Palates: Exercise #1

Firstly, I'm going to ask you to close your eyes. I want to do a sensory warm-up stretch to teach you how to tune in to your bank of flavor memories. Each of us has, in our brains, a collection of flavors, aromas, basic tastes, textures, temperatures, and they're cataloged in our brain, and they're tied directly to our memory. It's what's at work, for example, when you have, say, a comfort food from your childhood, and all of those flavors will flood your brain with a number of memories, of sitting at the table with your grandmother, or, maybe, a trip to Italy or something like that.

So here's how it's going to work. I'm going to introduce a food, and then I want you to visualize that food. I want you to taste it as best as you can. Smell it. And as soon as you get that sensation in your palate, well, then you can let that go, and then I'll go to the next one. Take a sip of water if you have to to cleanse your palate. There will be five of them altogether. Are you ready? Close your eyes.

1. First, I want you to visualize vanilla ice cream. I want you to see the scoop going through the flavor, and I want you to see the vanilla specks, and the ice cream curling on itself.
2. Next, now I want you to visualize peanut butter, chunky or smooth, your preference. Just taste it. And, as best as you can, spread that around the inside of your mouth. Dismiss that one.
3. The next food is Welch's Grape Jelly. What does that taste like? What does that feel like?
4. The next one, I want you to lick an envelope. And if you don't have an envelope, lick a stamp. What's the flavor of that? What's the taste of that?
5. And now I have one more. And the last one is a sugar substitute. Just maybe visualize that tiny little speck of white powder on the rim of the glass that didn't get stirred in and dissolved. What does that feel like? What does that taste like?

That concludes the exercise. So the question is: *What does this collection of terms have in common?* Well, depending on your flavor memories, there's any number of connections that you might have made, but I chose five food experiences that are sweet — with different levels of sweetness.

## Prepping our Palates: Exercise #2

Each of us, however, has a different perception of how sweet something is. What I think is a moderate sweet, someone else may think is high, or someone else may think is low. So what we have to do is establish a grading system, a system of references that we can relate to so that we understand what we're talking about.

So imagine, if you will, a sweetness intensity scale, and it goes from left to right, and the intensities go from very low to very high.

What I'd like you to do now is to take a few seconds, and those five food experiences that you just called to mind, I want you to rank them in order, from low sweet to high sweet, using this scale of very low to very high intensities of sweetness.

Are you ready for the answers?

Very Low Intensity of Sweetness	Low Intensity of Sweetness	Moderate Intensity of Sweetness	High Intensity of Sweetness	Very High Intensity of Sweetness
Envelope Glue/Postage Stamp	Peanut Butter	Vanilla Ice Cream	Grape Jelly/Soft Drinks	Sugar Substitute

Now, these aren't answers per se, because I said somebody's moderate may be somebody else's low. But what's important is that you ordered them in a series that is somewhat similar to this.

## Flavors and Tastes

Now, as a teacher, I wanted to build a training tool for my students to help them develop their power to catalog and to remember the flavors and tastes of the breads that they ate. This is very important when you're in the bakery at 3:00 in the morning, and you're trying to determine: *Oh, wait, is this the way I want to go with this brioche? Maybe I should do something else.* So having these memories are a very valuable tool for a baker.

I wanted something like this, but for bread, of course. So I sought out Dr. Ann Noble, who taught sensory evaluation at UC Davis in the wine program. She explains her wheel is based in cognitive psychology. Aromas and flavors are grouped in broad categories according to how people perceive them as being similar.

There are broad categories, such as "vegetative," or "fruity" — and "fruity" is divided into smaller groups, such as "berry" or "tree fruit" — and then even further divisions, down to "strawberry" and "raspberry."

Now, whereas wine is thought of as a blend of these aromas, I discovered that bread actually has three separate components that can be analyzed independently and give you information about how your proofing is going, how your fermentation is going, and how you may or may not adjust your baking.

## The Bread Flavor Wheel

I didn't want to reinvent the wheel, literally, but I did want something that would relate for students what it is that we're after.

So this is what I came up with. There are three aspects of bread that have their own collection of aromas and flavors. These are the crumb, or the interior, the crust, and then a vague concept called "character" — "grain character." So let me explain what I mean by each one of these.

### Crumb

In the crumb, the primary tastes that we recognize are sweetness and sourness. It's the alchemy of the baker to adjust these. If you choose oat flour to complement your wheat, you'll develop sweeter flavors in your bread. If you choose some rye to supplement, then you'll develop tangy flavors.

### Crust

In the crust, now, this is really where the realm of the oven comes into play, and the set of skills to help a bread rise to its fullest, to caramelize, and get the colors and the flavors that we want on the crust. This is all an entirely different set of skills from blending, developing, kneading, and fermenting your dough in the first place.

## Grain Character

And then the final one is what's called "grain character." Now, this is a little on the intermediate level, so we won't really address that today. But I'll give you an analogy using cow's milk. And, in a very simplistic character, the milk has sweetness. It has dairy tones. There's maybe grassiness, and just the tiniest, tiniest little bit of sour. Now, as that ferments and becomes a yogurt or a soft cheese, or something like that, the freshness kind of dissipates. A tangier flavor takes on. We lose the grassy notes. And then, as an extreme, think of Reggiano Parmesan and the nutty character that comes from that, and the almost astringency and the creaminess that it delivers. Now, they're all dairy products, but they have different characters.

## The Sensations of Flavor + Taste

Well, now that I have a basic approach to how students are going to talk about these, I needed to collect words that I would put in the lexicon to describe these sensations. Well with a brilliant stroke of luck, for a couple of decades now, I've had the opportunity to work with a group called ChefsBest. They're an independent company that conducts tasting panels on a variety of consumer food products. Outstanding products become eligible for the ChefsBest seal.

Now, the backbone of this process is a team of professional chefs who have undergone further training to become certified as Master Tasters. These chefs can sniff, taste, smell, chew, and they can give you exactly the precise word to define what it is they experience. And although ChefsBest as a company wasn't officially involved in my project here, any number of sensory professionals, aroma chemists, and chef Master Tasters served as my sounding board during this project, and many of them just said: *Yes, we'll gladly be your tasters for any of your breads.* So I want to give a shout-out of thanks to everybody in that community who helped me.

## Chewy

So, "chewy." That's a word. As a descriptor, it's not really very precise. I can have a chewy New York bagel or I can have a chocolate chip cookie, which is also chewy. And these are very different experiences. So the word "chewy" is not so much a sensory experience as it is a mechanical one. What's important when you taste your bread is to correlate how much chewing you do to what the texture of the bread is.

I came up with what I call "The Chew Test." Let me explain how this works. With a piece of the interior of the bread, I try to take something that's about the size of, maybe, a quarter, or a half dollar, or something like that, or the largest piece I can, and still manage it easily. So I put that in my mouth all at once, and I bite down on it. And when my teeth come back, then I have maybe two or three pieces. Then I chew again, and then I have maybe four or five pieces.

Each time I chew, I feel the spring-back of the bread becoming less and less. Now, there's a certain point where there's hardly any spring-back, and all the pieces kind of form into a ball, into a wad. In sensory lingo, this is called "chewing to a bolus," to a ball. I call it "The Chew Test."

Now I'm visualizing a scale that measures the duration of this chew, from left to right, from short to long. I put some benchmarks up there, and, on the one hand, I have that chewy New York bagel, and then, on the other hand, I have a Ritz cracker.

Very Short Duration of Chew	Short Duration of Chew	Moderate Duration of Chew	Long Duration of Chew	Very Long Duration of Chew
Ritz Cracker	White Flour Tortilla	Angel Food Cake	Gummy Bear	New York Bagel

When you do this yourself — what I want you to do is I want you to take a sample from the crumb of your bread. Take something large enough that's manageable, and count the number of chews, and rank this on your scale.

Now, I test baked a loaf of sourdough using Dr. Eric McKenney's basic formula. On my sample, I counted 16 chews, so that puts this up in the moderately high range of chewiness. Now, as they say in commercials, your results may differ. If you use a bread flour, for example, instead of all-purpose, you'll get more chews out of that product. On a technical end, if your bread didn't proof as much as it could, then you won't get as many chews, and it will actually feel a little bit softer.

This is a good point for me to say there are no right or wrong answers. The very redeeming factor of being a sensory being is that whatever you sense, whatever you perceive, well, that is correct. So it's not going to be the same as everyone else's. When we do Master Tasting panels, we look for consensus, for a very narrow kind of spread on the range.

## The Science of Tasting

Let's look at how tasting actually works. Well, our basic tastes are sweet, sour, salty, and bitter, and there's a fifth one called "umami." Umami is a meatiness. It's a browning. When most people describe umami, they think of a grilled steak.

We basically recognize all of these tastes on our tongue, although we have taste receptors in our nasal cavity, down our throat, in our esophagus. The nose is where the volatile flavor and aromas come from, from the bread. And this is what I was referring to earlier, about how the brain takes those and categorizes them. It's the combination of this aroma and the taste that we recognize as flavor.

But that's only where the magic starts. There's a much more powerful tool, and most people never take advantage of it. It's a phenomenon called "retronasal olfaction," and that's a textbook way of saying: *Hey, I can smell this in the back of my throat.* It happens when volatile aromas are perceived not by the nose, but through a hole in the back of your throat that leads up into the nasal cavity. It's a very different kind of smelling, and the

way to activate that is to exhale through your nose with your mouth open. That way, you're getting the flavor and the taste coming in, and the retronasal effect as well.

As you chew, the combination of heat, pressure, and saliva exposes all of these volatile aroma compounds. These are those wavy lines that come from the donuts that stare at Homer Simpson. We call these volatiles, and they collect in the roof of the mouth in the part of the nasal cavity.

## The Power of Aromas

I want to give you a short list of notes and I want to see how your own flavor memory works — if you can put these together and identify the food I'm talking about.

The first note is plump raisins. And now I have dark caramel. Now I have a fruity kind of sour. And now I have toasted oak.

So your brain is sorting through those flavors, and maybe it came up with balsamic vinegar, specifically, aged balsamic. And those are the primary flavor notes in that product.

All of this points to the power of aromas. We can smell, and we can chew, and we can breathe out through our nose, but it's up to us to think about those, and focus on those sensations, catalog them, and develop words to describe them so that these aromas have more power in our flavor bank.

## Tasting for Sourness

Next time you resample your bread, I want you to focus on the sourness intensity. Take approximately the same sized sample piece as before, and chew it as you did earlier. Here's a scale for your reference, with some food benchmarks:

Very Low Sourness Intensity	Low Sourness Intensity	Moderate Sourness Intensity	High Sourness Intensity	Very High Sourness Intensity
Milk Chocolate	Coffee	Ketchup and Mustard	Plain Yogurt	Lemon Justice and Vinegar

My own sample is fairly sour. I would rank it dead center in the high section.

## Variance in Flavors

Now, there's a concept of umbrella words, like "sour." It can encompass any number of other words. It's a base note. To use a musical analogy, it's a bass note, like a middle C, that then you can play the E and the G on top, and you can create a chord with a different sound, with different flavors, with different colors. A C major chord sounds quite different from a C minor, but it still is based on the base note of a C.

Now, how that relates to food: let's look at a strawberry. If you take a fresh strawberry, the notes you might get out of it are a very low kind of chlorophyll note.

You'll get a little bit of perfume, and maybe a floral note out of it. And there'll be a sweetness and a sourness that kind of vie with one another, depending on how ripe the strawberry is. And maybe the sides of your tongue puckered a little bit while you were thinking of that, and that's the astringency that's part of that.

So lots of foods come in strawberry, but they don't all have the same set of notes. Strawberry ice cream can have a perfumed note in it. A power bar has a dried strawberry character. In fruit leather, there might be a jammy, cooked kind of character. And in a pink breakfast cereal, I think you're going to get a candied note. They're all strawberry, but they all have different characters.

## The Role of Character

So, now, why is this relevant? Well, in your readings on sourdough, you may have come across the terms "lactic acid" and "acetic acid." Now, these are chemical compounds. They're measurable on spectrometers, and they are side effects of the fermentation process. But they don't do very much of eliciting flavor memories in the people you're talking to. So what we want to do is create some sort of way of dealing with these, and that is where the idea of character comes in.

In my research with the Master Tasters, every bread I gave them, they were able to say: *Yes, this is sour, but this is sour like a green, or This is sour like, oh, Greek yogurt, but with honey.* And that's how precise these tasters are.

## Tasting for Sourness, Part 2

I want to repeat the sourness test again. When you try it, remember to chew with your mouth open, exhaling through your nose. See what character the sourness of your bread has for you.

Now, in my sample of Dr. McKenney's sourdough, I experienced Granny Smith apples, yellow grapefruit, and just the smallest hint of butter. I would characterize my sourness as being fairly fruity.

Let's move on to the crust flavors. When we evaluate crust flavors, we have to come to grips, first, with bitterness. Bitterness receptors are everywhere on our palates. They're in the roof of our mouth, down our esophagus, as I said previously. But young tasters tend to focus mostly on the back of their throat, or the roof of their mouth, just above that. Some bitter foods are unsweetened chocolate, coffee, vodka, spinach.

<b>Very Low Bitterness Intensity</b>	<b>Low Bitterness Intensity</b>	<b>Moderate Bitterness Intensity</b>	<b>High Bitterness Intensity</b>	<b>Very High Bitterness Intensity</b>
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Raw Peanut and Milk Chocolate	Beer	Strong Coffee	Tonic Water	Unsweetened Chocolate and Guinness Stout
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Here's a chart that ranks bitterness intensity. What I want you to do is to take a sample of your crust, chew that, and see what sorts of bitterness you can get out of this. Don't focus on specific notes. We're just after the bitterness intensity.

Now, again, on my sample, well, I did what's called a "bien cuit," a very well-baked crust, on mine. So the bitterness that I got is somewhere between tonic water and Guinness stout.

## A Closer Look at Crust

Now, how does bitterness develop in the crust? Well, let's take a look at what happens as sugar cooks. If you take sugar and water, dilute it, and then you start to cook it, it goes through a series of color changes. When it's very clear, the sweetness is very high. As you cook it more, it starts to get a little bit of color. The sweetness decreases as the bitterness enters into the equation, until it's very dark, like, kind of a reddish dark, almost like a Cajun roux, and the bitterness is quite high, and the sweetness note is quite low. In the process, we have this inverse relationship between sweetness and the bitterness. All of these accumulate on the crust in the process of baking.

As this is happening with the sugar, there are so many other transformations going on in the dough, as Peter Reinhart has focused on — the flour, the grain, is broken down into protein and starch. The protein becomes broken into amino acids. And some of this is enzyme activity. Some of it is yeast fermentation. Then these amino acids become fermented by enzymes, and they create a number of flavor profiles. Now, at the same time, the starch is broken down into different chains and different types of sugars. All of these sugars are broken down into different flavor notes, and this is where bacterial fermentation really comes into play.

On the surface of this dough, we have any combination of proteins, amino acid, starches, sugars, flavor notes, whatever, and these align in as many different permutations as they can manage. Each one of these becomes a flavor note in its own right, and it cooks from light to medium to dark, so it changes its character as the crust continues to cook. This whole phenomenon is called the "Maillard Reaction." This has to do with the caramelization on the surface of food, and this is where the umami, where the meatiness character, of foods is developed.

Now, let's take a look at the crust detail. Now, depending on the flour and the grain that the chef chose and the fermentation, you're going to get any number of categories, such as "roasted," "fruity," and "resinous." The one category that I get more questions about is the "resinous" one. And with a resinous food, think of pine needles, a Christmas tree, or fresh Rosemary. It's that recurring oiliness character.

For our final exercise, I'd like you to take another piece of your crust sample, and chew it, and, this time, see what specific notes you are able to bring out of your crust.

In my sample, I found dark beer, French roast coffee beans, unsweetened chocolate, and there was a little bit of blackstrap molasses.

## **Conclusion**

That concludes our tasting fundamentals right there. There are many, many more topics that we can go into, but these are the basic skills that every time you taste bread, if you focus and think about those memories, you will develop your own flavor chart to such a degree that you'll be able to make different changes in your bread, put some rye flour in, maybe put a little bit of oat flour in, or some sorghum to bring a honey flavor to it. This is the realm, this is the alchemy of the baker, and this is your key to that experience.