Linda Bartoshuk on Taste and Pleasure

Linda Bartoshuk is an American psychologist who has extensively studied how genetic differences and diseases can impact the senses of smell and taste. She is best known for her discoveries on supertasters.

How did you find yourself studying smell and taste?

I was studying philosophy and fascinated with epistemology—how do we learn what we know? I became interested in comparing taste sensations from one person to another, which is a really interesting philosophical question. If you think about it, you and I cannot share experiences. How can I know what you experience when you taste something, or feel pain, or any kind of sensation?

I think of indicator scales—on a scale of 1 to 10—or discrimination tests where you're given a bunch of samples and asked to rank them.

Ranking procedures give you some information, but they don't tell you what someone else is experiencing. Let me give you an example with pain. If you're in the hospital, a nurse is going to ask you what your pain is from 1 to 10. It's a reasonable scale to find out if your pain gets better if you're given an analgesic. But does your pain relate to the person in the bed next to you? No, because you don't know what 10 is to that person. Solving that problem led to discoveries like that there are supertasters, people who taste things more intensely than others do.

How do you compare taste differences between people, especially with something like supertasting where there are various degrees?

We ask them to compare taste to something that isn't related to taste at all. I'll give you an example. We get a bunch of people together and we look at their tongues. We can see one structure of the tongue called *fungiform papillae*; they're the larger bumps you can see on your tongue and a structure that houses taste buds. So we pick a group of people who have lots of fungiform papillae and we pick another group that have fewer. Then we put earphones on our subjects and have them match the sweetness of a soft drink to the loudness of a sound. We give them a knob to make the sound louder or softer. The people with lots of taste buds will crank that knob up to 90 decibels; the subjects with fewer taste buds will drop it down to 80 decibels. A 10-decibel difference means a doubling of loudness, so we've shown that the people with lots of fungiform papillae, and thus lots of taste buds, match the sweetness of a soft drink to a sound twice as loud. Now you might say, "Maybe their hearing is different." Well, we don't have any reason to think that hearing is related to taste, and if we are right, on average those with the most taste buds experience twice the sweetness. To be safe, we use loudness as well as many other standards.

We know a lot about supertasters. If you're a supertaster and you taste table sugar, it'll be two to three times as sweet to you as it is to me because I am not a supertaster. I'm all the way at the other end. The metaphor I used is vision: I taste pastel and supertasters taste neon.

Does that mean you don't enjoy food as much as supertasters?

Well, liking food is a lot more than biology. Most of it has to do with previous experience and we tend to like what we previously experienced. I don't wish I were a supertaster because I actually like the world I live in.

I love chocolate chip cookies. I can't imagine that I'd love them any more if I were a supertaster, but of course I can't tell because I can't share that experience. However, we can use our new methods to compare the pleasure people get from things. Chocolate chip cookies probably do give supertasters a little more pleasure than they give me if we're measuring it on a pleasure scale. In general, supertasters get more pleasure from their favorite foods than non-supertasters do.

Where does pleasure associated from food come from?

We think it has to be learned. The most common belief in the field now is that all odor affect is learned. Sometimes odor is paired with what we consider a primary affect, what we call "hardwired." You're born loving sugar, so you can make an odor really liked by pairing it with sugar. You can also take something like an odor of meat, the odors of things that are primarily associated with fats. The brain wants you to eat fat because you need the calories. The brain notices that the fat that it detects in the stomach came in with a particular odor. And it wants you to eat fat, so it makes you like that odor better, because that odor was paired with something it wants: fat. And that is the mechanism of a conditioned preference. This is why experimental psychology has so much to say about why we like certain foods. It's worked out the system; there are rules to it.

If you wanted to have someone take greater pleasure in a food, how would you do that?

Evaluative conditioning studies the transfer of affect from one stimulus to another. Olfaction is particularly interesting since we get so much transfer of affect with smell. You want to make somebody like a new dish? Pair the odor of that food with a really pleasant situation, like eating with somebody they really like. Later on, they'll like the new dish more because they first had it with somebody that they liked.

This was an exam question I used to use when I was teaching a food behavior course. I'd ask the students, "You are a chemist and you've just invented a new odor that's never been on the earth before." And that's possible. "Now, you want your new odor to be picked by the president of the company for promotion. How do you make the president like your odor?" The answers get very creative. "Have his girlfriend wear it as a perfume." "He likes baseball games; spray the odor on his seat when he goes to a game." "Put it in the food he likes best." All of these are cases of transfer of affect. You associate something neutral with something that is already liked, and that neutral stimulus becomes liked.

Is this why we like certain combinations of flavors?

You can look at it from the pleasure point of view. For example, if you take duck and add orange to it, that's a wonderful combination. Raspberry with chocolate is another pair that we tend to like. On the other hand, what if you added chocolate to duck—that doesn't sound terribly interesting—or raspberry to orange? If you think about the pleasure of olfaction and how it is acquired, I believe there's a structure to it that we don't necessarily pay attention to. For example, orange is initially pleasurable because it's paired with sweet. Duck is initially pleasurable because it's paired with fat. Orange odor is not innately liked; you learn to like it by pairing it with sweet. And duck odor is not innately liked; you learn to like it paired with fat. Pairing odors that acquired their affect in different ways may produce more intense affect.

How does this tie in with combinations of tastes—tastes as in the gustatory sense?

We know the rules of taste mixture. We know what happens if you combine sweet, salty, sour, bitter. When you add two things together that have a common taste, they add. Like sweet from saccharin and sweet from sugar; they're going to add. But if you add two different tastes, like sweet from sugar and bitter from quinine, they're going to suppress each other. So the rule is whenever you add two different qualities in taste, they will mutually suppress each other. If you think about it, this may be a very nice mechanism. Think about a really complex Chinese sauce where you might use vinegar and soy sauce, put a little sugar in, and of course ginger for a nice flavor. If they added linearly, it would blow the top of your head off.

In taste, you get quite powerful mixture suppression, which keeps taste in a reasonable range. Otherwise, every time you had a complex taste, it would be much, much more intense, and that probably wouldn't be useful since it's more important in the world to identify different objects based on their taste. You don't really want them to add linearly. In olfaction, it's even worse. Think about all the different odors you can put together in a mixture. If they added up linearly, every complicated mixture would be incredibly intense and every simple smell would be weak. That isn't how it works. In olfaction, you get suppression among the components, even more powerfully so than in taste.

How we perceive and react to food sounds very, very broad. There's so much more than smell and taste in food, which makes it that much more complex.

The love of food is an incredibly powerful force in our lives. We know a great deal about what makes people like food or dislike it. Biology plays a relatively small role because most of it is experience.