New York
RESTAURANTS

Chemistry in a Cone

If that scoop of ice cream doesn't melt, isn't cold, and tastes like an everything bagel, is it still ice cream?

In June, the Cold Stone Creamery chain introduced a new ice cream that doesn't melt. The dripless ice cream comes in two flavors, Butterscotch Velvet and Chocolate-y Goodness. It takes a second to process this. Melting ice cream is an immutable truth of summer, a symbol of the fleeting nature of the season itself. How did they do away with one of the frozen treat's most fundamental properties? Welcome to the weird science of ice cream.

Ice cream is like Play-Doh for scientists—it practically begs to be manipulated. Its chemistry is an intricate mix of solid, liquid, and gas, and fiddling with one thing affects another. If you play with protein, you're going to be messing with fat globules, and if you tick off the fat globules, you're going to hear about it from the air bubbles. The fact that all of this interplay occurs in a frozen environment is the clincher: A basic bowl of organic vanilla is one of the most complex foods we eat. And it's becoming even more so, because in laboratories, restaurants, and home kitchens, ice cream is being reinvented at the molecular level.

The Texture

An arctic fish might hold the keys to a silky smooth scoop.

Ice crystals are like the cancer cells of ice cream. Retarding their growth is the holy grail. To get the smoothest ice cream, you want the smallest ice crystals. But every time a pint sits on a kitchen counter or a loading dock, the ice crystals get big, and the ice cream gets crunchy. (This is generally agreed to be a loss of quality, though food writer Harold McGee has argued in the *Times* that perhaps there's nothing wrong with a granitalike texture.)

Richard Hartel, the scientist who co-wrote the book on ice cream (*Ice Cream*, sixth edition), is a food-engineering professor at the University of Wisconsin, Madison, who studies ice crystals. His current approach involves reexamining an age-old process: how exactly ice crystals form in a typical commercial freezer. Hartel and one of his grad students have jury-rigged a microscope, a digital camera, and a refrigerated glove box. "It's really ugly, but pretty effective," Hartel explained. Though it's too soon to predict the outcome of the experiment—the early photographs have a blurry quality, like ultrasound for ice cream—the work may eventually change how freezers are made. It could be possible to reengineer them so that they produce small crystals, and smooth ice cream, right from the start.

But the solution may ultimately be found in nature's own freezer case. One recent breakthrough involves a fish called the ocean pout, which lives in the Arctic and resembles an eel. A protein that prevents the ocean pout from freezing to death in icy waters turns out also to inhibit the growth of ice crystals in ice cream. Breyer's has been using a synthetic version of the fish's protein in some of its low-fat varieties. The company also found that it improved taste (thereby inviting cracks about "van-eel-a").

The Temperature

Cold is not the only option.

When I called Cold Stone Creamery to ask how their no-melt ice cream works, the explanation turned out to be simple. Someone at Cold Stone came up with an idea for an ice cream that would have the texture of Jell-O pudding. The modified food starch that sets instant pudding caused the resulting blend to gel rather than liquefy. The guy who created the flavor discovered this when he accidentally left a bowl of it out on the counter. A classic example of scientific serendipity. But there's a whole world of molecular gastronomes out there performing intentional experiments with temperature and ice cream.

Alex Talbot, an experimental chef, recently moved to Bucks County, but before that he lived in Queens, and before that he was running the kitchen at a boutique hotel in Pagosa Springs, Colorado, which is where he was when he set out to create a dessert that resembled ice cream in every single way but one: He wanted it to be hot. "To do this in the hot state—that was the quest," Talbot told me. On Ideas in Food, the blog he writes with his wife, Aki Kamozawa, Talbot posted a recipe for hot vanilla ice cream. All of the ingredients were easily found, as long as you had a good connection at Dow Chemical.

The recipe calls for familiar basics like yogurt and cream cheese, specialty ingredients like a pinch of sea salt and a scraped bourbon vanilla bean, and then the kicker, 11.55 grams of Methocel food gum SGA150, which forms a gel when heated. Talbot begins by adding Methocel to his unfrozen ice-cream base; then he dips an ice-cream scoop into the base, moves the scoop to a pot of boiling water, and, as the ice cream begins to set, gently releases the scoop, creating what amounts to ice-cream dumplings—little balls of "hot" ice cream. When the ice cream is removed from the water, it is unpleasantly firm—just as regular ice cream is when you first take it out of the freezer. Which means that, weirdly, hot ice cream actually has to melt a little before you can eat it. "We had to add that to the technique of the recipe," Talbot says. "It was common sense for us to let it temper, but it wasn't common sense for everyone."