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Nestlé researchers prepare to discover whether consumers will like reformulated cereal.  
(Nestec S.A., Nestlé Research Center, Lausanne, Switzerland)

## Can Technology Save Breakfast?

### Cereal companies, maligned for overprocessing, are now using the same techniques to put some nature back in the bowl

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What do foodies want? It's not hard to answer, at least not for right-minded ones: locally raised food grown organically, completely unprocessed, delivered by hand or mule-driven cart. As the author of one of the first books about the slow food movement, I certainly want that kind of food to be both affordable and widely available. But that's not what most of the industrialized world can get. I break from my soul mates in believing in the power of evolving technology and, yes, the food industry to help people find and afford—and even like—food that new machines and processes can bring near its unprocessed, whole state.

Technology and food aren't supposed to go together in any context but angry scorn. Technology and industry, in unholy collusion with all forms of media, are responsible for most every ill that food has anything to do with—particularly the U.S. epidemic of childhood obesity, laid squarely at the doorstep of cheap, greasy fast food and sugary sodas. The food industry, in large part, denatures food, often to sickening effect. Think of “pink slime,” only the most recent outrage, with its bits of mechanically stripped scraps extruded into ammoniated filler that turns up in school-lunch hamburgers.

But maybe the food industry can re-nature products. Maybe it can make the best of the food we care

about—whole grains, fiber, and vitamins, minerals and antioxidants—convenient and accessible. Sure, it's unlikely. But not impossible. If technology, scale, industrialization and relentless marketing have been the forces of nutritional evil, maybe they can be the forces of nutritional salvation. The food industry, pretty much everyone recognizes, has a lot to answer for. Some forward-looking companies are already beginning to find some of the answers—and more need to follow.

Finding current examples isn't simple. Huge corporations do manufacture “better-for-you” foods—a term they're glad to use, though of course they don't talk about “bad-for-you” foods. But good-for-you foods can be bad for the bottom line. Public commitments, like Pepsi's to become more nutrition-minded and Wal-Mart's to reduce sodium and added sugars and eliminate trans fats from many private-label foods, can curdle with a bad quarterly profit-and-loss statement. When Campbell's retreated from a very loud commitment to cut salt in a wide range of its soups, admitting that its “health-inspired low-sodium push failed to lift sales,” as one report said, its stock price went up the next day.

One packaged, industrialized food that practically everybody buys is an exception: cereal. From the time of its wacky origins, manufacturers have been glad to trumpet breakfast cereal's wholesome attributes. It has also been the object of ridicule when it has gone too far in saying just how good it is for you, and for blatantly advertising to children. Advertising food to children under 12 is now considered second only to advertising cigarettes to minors. Children, the anti-advertising argument goes, are unable to judge what is good or bad for them; and the companies that have the money to buy TV time will spend it not telling children what's actually good for them but pushing the highest-sugar and -sodium foods, which sets children up for impulse eating, unbalanced meals and obesity.

The cereal industry, however many black eyes it gets, still likes its healthy image. It might be the food industry least afraid of slow food types with prying eyes. And so it was that I found myself at a long white table in front of nine plastic bowls of Cinnamon Toast Crunch.

Like all professional food people, I have food peculiarities. One is that I am incapable of keeping a box of dry cereal in my cupboard without consuming it in a very short period—say, before daybreak. When it comes to burgers, fries and soda, I am immune to the diabolical neurotransmitter mechanisms that David Kessler, in his bestseller *The End of Overeating: Taking Control of the Insatiable American Appetite*, accuses the food industry of mastering. Industry tripwires our brains, he and others say, to consume limitless quantities of food with insidiously increasing levels of fat, sugar and salt. I pride myself on distinguishing, and rejecting, artificial flavors like the ones Eric Schlosser describes in *Fast Food Nation*, engineered to taste better than, say, strawberry, and to make fat even more craveable. In a fairly excruciating smell test in which I had to distinguish the smell of rotted fish in ever-tinier concentrations (laugh, but then think of Vietnamese fish sauce and Worcestershire), I was declared a “supertaster.” Yet I am helpless before a box of dry cereal.

“Ready-to-eat” cereal happens to be a prime contender for the title of most manipulated food product. It's also the likeliest to make outlandish health claims. Cereal was initially marketed as a health food, as has been documented in books and movies (*The Great American Cereal Book*; *The Cornflake Crusade*; T.C. Boyle's novel about the promiscuous revivalist sanitarium community of Battle Creek, *The Road to Wellville*, which was turned into a movie with Matthew Broderick as a patient and Anthony Hopkins as Harvey Kellogg). Its creation and rise have been products of ever-devout American beliefs in the power of technology and marketing, and of food to improve health.

Marion Nestle, the influential New York University nutrition professor, has taken special delight in collecting cereal boxes making unproven claims along the lines of preventing heart attacks and cancer. The main evil that cereals pump into the mouths of unsuspecting children, according to her and others, is sugar. Nestle says that high-sugar kids' cereals are just cookies by another name. Salt levels can be high,

too: 170 milligrams in a serving of Lucky Charms, when the recommended daily allowance (RDA) for children is less than 1,500 milligrams a day. And even if the benefit of the whole grains many cereals have can make up for the sugar and sodium, as manufacturers claim—they like to point to the many studies showing that children who eat breakfast do better in school and maintain lower weight—nutritionists say that presweetened cereal is the equivalent of a gateway drug to soda, potato chips and obesity.

General Mills, the world's sixth-largest food company, did make two pioneering commitments. One, the most sweeping, was to increase whole grains and fiber in all of its products, and to make whole grains the single greatest ingredient in all of its cereals by this year. The second was to reduce sugar in presweetened cereals to less than 10 grams per serving, or 40 calories, when some of them, like Lucky Charms—its leading children's cereal—had 15 grams. The RDAs don't set a limit on how much sugar a child's diet should include, but they do recommend that added sugars make up no more than 5 to 15 percent of a child's daily diet of 1,000 to 2,000 calories.

Cinnamon Toast Crunch, which made its debut in 1984, is being reformulated to reduce sugar and sodium and increase whole grains, and will appear on shelves in June. The bowls in front of me reproduced the triangle test every reformulated product must pass before the company green-lights it: No more than 10 percent of consumers must be able to tell the difference between the old and new versions. I had to taste three sets of three bowls of little Chex-shaped cereal pieces and say which one of the three was different from the other two.

The man seated on the other side of the table had a twinkle in his eye as he explained the rules, as if he were the Father Christmas of breakfast cereals. And at General Mills, he is: John Mendesh is a vice president in research and development at the Bell Institute of Health and Nutrition, a research center named not for Alexander Graham but James Ford Bell, the founder of the group of flour mills that in 1928 became General Mills. That a research lab is named for Bell is only appropriate, given that he once referred to the need to design products, according to *Cerealizing America: The Unsweetened Story of American Breakfast Cereal* by Scott Bruce and Bill Crawford, that would attract “those sensitive little nerves that fringe the tongue...[and] ... carry messages from the human tongue to the human pocketbook.” The lab building is big and fairly new, though with Bauhaus touches that make it look like it's charting the future in the 1950s—just when sugared cereals grew to their current dominance, thanks to ads on children's TV. On one floor, down the hall from Mendesh's office, is a pilot plant with pressure chambers called guns, extruders and rollers that make test batches of Cheerios, Wheaties, Kix, Lucky Charms and Cinnamon Toast Crunch.

Mendesh likes cereal—making it, eating it, talking about it. He believes in what he does. Two of his maxims are “All food is processed” and “It's not nutrition if people don't eat it.” He explains that fortification with vitamins and iron is easy: It just means spraying cereal with supplements, and, though there's an actual taste to that spray (I tasted one cereal sample before and after, and it was better without the slightly bitter vitamins), it doesn't pose many technical challenges. Taking out sugar is hard. As with sodium in soups and fat in breads, sugar is not just for taste but also plays a functional role, affecting a food's texture, color and bulk. Home bakers know that it's often harder to cut down on sugar than butter or shortening, and so do cerealmakers. Cerealmakers' strategy is to move sugar from the inside of cereal pieces, as they're called, to the coating, and to rejigger the sugar's crystal size—all to increase the sensation of sweetness while reducing the actual weight of sugar used. The problem is the “bowl life,” a term I loved upon hearing—how long before cereal in milk gets soggy or slimy. General Mills wants three minutes of bowl life.

The reformulated cereal I was about to try to guess, Mendesh told me, wouldn't have been possible to make some 30 years ago. An extrusion cooker he showed me in the test plant that allows less sugar in the

cereal piece without sacrificing bowl life—a giant screw press in a stainless-steel tube, with a tiny glass dome-shaped window at one end through which I could see Cheerios being shot out of a gun—didn't exist then. How, exactly, did they thin the layer of coating sugar?

Wouldn't Kellogg's like to know, Peter Erickson, senior vice president of innovation, responded when I asked him later. "We pay a lot of attention to the foam structure of that cereal piece," he said, using another term I loved upon hearing, explaining that even if Cheerios, Kix, Chex and Cinnamon Toast Crunch aren't called puffed, they are: subjected to heat and pressure that expands them like a kernel of popcorn.

As I ate little dry squares from each of the nine bowls, I was at first confused, but a preliminary impression I'd formed only grew stronger: The old version was not just too sweet but left an oily film on my tongue and a strong, strong taste of salt. This was consonant with the differences between old and new, Mendesh told me: modest one-gram changes in sugar, from 10 to 9 per serving and 11 to 12 in whole grains, but a full 40-milligram reduction in sodium, from 220 to 180 milligrams. The old version seemed greasy and salty—just like a snack food, though not sweet enough to be a mini-cookie. The new was still sweet and unsubtly cinnamony, but didn't make me reach for water afterward, or for milk. I aced the test.

Just how salty, artificially flavored and way-sweet many mainstream brands remain became vivid when I later visited the cereal floor of General Mills headquarters, where a big, high, circular tasting table is ringed with tall plastic cylinders of different commercial cereals, like bulk bins at the supermarket. Cap'n Crunch, from Quaker Oats, had the annoying malty corn flavor I remembered from childhood and was terribly sweet and salty. Chex cereals, always good, have been engineered to be gluten-free (with the exception of Wheat Chex and Multi-Bran Chex). The pastel-colored marshmallow pieces in Lucky Charms still taste like sweet chalk, but the actual cereal pieces, whose resemblance to Cheerios I'd forgotten, tasted pretty good. As for the silly, exaggerated colors of those marshmallows, one food-industry source suggested that they might soon be less lurid. "Colors are the new frontier," she told me, predicting that General Mills will commit to reducing or eliminating artificial colorings ahead of possible future FDA restrictions based on years of intermittent food-safety alarms.

Whether colors are, in fact, next, Susan Crockett, director of the Bell Institute, wouldn't say. But then, Crockett makes changes carefully. "Stealth health," she likes to say, referring to the "stepwise" reduction of fats, say, in Pillsbury refrigerated biscuits, or sodium in Progresso soups, or sugar in kid cereals. Crockett, former chairwoman of the food and nutrition department at Syracuse University, has a confident, warm demeanor that would qualify her to be the new face of Betty Crocker, a General Mills icon that changes every decade or so to suit the times—usually based on a composite ideal rather than an actual person, let alone a company executive. Her commitment to increasing whole grains in all of the company's cereals, though, was very public, and came five years before the USDA Dietary Guidelines recommended increasing them. She claims it paid off: Cereal sales have risen, though the company won't break them out by brand. Since 2005 it has increased whole grains by 40 percent, and since 2004 increased the amount of its R&D budget focused on health by 75 percent. Sodium reduction is the stealthiest: an announced five-year, 20 percent reduction in 400 products by 2015, including several cereals, and a roughly similar reduction in some Progresso soups. Anyone who makes soup understands how unappetizing low-salt soup is, Crockett told me. "I've tried to sell low-sodium soup to family and I've been unsuccessful." This is part of the reason companies make change slowly, and a history of bland or off-tasting "healthy" foods explains the reluctance of companies to advertise lower sodium on packages.

Startlingly, Crockett makes no apology about paying for Lucky Charms commercials. "We think it's a great thing to market cereal to kids," she says, citing the milk and whole grains that cereal contributes to

their diets. “What’s not to like in advertising to children?” (Pretty much everything, most nutritionists would say.) “Yes, we’d rather have children eat steel-cut oatmeal,” she says with warm but unmistakable disdain that means, That isn’t gonna happen. The alternative to presweetened cereals, she says, is Coke for breakfast—and in fact, since coffee started losing ground in the late 1960s, cola is increasingly a choice for both kids and their parents.

The world’s largest food company, Nestlé, maintains a campus-like research facility near Lausanne, Switzerland. At the center, which includes a pilot plant for manufacturing test batches of liquid, powdered and other processed foods, 350 scientists (the staff numbers 700) measure responses to taste receptors on the tongue using a “gustometer,” a device that looks like an old telephone switchboard with stacks of metal bars for each taste receptor, on which a machine precisely deposits bits of food. Partly based on the result of gustometer findings, Nestlé started making some of its chocolate bars with squares that have sloped indentations like the swooping roof of a Le Corbusier chapel (rather than the usual flat top), which it says gives a more intense and longer-lasting flavor by changing the rate at which it melts and the way it makes contact with the palate.

In the center of what looks like an operating room in an ambulatory-care center, a research subject lies on a stretcher with his head encased in a big clear plastic box with tubes coming out of it. The machine gauges how the body burns fat after eating different foods by measuring the carbon dioxide a person breathes through his mouth and nose and even releases from his skin. There are clinic-like rooms where subjects sleep after eating meals prepared in a high-tech kitchen and rooms with exercise equipment to measure performance after eating certain foods (“We make PowerBars,” says a company communications specialist, Hilary Green, herself a Ph.D). In one lab was a shiny red plastic elastic cap that looked like a high-tech shower cap. Very high tech: It’s spotted with amoeba-shaped holders for electrodes that measure electrical activity in the brain, perhaps useful in testing whether, for instance, a product with reduced salt evokes the same response as the conventionally salted product.

In another lab, flasks of cloudy, light-colored liquid are bubbling on stainless steel heaters, each flask containing a different fermented vegetable. It smells like a big sauerkraut maker, which is more or less what it is: The liquids contain different fermenting agents like lactobacillus, historically used to preserve and flavor foods like sauerkraut and sausage, which break foods like onions, garlic and tomatoes into “flavor precursors” that could in turn be used to enhance soups and sauces—in essence, using precise means to create natural rather than synthesized flavor concentrates. “We want to use the intrinsic potential of raw materials,” Christelle Schaffer-Lequart, a researcher in the lab’s bioprocessing group, told me.

The area of experimentation that most caught my interest uses enzymes to break down whole grains and cereals into easier-to-digest powders that can be sneaked into foods like cake mixes and light breads in which whole grains would be unpalatably heavy, and into foods where you’d never expect to find them: soups, sauces, puddings and creamy fillings that already have starch in some form. “Why not whole-grains starch?” asked Monica Fischer, head of the food science and technology department. Breaking down the grains can also create sweetness, which raises the possibility of substituting whole grains for sugar in certain products. I saw packages of two Peruvian cereal drinks: Ecco and Nesquik, both marked “*con cereales Andinos*” (containing Andean cereals), including corn, quinoa and amaranth. Those and other grains from affiliates in South America and Abidjan, Ivory Coast, are being studied to understand how and whether they can be extruded into pasta and noodles and used in place of northern European wheat.

Because the research is basic, Nestlé doesn’t know yet which of its hundreds of food businesses will apply its findings—the actual testing of products takes place in 300 “application groups” around the world. But Nestlé already buys locally grown grains in the U.S. and Canada and will likely increase the

percentage. Not long from now we might find Stouffer's turkey tetrazzini with whole grains in both the noodles and the sauce; one of those cereal drinks on a local supermarket shelf; amaranth in a health drink; and more fiber and whole grains in Purina pet food, a big part of Nestlé business. (Nestlé won't talk about its future marketing plans.) Or whole-grain Kit Kats, which Nestlé has already marketed in England. Or Buitoni quinoa fusilli, which the rising number of gluten-intolerant people will certainly welcome. But will Ecuadoreans?

The research I saw at the world's largest and sixth-largest food companies will, of course, come at a price. Processing, even to restore a food's natural ingredients or not remove them in the first place, always adds to a food's cost. Another potential threat of the new food research is that these products could co-opt traditional markets, like the ones for quinoa and amaranth, and begin to erase native foods, which can be made for a fraction of the cost and have been shown for millennia to be healthful and practical. And there are plenty of other costs I'm leaving out: the treatment of labor, the environmental costs of packaging and transport, the general destruction of small businesses as large corporations grab local markets with lower prices and often bad-for-you food, deceptive claims and advertising, the checkered political history of all these companies.

But if huge corporations able to finance basic research don't build the kind of centers Nestlé has, government won't. Sputnik caused a technology-research revolution financed by massive government investment, often in partnership with private industry. The cold war gave us the Internet and GPS and a slew of electronic devices we rely on. As for comparable leaps forward in food—well, we got Tang.

Locally raised food, which I hasten to say governments and consumers should strongly support, won't meet the needs of the developing world. Or the world of time- and money-pressed American working families. But lowering the price of and improving the quality of packaged foods can help people eat better and weigh less. And, without a focused government investment in research or a retooled farm bill that favors health-minded farmers and food producers—both of which seem unlikely—those initiatives will be left to the seldom philanthropic free market.

As part of its commitment to lowering sodium and sugars in private-label foods, Wal-Mart also committed to eliminating the premium its consumers usually pay for whole-grains foods and fresh vegetables. That move jibes with the main finding of "It's Dinnertime," a recent national survey of American low-income families conducted principally by Share Our Strength, the national hunger-relief organization: Low-income families cook and eat at home much more often than is popularly supposed; the single biggest barrier to their doing it more is the cost of food.

But I did see and taste hope for a better nutritional future. Nestlé is working to simplify the ingredients in some of its popular foods, taking out everything artificial and all preservatives and limiting the ingredients on the label to five recognizable components. OK, the first product line it began to overhaul was Häagen-Dazs, but it was a start. Next is...Coffee-Mate, hardly a health food, but a product practically everyone uses, horrifying as the ingredient list has always been; the new Natural Bliss line is made with milk, cream, sugar and natural flavors. (We'll save the discussion of "natural," maybe the most misused word on a label, for another day.)

And in the Nestlé flasks, I smelled not just "sauerkraut" but the potential for re-naturing foods. I also heard about preservation and pathogen-killing treatments that can do the same thing: ultra-high pressure, at low temperatures, that can kill pathogens without denaturing flavorful bacteria as does the current, hated-by-foodies ultra-high pasteurization. Already pressure is used to kill viruses and other pathogens in oysters, preserving texture, liquid and flavor far better than pasteurization. The potential for long-life milk and cheeses that actually taste, well, natural, is large.

At the General Mills company store, I bought a can of green beans and a frozen product the people I visited kept mentioning, Steamers, thick plastic bags of vegetables that go right into the microwave. I wanted to compare frozen to canned green beans. The canned were terrible: as waterlogged, briny, sour because overcooked, and otherwise flavorless as the ones I remembered from school lunches, and just as likely to make kids hate vegetables. But the frozen were bright, fresh-flavored and better than the fresh green beans I can get at any market for nine months of the year, and they had no added salt and no preservatives. I'd buy these for a weeknight, environmentally incorrect packaging and all.

The place I couldn't restrain myself was in the test plant at Bell Institute, in front of a large aluminum tray of Wheaties. I never much liked Wheaties: They lack the light crispness of corn flakes, and, admirably high as they are in whole grains and low in the number of ingredients (whole wheat, sugar, salt), Wheaties are too reminiscent of cereal's health-food origins. A very few hours before, a machine had made a test batch, starting with whole wheat berries in a pressure cooker, turning them into dough, extruding that dough into pellets, then running the pellets between steel rollers. Mendesh had thoughtfully set aside samples of the wet, sweetish dough and very good nuggets pre-flaking. But those flakes! Incredibly fresh, crisper than any Wheaties I'd certainly had, and tasting strongly of the whole wheat they had so recently begun as. "The minute you make it, it starts getting worse," Mendesh said, beaming as he watched me go back to the bin again and again. He didn't protest when I asked for a bag for the road—a bag that filled a good portion of my overnight luggage. Most of it was gone by the next morning.

#### About Corby Kummer

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