

# THE SECRET INGREDIENT

Keeping the world kosher  
By Frederick Kaufman

**J**ust as the ancient god of the Hebrews blessed one person and cursed another for reasons no one could ever figure out, the men and women at the Manhattan headquarters of the Orthodox Union pursue their mission behind locked doors. The OU is one of hundreds of kosher-certifying groups in America, from Square-K Kosher Services of Seattle, Washington, to the Lehigh Valley Kashrut Commission in Allentown, Pennsylvania, but it is by far the largest of them all, the Microsoft of kosher certification. There is no way in without identification, a visitor pass, and frequent buzzes from security. Supplicant, I waited on the couch next to reception, contemplating the sterile glass coffee tables, the stainless-steel chairs, and the plain white walls offering up nothing more than a Monet print (*Le Pont Japonais*), an in-house poster ("Think Kosher"), and a world map.

"Rabbi Genack has such a nice view from his office," said his secretary when she finally came to lead me past the maze of cubicles and conference rooms. More than fifty "rabbinical coordinators" help OU clients wend their way through the intricate series of written forms and nerve-racking on-site

*Frederick Kaufman's last article for Harper's Magazine, "Fat of the Land," appeared in the October 2003 issue. His next book, A Short History of the American Stomach, will be published by Harcourt.*

inspections that outline the purview of kosher certification. These kosher account executives, along with other specialists, flavor analysts, and support



staff, fill the little white side-offices. As I walked down the endless corridor, I began to appreciate the size of the operation. The Orthodox Union has certified kosher more than a quarter of a million products and ingredients from nearly 6,000 factories located in sixty-eight countries.

Menachem Genack, rabbinic administrator of the OU's Kashrut Division, was sitting at a round table in his corner office, slurping soup. He

showed me the can: America's Choice, Cream of Celery. Newly certified kosher. I took a seat and found myself staring at a framed magazine cover of *The Jerusalem Report*. There was a beaming Rabbi Genack, shaking hands with Bill Clinton.

When I told the rabbi about my desire to witness an actual act of certification, to see with my own eyes the moment when foodstuff made the metaphysical transition from unclean to clean, he looked up from his soup. I told him that kosher certifiers offered certainty, and certainty was what I sought. I stood before the man who had certified 100-percent kosher the OreO cookie (and all its ingredients), the man behind the historic certification of Campbell's vegetable soup. Genack looked me in the eye and said, "Everything we know is confidential."

But Rabbi Genack had talked to enough reporters to know you can't get rid of them by not talking. So he suggested I speak with Rabbi Raymond Morrison, head of the Orthodox Union's ingredient registry, a computer system that coordinates all the ingredients and ingredients of ingredients in all of the food the OU has ever certified, a database of more than 200,000 entries. It is the largest such database in the world; I suspected that somewhere in that electronic Babel might have been inputted *Hashem*, the unnameable name of the King of Kings.



I walked a dozen more offices down to meet Morrison, whose desk was piled with stacks of paper that he pulled protectively to his side of the table. "Unfortunately, I cannot let you look too closely," he said. "This is highly confidential."

Morrison lifted one of the piles and flipped through it, a flurry of lists and graphs meaningless to the uninitiated. "Information on a new product," he explained. "A flavor. Made up of fifteen ingredients." He looked at me. "This is the information on one of those ingredients."

I attempted to convince Rabbi Morrison that I was aware of the highly technical nature of ensuring that partially hydrogenated soybean oil fit the dietary requirements as laid out in Deuteronomy, Chapter 14. "The concrete details are what I'm after," I told him. "I want to see exactly how it happens." But Rabbi Morrison shook his head. "The procedures are highly proprietary."

A pitiful silence. Then I said, "Look. This is a great story. And an OU rabbi is the hero. In a world of multinational corporations, a world where money buys everything, he cannot be bought..."

And so on. It was a bald appeal to vanity, but I figured everybody wants to be a star. I mustered an enthusiastic smile. Rabbi Morrison did not say anything, but he punched some numbers into his phone and soon a pale man named Menachem Adler marched into the office—my third rabbi in less than ten minutes. How many more were there? How immense was this work of redemption?

I explained to Adler what I wanted to see, and he exchanged a glance with Morrison. Morrison gave the nod, and Adler began to name some of the places where his people did their work. Freighted with connections and implications that hovered just beyond my grasp, Adler's list of corporate giants possessed a cabalistic savor, as though reciting the names of ingredient companies was itself a mystical mode of contemplating the seventy-two esoteric words for Adonai. Genencor International, the bioproduct and health-care giant (\$380 million in 2003 revenue) had an ingredient plant in Rochester, New

York. Quest International (\$255 million on food ingredients alone in 2003) had a plant in Minnesota. And, oh yes, there was that OU field rabbi who made frequent visits to ingredient works in Beloit, a two-hour drive from Chicago.

"Give me a contact," I said. "I'll fly out tomorrow."

"What we have to figure out," Adler said, "is how we can help you without hurting ourselves."

Now Adler's list jumped to Europe. A Danish company called Novozymes, the world's largest producer of food-grade enzymes, had facilities in Bagsvaerd and Fuglebakken, both due for their yearly kosher audits right about the time of my travel window. A coincidence?

"Who's the certifier?" asked Morrison.

"Meyer," said Adler.

"Avraham Meyer?"

Adler nodded. Again, Morrison and Adler fell silent. Something had been decided, but after a moment or two I understood that between the two of them still hung a disturbing possibility: I was no regular reporter but a gnostic foodie, alienated and confused. Trouble.

"I need a name," I said, bulling ahead.

"It would be perceived as a breach of protocol," said Rabbi Morrison. But Adler was already scribbling in his notebook. It was a done deal.

When I stood to leave, it was Rabbi Morrison's turn to smile. "Can you find your way out of this labyrinth?"

**T**here are those who argue that the Torah's dietary laws were politically motivated, a matter of suppressing the influence of other ancient Canaanite tribes, for whom boiling meat in mother's milk was a cultic act. Others assert that the different foods are allegories of virtues or vices: Weasels are malicious and destructive and thus forbidden; reptiles are greedy, so you can't fry them up for breakfast. Others say that the abomination of all creeping things was stolen straight from Zoroastrianism, while many believe the dietary rules were purposefully made to be arbitrary and irrational, discipline for the sake of discipline. The ancient

philosopher Philo thought that kosher was simply a matter of choosing the most delicious cuts of meat, although anyone who has ever devoured a platter of pork fried rice has grounds to debate Philo. Hygiene, too, has long been a popular theory—that pig has trichinosis! But it turns out hygiene has little if anything to do with kosher. Nor, for that matter, does nutrition in general. A dinner of Three Cheese Pizza Bagels with Ice Cream Classic Cake Log for dessert may be kosher, but no food guru on earth would dare call it healthy. Health was not the god of Abraham, Isaac, and Jacob; health is the American god. So the revisionist logic runs something like this: Since God is health, all that God approves must be healthy. Kosher is approved by God, therefore kosher is healthy. Result of the syllogism? Here in the land of the gluten-free, "Certified Kosher" has joined "Organic," "All Natural," and "No Preservatives" at the very top of Mount Sinai.

Yet Kosher's healthiness is only one, preliminary deduction. In a country where physical health has long been associated with economic health, kosher proves its wholesomeness by its cash value. Today in the United States it is hard to avoid eating food that some rabbi, somewhere, has not certified kosher. Market specialists now assert that out of a \$500 billion market, U.S. food manufacturers sell more than \$170 billion worth of kosher-certified products each year. Of course, the newly certified kosher Snickers bar is no more nutritionally vital than the old noncertified Snickers bar. What has been enhanced is its economic vigor. Indeed, whenever a company takes a food line kosher, it sees a jump in market share. And for Nestlé or Nabisco or Best Foods or General Mills, even a fraction of a percentage point may translate into millions of dollars. Because it's not only observant Jews who eat kosher—it's Muslims and Seventh-Day Adventists, throngs of the lactose intolerant, vegetarians and the health conscious, and even those who believe kosher adds a little ethnic excitement to the table. According to *U.S. News & World Report*, 28 percent of Americans say they have knowingly purchased a kosher product in the past year; and only 8 percent of those did so



for religious reasons. Kosher may be a myth, but it's our kind of myth. A myth that increases sales.

In fact, my pursuit of culinary gnosis had begun at a trade show. At Kosherfest 2003, at the Javits Center in New York City, Alfi Fass, director of Moga International (a kosher-ingredient purveyor) informed me that 60 percent of all products in American supermarkets have been certified kosher. Such a miraculous statistic had to be investigated. "It's been a domino effect," agreed Mordechai Levin, executive director of the Kashruth Council of Canada. "In the last twenty years, the business has exploded." The vast aisles of Kosherfest brimmed with kosher dog and cat food, kosher toothpaste, kosher salsa, kosher sushi, kosher burritos, kosher biscotti, kosher Portobello mushroom soup, and kosher paper bags for carrying it all. Public relations guys sauntered among the booths, spewing endless factoids about "the kosherization of America." Today Wal-Mart sells kosher products, along with Trader Joe's and Whole Foods and FreshDirect and A&P and Safeway. In fact, the average American supermarket carries 13,000 kosher products. The uncanny ubiquity of kosher duck sauce and kosher bottled water and all the hoopla at the Javits Center made it clear that the ancient kosher gods and the new market gods could exist happily side by side.

And kosher economics do trickle down. One level beneath the retail kosher product lurks the wholesale kosher ingredient. And beneath the ingredient lies the infinitely recursive level of the ingredients of the ingredients, the sub-substance of the substances, which are themselves combinations of even more basic substances. There is plenty of profit to go around, even on the esoteric strata of emulsifiers, flavor enhancers, starches, and dehydrates. And in the land of ascorbic acid, dextrose, and ethyl vanillin, the market saturation of products certified kosher reaches even more gargantuan proportions, an overwhelming 80 percent. If you take into consideration that some ingredients will never be kosher, no matter what (essence of fried pork rind, say), that 80 percent figure, in real terms, means that nearly 100 percent of the food sub-

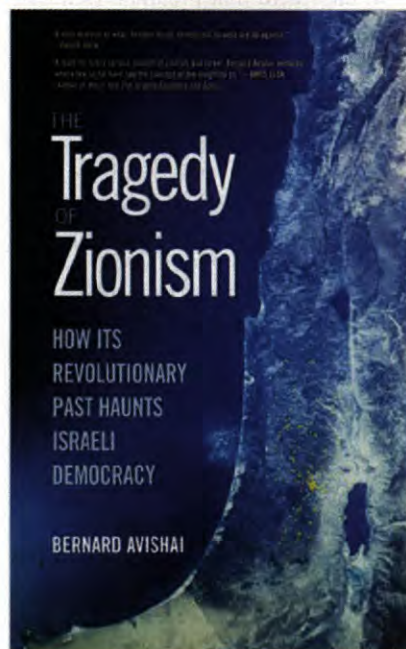
stance in America that can be kosher is, in fact, kosher.

Here was revealed the obsessive soul of Kosherfest. Markets may atomize and globalize, manufacturers may specialize within specializations, but unlike the rest of us, the rabbis have not drifted into bewilderment. They are watching the fragments, and they are counting. The tiniest particle of disodium phosphate floating around in that box of Berry Blue Jell-O must nonetheless pass the essential test of kosher certification. Now, consider that a single bite of a Frito-Lay brand certified-kosher barbecued potato chip delivers dehydrated starch from Idaho, dehydrated onions from China, dehydrated garlic from India, and a bit of paprika from Spain, all of which must be certified kosher. "A simple product has ten, twenty ingredients," explained one of the throng of rabbis milling about the Orthodox Union's Kosherfest booth. "Twenty certifications behind the certification, you see? I don't think anyone understands the globalization of the food market as we do."

Indeed. Every day the tally of rootless cosmopolitan kosher certifiers grows: Shimon Freudlich, a Chabad rabbi, now lives in Beijing. Shalom Greenberg has moved to Shanghai. Moshe Gutnick works out of Australia, Yosef Kantor from Thailand. And then there are the hundreds of professional kosher certifiers who are always on the move, jetting from pickle manufacturers in Bangalore to edible-oil plants in Sumatra to yogurt factories in outer Mongolia. Known as *mashegichim*, these men can walk into any factory on earth, interview the chief of R&D, apply their expertise in chemistry, food technology, and the laws of Deuteronomy and Leviticus, then rule. They know cheese, but they also know Cheetos. They understand artificial acidulants and sweeteners, glucose, maltodextrin, and polysorbates. They know precipitates and finning agents and micron filtration. It may sound like science fiction, but we eat it every day. As Rabbi Yaakov Luban, the Orthodox Union's executive rabbinic coordinator, told me, "Everything artificial is inherently kosher."

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**Helios Press**



But its world headquarters remains in Bagsvaerd, a dreary little northern outskirt of Copenhagen. Novo's administrative offices, research laboratories, warehouses, and granulating towers take up half the town. It was in Bagsvaerd that I found myself hurrying past a blue-and-white Novozymes flag, which whipped around in the frigid drizzle. Inside headquarters, Novo employees strolled the hallways in the foul-weather casual dress of tech geeks worldwide: comfy sweaters, wrinkled khakis, and bright-hued windbreakers. Behind the receptionists twinkled the company's checkerboard logo, all bacteria and polymer and clear blue skies, and beneath the glimmering images, Novozymes' motto: Unlocking the Magic of Nature.

As I waited in the lobby I watched corporate video in an endless loop on a high-definition widescreen, a montage of industrial defilements and enzymatic saviors, juxtapositions of smoke-spewing factories against rows and rows of clean and shimmering flasks, dutifully nurtured by white-suited lab technicians. I was mesmerized by hummingbirds and dolphins, laughing children and four-leaf clovers, DNA mutagenesis and blossoming colonies of bacteria. No mention of anything kosher.

Then I met Eva Louise Holm Petersen, Novozymes' media relations manager. Petersen wanted to discuss ground rules. "There are some technical details we do not want published," she said. We sat around a blond-wood oval table in a blond-wood conference room, and someone delivered a definitely non-kosher smorgasbord of shrimp salad and rolled pork sausage sandwiches. Petersen did not touch the food. She reconfirmed that I had not brought a photographer. Then there was the matter of "Row Number One," the 300-meter hall of laboratories just a few blocks away, the longest straight run of kosher enzyme research in all of northern Europe. More than 400 scientists labor on Row Number One, which was of course off-limits.

I switched the conversation to the Danish Lutheran priest who had made headlines in Denmark this past year by publicly disavowing his faith in God. I mentioned recent news reports

about a Danish pagan association that after years of intense lobbying had finally convinced the Danish government to authorize heathen marriages. Petersen smiled. She was born and still lives in Roskilde, a town of 50,000 people, home of the Viking Ship Museum. Perhaps she, too, worshiped Odin, Thor, and Freya.

What did she make of kosher certification? "It's meaningful," she said, "to our customers." Did she have any idea why Jewish law prohibited the consumption of badgers but not frogs? Silence. Any insights into the great prohibition against mixing milk and meat? "I don't know," Petersen said. She took a bite of shrimp salad. "But I would like to know."

After lunch I met Jes Knudsen, a tall, wiry twenty-three-year Novozymes veteran and an expert in quality control and general enzymology. Within company walls, Knudsen is perhaps most famous for having composed a satirical ballad called "Revolutionære Celler," a song about subversive cells in fermentation tanks striking for better conditions and stock options. But for the next several hours his main concern would be making sure I didn't write down the number of fermenters in any building or their specific capacities. It was a secret.

At first Knudsen had believed that making sure the enzymes were kosher was a nuisance, "doing all these things for a few Jewish customers." But he has since changed his mind. "Now I see the need for it. The rules may be annoying, but there are good reasons. We have to be a part of the kosher supply chain. It is the key to the U.S. market."

I asked, "How do you say, 'Unlocking the Magic of Nature' in Danish?"

"There is no proper translation," he said. "It cannot be done."

Knudsen took me outside to a little blue Novozymes company car. Only after I got in the back seat did I notice that there was someone in front, so when Knudsen introduced me to the great Dr. Avraham Meyer, all I could see were the outlines of his full gray beard and braided payess, the creased folds of his knee-length black bekishe, and the inscrutable back of his tall felt hat. On the streets of Brooklyn, Meyer would have been instantly recognizable and totally unremarkable—yet

another ultra-orthodox—but here in Denmark, Jews are scarce; no one would have guessed that he had come to warrant and certify kosher every last one of Novozymes' mass-produced, genetically modified food-grade enzymes.

We drove a few blocks in the little blue company car, then got out. Jes Knudsen tapped a number into an electronic keypad next to the metal door of a staggeringly large warehouse. Dozens of electronic forklifts whizzed among gigantic pallets labeled ENZYMES, each machine steered by stark-featured Nordic men and women dressed in white uniforms stenciled with light blue Novozymes logos. Huge, clear plastic doors slid open and closed, straight up and down. The manic high-tech warehouse produced the unmistakable vibe of a James Bond film. Everything was perfect except for black-suited, gray-bearded Dr. Meyer, who seemed to have wandered in off the set of *Fiddler on the Roof*.

Now he stood in the middle of the concrete floor, serene amid the chaos. Here it was, the moment I had been waiting for, the moment of kosher truth. But nothing happened. No invocations of Hebraic law, no incantations, no prayers. No certainty. Indeed, Jes Knudsen seemed increasingly uncertain. A bad report from Meyer would mean more than lost enzymes and lost sales; it could mean the re-vamping of a fat chunk of industrial process, anything from upping some water temperature a few degrees centigrade to a complete reprogramming of the ink-jets that label the product cases. I trailed Dr. Meyer as he strolled past pallets of Ultraflo (headed to Switzerland), Cellusoft (to Ecuador), Promozyme (South Korea), and a towering pallet of Termamyl, a brewing enzyme on its way to Lagos, Nigeria. (Since ancient times, beer has been made with malt. But malt can be temperamental. Better to use an enzyme, every function of which has been genetically calibrated.)

The forklifts honked as Meyer made his way past pallets of Lactozyme, Pectinex, Miraculase . . . Last year Novozymes sold more than \$1 billion worth of enzymes, which can be used for almost anything. A feature of one Novo product, SP 249, is that it reduces flatulence in piglets.



"What does Freshzyme do?" I asked.

Jes Knudsen said nothing.

Dr. Meyer circled the warehouse, and by the time he came to a halt next to a huge conveyor belt that fed straight into the jaws of a monstrous shrink-wrap machine, Jes Knudsen was wringing his hands. Meyer looked up, contemplating the impossibly tall towers of blue plastic bottles filled with bioengineered proteins. The forklifts swerved, the automatic warehouse doors slid open and closed, but Meyer stood still for a long, long time. It might have been kosher supervision, but it looked like existentialism.

"All right, sirs," Meyer finally said. "Forward."

**W**hen I heard that Novozymes was the world's largest producer of food-grade enzymes, my first thought was, What's an enzyme?

I was soon to learn that when it comes to producing food, enzymes are nothing new. In the *Odyssey*, Homer describes how after milking his goat, the cyclops Polyphemus "took half the milk and made it into cheese, which he skillfully curdled, separated from the whey and stored in wicker baskets." Polyphemus knew how to make cheese because he knew how to use the enzyme rennin, a protein that can be scraped from the stomach lining of suckling calves. But it was not until 1913 that a German scientist named Otto Röhm first patented the use of enzymes extracted from the pancreases of slaughtered pigs. Of course, such primitive trypsin and protease were not kosher. "The swine," said God, "because it parts the hoof and is cloven-footed but does not chew the cud, is unclean unto you."

Even without hooves and cud, enzymes are gargantuan proteins. They are so extraordinarily complicated that the most advanced recombinant DNA laboratory in the world cannot create an enzyme from scratch. But that doesn't mean some slick Danish bioengineer can't find some appropriate bacterial vessel (a sliver of backyard lichen or some fungus attached to a grain of rice or even, in one famous case, some dirt from the

top of Kierkegaard's grave), nurture the molecular secretions until they blossom, modify a few covalent bonds here and there (splice in a gene for this, a gene for that), then take out a patent on the mutant spores and start earning royalties.

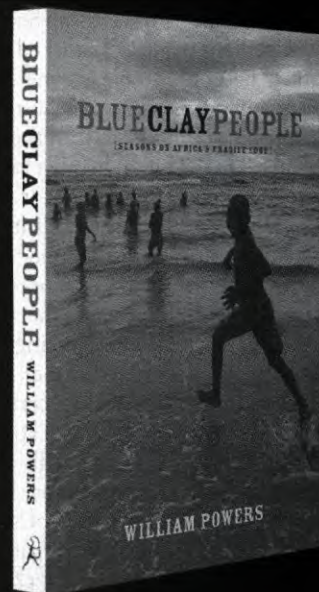
Designer enzymes can do anything artificial ingredients can do, and more. They can bind, stabilize, sweeten, coagulate, clarify, dissolve, foam, tenderize, and texturize. They can increase crumb quality, enhance aroma, improve sliceability and what people in the food business call "mouthfeel." But there is one enormous difference between an enzyme and an artificial ingredient: enzymes do not have to be listed on the ingredient panel.

Before the kosher ice cream or kosher dehydrated gravy has reached its ultimate substantiation as packaged product, the enzymes that created the comestible have disappeared. Micro-filtrated, sublimated, or centrifuged out from the mother broths, they have, quite literally, become ghosts in the food-production machine. Once the enzymes have blessed all the other ingredients, they can return to their transcendental plain. Thus can the ingredient panel of the kosher-certified, all-natural, organic loaf of whole wheat bread become the dream of every retailer: flour, water, salt—and nothing else.

Since enzymes have been used—and then "recovered"—there's no need to list the Fungamyl, the Novamyl, the Pentopan, the Gluzyme, and the Lipopan, the gene-shuffled proteins that have increased the loaf volume of almost every hot-dog bun sold in America today. The enzymes sanctify the bread with longer shelf life, better water retention, a browner crust, superior dough handling, stability, tolerance, and machinability—and then the enzymes go away. It's a miracle, the uncanny convergence of fairies and microbiology: Frankenfood that vanishes without a trace. Awe-inspiring, terrifying, numinous, and salvific, enzymes are perhaps most reminiscent of that bush that burned with fire but was not consumed.

In the past twenty years the enzyme has become the prince—or Gorgon—of all genetically modified organisms.

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Much beloved by the FDA and a paranoid American public yearning for kinder, gentler, less artificial food ingredients, mass-produced designer enzymes that never have to appear on the ingredient panel of a finished food product had only to please one, final constituency. Of course, these were the *mashgichim*, specialists in the ethereal.

And that's the hitch. In order for the packaged yogurt or marinade or baby food to be certified kosher, all its ingredients must be certified kosher; likewise, in order for the ingredients to be certified kosher, the enzymes that have mediated the creation of said ingredients must also be certified kosher. And in order for an enzyme to be certified kosher, that enzyme must keep kosher.

Tales abound of urgent calls from start-up biotech companies that have come up with a new strain of some wonder genetically modified organism, a protein that will accelerate cheese ripening or extract a more savory meat flavor from scrap-bone residue. The tech-savvy *mashgiach*—Dr. Avraham Meyer, perhaps—will be deployed on an emergency basis to certify that the new microorganism is kosher, only to find that the infant enzyme cultures—which, like any newborn, need a rich diet—have been brought up on a substrate of brain tissue, an infusion of pig heart, or human blood serum. Definitely not kosher.

What to do? Try to feed the germs something else, of course. But what if those itty-bitty bacterial colonies get finicky? They like their human blood serum. They don't want kosher potato flakes! They don't want boiled beets and carrots! They don't want soy grits or V8 juice (a common starter for colonies of gene-mutated enzymes).

This is when the halakic heavy hitters meet in conference rooms lined with Torah, Talmud, and the commentaries. One OU certifier told me that the rabbinic experts there spend more time on biotech than anything else. And kosher rulings involve some of the most nuanced and complicated of all rabbinic interpretations. Perhaps, if the baby GMO will eat just a little bit of pulverized potato flake, just one bite, so to speak, it might qualify. But there are no straightforward judgments. And so the Orthodox Union has in the

past come up with a general guideline: In order for an enzyme to be certified kosher, the feed media for that enzyme must be "kosherish."

And what about the feed media for the feed media? It is a food chain of microscopic yet divine reticulation, leading back to the mother-of-all proteins, keeping kosherish in an aerated flask.

Unlike the warehouses of Bagsvaerd, the biorefineries in Fuglebakken have a dress code: white lab coats, clear plastic goggles, wax earplugs, and white hair nets. We donned our raiments and entered the control center, a glass-walled room packed with floor-to-ceiling computers, wall-sized flow-charts, and video screens. Here the technicians monitored jet-cooking and gelatinization, steam pressures, temperatures, and pH values. A tiny radio blared Danish rap. Dr. Meyer did not say a word. Almost as soon as he entered, he turned to leave, but just outside the door he swiveled and everyone halted. Meyer was gazing at the exterior of the control room, which someone had painted to resemble one of those horribly quaint Danish thatched huts.

"The only decorated fermentation facility I have ever been in," said Meyer.

We passed through more hallways of corrugated metal and came to a colossal edifice of whirring, steaming fermenters. There in the corner sat rows of what looked like big metal dairy buckets. Each conical container, locally known as a "Sputnik," flashed a red label that read KOSHER. Dr. Meyer stopped and stared. Jes Knudsen sucked in his breath.

The fermentation chemist, our Fuglebakken tour guide, was named Lars. "Any questions?" Lars asked.

"No," said Dr. Meyer.

Next we entered an armory of huge, roaring, shaking tanks. Meyer glanced at the tumult and turned to leave.

Outside we stomped across more frozen mud. The Novozymes facility at Fuglebakken stretches across an interminable campus, each bunker of which must be duly inspected. I caught up with Meyer and asked him what it was we had just seen, and he explained that in order to make en-

zymes, the biomass must be stirred and accelerated, but without antifoaming agents you get something that resembles a Guinness. All foam must be annihilated, but the antifoaming liquids, which have traditionally been meat-based emulsifiers and oleic acids, must now be kosher. So Novozymes uses newfangled antifoaming additives, made from vegetables or totally synthetic gloop, like Antifoam 5673.

And how does an antifoaming agent work? "It's halfway between black magic and science," Meyer said. "No one is quite sure how they work."

We plodded past more pallets of chemicals, hiked up and down endless flights of metal stairs. Meyer led us through rooms that sprayed jets of blood-red mist, depots stuffed with nothing but vacuum pumps, compartments wound with rubber tubing, chambers that dripped, and entire factory floors that smelled really, really bad. "Any questions?" asked Lars. "Any questions? Any questions?"

Meyer stopped to blow his nose. He smiled at the machines. But he had no questions.

In fact, no one except Lars had said much of anything for quite some time, so I figured I might as well. "Excuse me," I said. "How many cubic meters does that tank hold?"

"No, no," said Knudsen, shaking his head at Lars. "Don't answer that."

By now, the automatic plastic doors that slid up and down behind us wherever we went in Fuglebakken had lost their novelty. Even the thrill of our all-white sci-fi getups had begun to subside. There was no hair net for Meyer's great, flowing gray beard, and he had not buttoned his lab coat, so his black bekishe protruded as he tramped around the rocket-sized media tanks. Every once in a while he paused to gaze at the huge burlap sacks of feed media that lay scattered about the concrete floor: sugar, salt, cornstarch, sucrose, soy, calcium carbonate, ammonium sulfate, and something simply labeled FLAKES.

We filed into yet another massive indoor expanse, sweet-smelling and tropical. Now this was something special: boiling vats of fungal mycelium shot jets of steam from under the sides



of lids fastened down with tremendous steel bolts. The ceiling was an intricate webwork of painted pipes in which flowed eternal supplies of phosphoric acid and nitrogen oxide. As far as the eye could see were rows and rows of gigantic, hissing steel tubs riddled with release valves, thermostats, spigots, and evaporators. A terrible whirring and rumbling engulfed us.

I knelt next to a tank and found it warm to the touch. It groaned with unknown inner turbulence. Mutated microorganisms hatched cloned cells and fed on sterilized nutrients. And as the kosher biomass grew, Jes Knudsen waxed nostalgic. "Nothing changes at Fuglebakken," he sighed. "All the same as when I worked here fifteen years ago."

We left the building and entered yet another one. "More tanks," noted Meyer. He paused to watch two technicians in white lab coats tap steep liquor from an enzyme vat. "Some plants are more romantic than others," he said. "This is not one of the romantic ones."

"Back to headquarters?" asked Knudsen.

"Yes," said Meyer. "To say my evening service before the sun sets."

**D**r. Meyer and I shared a cab back to the airport Hilton, and I invited him out to eat in wonderful Copenhagen.

"I don't do dinner," he said. It seemed that in the entire country of Denmark there was not one restaurant kosher enough for Avraham Meyer. Back in his room, he heated a packaged Stogel Catering kosher meal in the bathroom sink. Half TV dinner, half Marine Corps Meal, Ready-to-Eat, the Stogel Catering kosher meal is how Meyer survives on the road. It is also the reason why, in all memos to the Orthodox Union's New York offices, he rates the hot water in hotels.

As his dinner soaked, Meyer reminisced about the fabulous biotech hopes and dreams of the late twentieth century, and how they never quite got off the ground—except in enzymes. Then he began to tell me of his sojourns through the wilderness. One assignment had led him

to a medieval Japanese farmhouse, where he certified kosher an ancient process of producing soy sauce. The farmers were playing music to the slurry because they believed the rhythms and melodies would make the soy ferment better. "I only saw it once," said Meyer. "But they were making real soy sauce. Musical soy sauce."

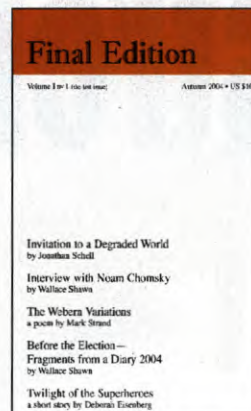
It took a while for that to sink in. What did real soy sauce matter to Dr. Meyer? What did real anything matter to him? If everything artificial was inherently kosher, if Jehovah Lord God Almighty Himself worked with flaming swords and water from the rock—what difference did real make? What was real about a kosher burrito? (Not much.) What was real about Novamyl and Pentopan and Gluzyme and Lipopan? (Nothing at all.) Then again, what wasn't real about them? And I knew it was my own foolish desire for total effability that had led to this metaphysical mess. Having been to the fermentation and recovery plants of Fuglebakken, I knew no more about the deep structure of kosher ingredients than before I had visited the world headquarters of the Orthodox Union in Manhattan. Except for one thing: Rabbi Genack and Rabbi Morrison and Rabbi Adler and Eva Louise Holm Petersen and Jes Knudsen and Lars—they had all been right. Kosher supervision was top secret and should remain so. Vanquished and subdued, I listened to Dr. Meyer.

Late into that winter night Meyer told me of his journeys to mushroom factories in distant parts of China, to cod-liver-oil factories on the islands along the fjords of northern Norway, of coconut plants in the Philippines and cookie works in the farthest reaches of the Dolomites. "It was incredibly remote and beautiful," he said. "Staggeringly beautiful. But travel is hard. You get incredibly lonely."

Outside the windows of Meyer's room on the eighteenth floor of the airport Hilton, snow had begun to fall. "Devastatingly lonely," repeated Meyer. Then he said, "Kosher is a test of faith. Someday we'll understand it."

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A co-publication of Wallace Shawn, Inc. and Seven Stories Press

