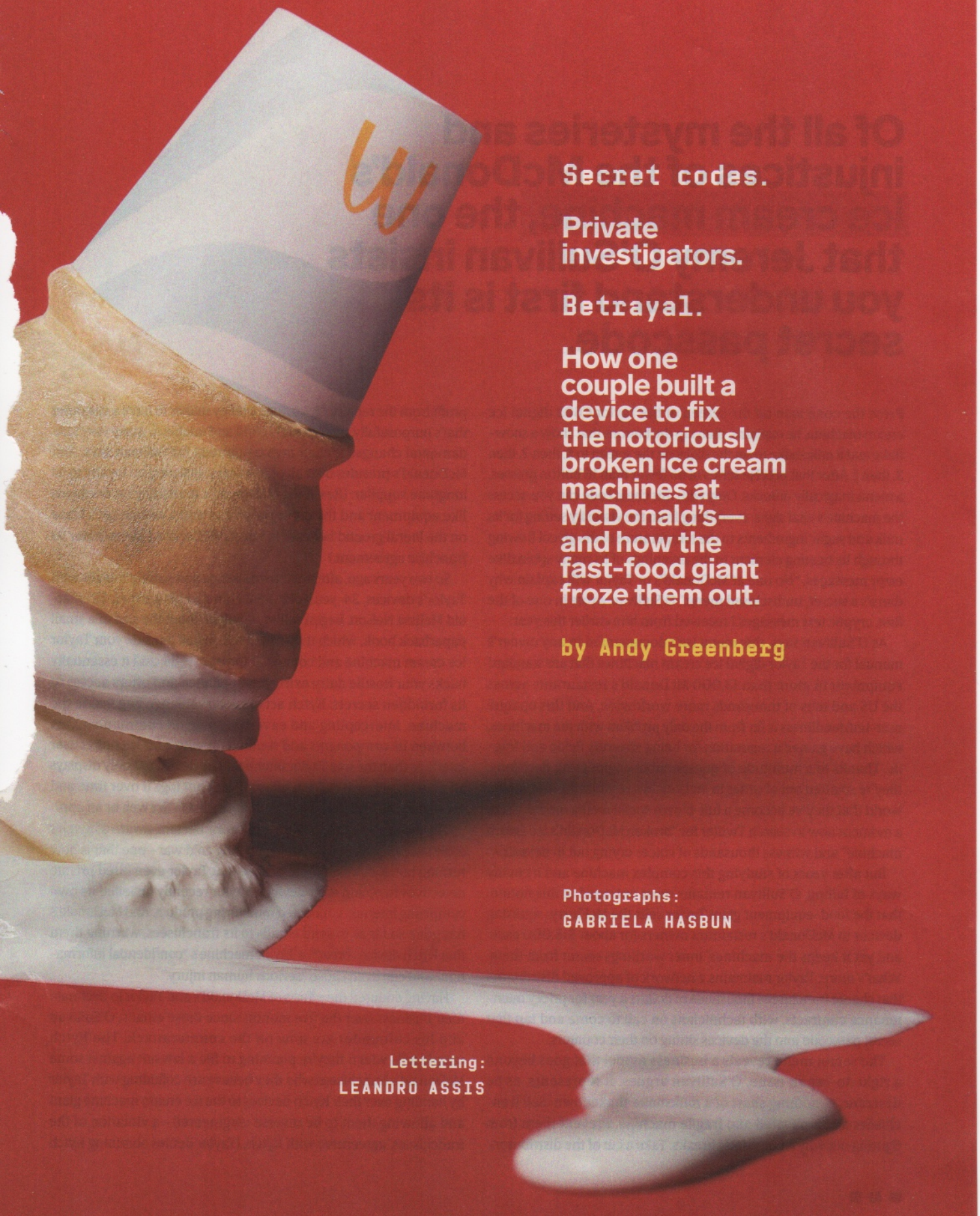

Secret codes.

Private investigators.

Betrayal.

How one couple built a device to fix the notoriously broken ice cream machines at McDonald's—and how the fast-food giant froze them out.

by Andy Greenberg

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Of all the mysteries and injustices of the McDonald's ice cream machine, the one that Jeremy O'Sullivan insists you understand first is its secret passcode.

Press the cone icon on the screen of the Taylor C602 digital ice cream machine, he explains, then tap the buttons that show a snowflake and a milkshake to set the digits on the screen to 5, then 2, then 3, then 1. After that precise series of no fewer than 16 button presses, a menu magically unlocks. Only with this cheat code can you access the machine's vital signs: everything from the viscosity setting for its milk and sugar ingredients to the temperature of the glycol flowing through its heating element to the meanings of its many sphinxlike error messages. "No one at McDonald's or Taylor will explain why there's a secret, undisclosed menu," O'Sullivan wrote in one of the first, cryptic text messages I received from him earlier this year.

As O'Sullivan says, this menu isn't documented in any owner's manual for the Taylor digital ice cream machines that are standard equipment in more than 13,000 McDonald's restaurants across the US and tens of thousands more worldwide. And this opaque user-unfriendliness is far from the only problem with the machines, which have gained a reputation for being absurdly fickle and fragile. Thanks to a multitude of questionable engineering decisions, they're so often out of order in McDonald's restaurants around the world that they've become a full-blown social media meme. (Take a moment now to search Twitter for "broken McDonald's ice cream machine" and witness thousands of voices crying out in despair.)

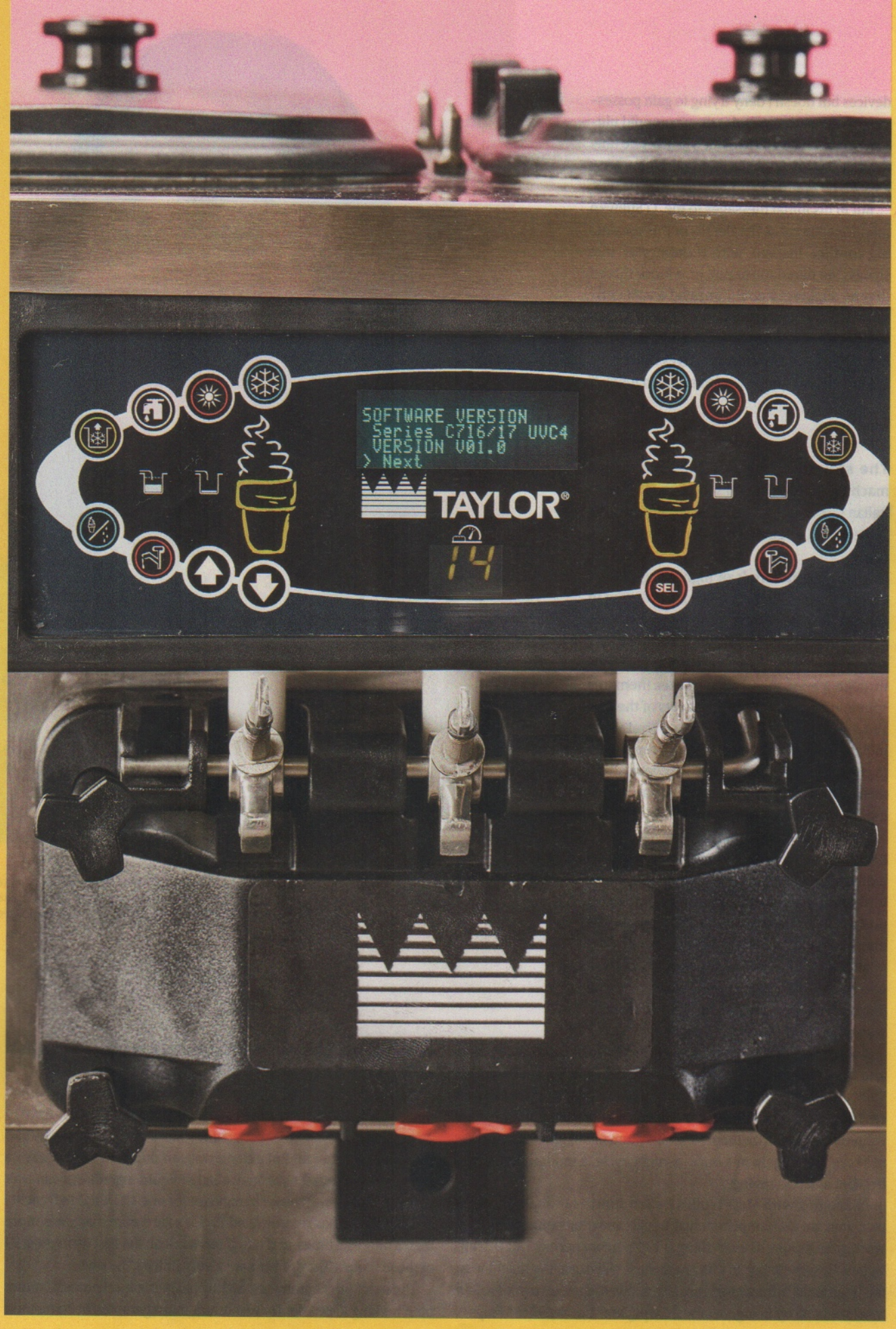
But after years of studying this complex machine and its many ways of failing, O'Sullivan remains most outraged at this notion: that the food-equipment giant Taylor sells the McFlurry-squirting devices to McDonald's restaurant owners for about $18,000 each, and yet it keeps the machines' inner workings secret from them. What's more, Taylor maintains a network of approved distributors that charge franchisees thousands of dollars a year for pricey maintenance contracts, with technicians on call to come and tap that secret passcode into the devices sitting on their counters.

The secret menu reveals a business model that goes beyond a right-to-repair issue, O'Sullivan argues. It represents, as he describes it, nothing short of a milkshake shakedown: Sell franchisees a complicated and fragile machine. Prevent them from figuring out why it constantly breaks. Take a cut of the distributors' profit from the repairs. "It's a huge money maker to have a customer that's purposefully, intentionally blind and unable to make very fundamental changes to their own equipment," O'Sullivan says. And McDonald's presides over all of it, he says, insisting on loyalty to its longtime supplier. (Resist the McDonald's monarchy on decisions like equipment and the corporation can end a restaurant's lease on the literal ground beneath it, which McDonald's owns under its franchise agreement.)

So two years ago, after their own strange and painful travails with Taylor's devices, 34-year-old O'Sullivan and his partner, 33-year-old Melissa Nelson, began selling a gadget about the size of a small paperback book, which they call Kytch. Install it inside your Taylor ice cream machine and connect it to your Wi-Fi, and it essentially hacks your hostile dairy extrusion appliance and offers access to its forbidden secrets. Kytch acts as a surveillance bug inside the machine, intercepting and eavesdropping on communications between its components and sending them to a far friendlier user interface than the one Taylor intended. The device not only displays all of the machine's hidden internal data but logs it over time and even suggests troubleshooting solutions, all via the web or an app.

The result, once McDonald's and Taylor became aware of Kytch's early success, has been a two-year-long cold war—one that is now turning hot. Kytch's creators believe that Taylor even hired private detectives to obtain their devices. Taylor recently unveiled its own competing internet-connected monitoring product. And McDonald's has gone so far as to send emails to its franchisees, warning them that Kytch devices breach a Taylor machine's "confidential information" and can even cause "serious human injury."

Having endured the efforts of McDonald's and Taylor to decimate their business over the five months since those emails, O'Sullivan and his cofounder are now on the counterattack. The Kytch couple tells WIRED they're planning to file a lawsuit against some McDonald's franchisees who they believe are colluding with Taylor by handing over their Kytch devices to the ice cream machine giant and allowing them to be reverse-engineered—a violation of the franchisees' agreement with Kytch. (Taylor denies obtaining Kytch



Taylor's notoriously fragile ice cream machines are used by most of the 13,000-plus McDonald's restaurants in the US.

devices but doesn't deny trying to gain possession of one or that a Taylor distributor did ultimately access it.) The lawsuit will likely be only the first salvo from Kytch in a mounting, messy legal battle against both Taylor and McDonald's.

But in his initial messages to me, O'Sullivan mentioned none of the details of this escalating conflict. Instead, with Hamburglar-like slyness, he dared me to pull on a loose thread that he suggested could unravel a vast conspiracy. "I think you could blow this story open by just asking a simple, very reasonable question," O'Sullivan's first text messages concluded: "What's the real purpose of this hidden menu?"

Just as O'Sullivan and Nelson's ice-cream-machine-hacking gadget began to gain customers, McDonald's warned its franchisees that Kytch breached the machines' "confidential information."

The standard Taylor digital ice cream machine in a McDonald's kitchen is "like an Italian sports car," as a franchisee who uses the Twitter nom de guerre McD Truth described it to me.

When the hundreds of highly engineered components in Taylor's C602 are working in concert, the machine's performance is a smooth display of efficiency and power. Like other ice cream machines, it takes in liquid ingredients through a hopper and then freezes them in a spinning barrel, pulling tiny sheets of the frozen mixture off the surface of the barrel's cold metal with scraper blades, mixing it repeatedly to create the smallest possible ice crystals, and then pushing it through a nozzle into an awaiting cup or cone.

But what makes the machine special is that it has two hoppers and two barrels, each working independently with precise settings, to produce both milkshakes and soft serve simultaneously. It uses a pump, rather than gravity like many other machines, to accelerate the flow of McFlurries and fudge sundaes. McD Truth describes selling 10 ice cream cones a minute during peak sales periods, an impossible feat with other machines.

And while other ice cream machines have to be disassembled and cleaned daily—and any leftover contents discarded—the Taylor machines at McDonald's use a daily "heat treatment" process designed to jack up their contents' temperature to 151 degrees Fahrenheit, pasteurize them for a minimum of 30 minutes, and then refreeze them again in a once-a-night cycle, a modern marvel of hygiene and cost savings.

In keeping with McD Truth's Italian sports car analogy, these machines are also temperamental, fragile, and overengineered. "They work great as long as everything is 100 percent perfect," McD Truth writes. "If something isn't 100 percent, it will cause the machine to fail." (McDonald's franchisees are also allowed to use an *actual* Italian machine, sold by Bologna-based Carpigiani, that McD Truth says is much better designed. But given that its replacement parts can take a week to arrive from Italy, far fewer restaurants buy it.)

Every two weeks, all of Taylor's precisely engineered components have to be disassembled and sanitized. Some pieces have to be carefully lubricated. The machine's parts include no fewer than two dozen rubber and plastic O-rings of different sizes. Leave a single one out and the pump can fail or liquid ingredients can leak out of the machine. The tech manager for one McDonald's franchisee told me he has reassembled Taylor's ice cream machines more than a hundred times, and had them work on the first try at most 10 of those times. "They're very, very, very finicky," he says.

The machine's automated nightly pasteurization process, rather than making life easier for restaurant managers, has become their

biggest albatross: Leave the machine with a bit too much or too little ingredient mixture in its hoppers, accidentally turn it off or unplug it at the wrong moment, or fall victim to myriad other trivial errors or acts of God, and the four-hour pasteurization process fails and offers a generic, inscrutable error message—meaning that the machine won't work until the entire four hours of heating and freezing repeats, often in the middle of peak ice cream sales hours.

The result can be hundreds of dollars in sales immediately lost. (Especially, O'Sullivan explains, during "shamrock season," when McDonald's offers a St. Patrick's Day–themed mint-green milkshake that boosts shake sales as much as 10-fold. "Shamrock season is a *big fucking deal*," O'Sullivan emphasizes.)

Taylor sells a machine with these technical demands to businesses where they might ultimately be run by a bored teenager whose fast-food career is measured in weeks. So perhaps it's no surprise that many McDonald's restaurants' ice cream machines seem to be as often broken as not. The website McBroken.com, which uses a bot to automatically attempt to place an online order for ice cream at every McDonald's in America every 20 to 30 minutes and measure the results, reveals that at any given time over the past three months, somewhere between 5 and 16 percent of all US McDonald's stores are unable to sell ice cream. On a typical bad day as I reported this piece, that included one out of five McDonald's stores in Los Angeles, Washington, DC, and Philadelphia, one out of four in San Francisco, and three out of 10 in New York City.

Plenty of companies have fought against their own customers' right-to-repair movements, from John Deere's efforts to prevent farmers from accessing their own tractors' software to Apple's efforts to limit who can fix an iPhone. But few of those companies' products need to be repaired quite so often as McDonald's ice cream machines. When WIRED reached out to McDonald's for this story, the company didn't even attempt to defend the machines' shambolic performance. "We understand it's frustrating for customers when they come to McDonald's for a frozen treat and our shake machines are down—and we're committed to doing better," a spokesperson wrote.

On social media, meanwhile, the McDonald's ice cream meme has come to represent everything disappointing about modern technology, capitalism, and the human condition. In 2017, when three women in Florida attacked a McDonald's employee after learning the ice cream machine was down, many people on Twitter sided with the attackers. McDonald's itself tweeted from its official account last August: "We have a joke about our soft serve machine but we're worried it won't work," a self-own that received nearly 29,000 likes.

On a recent evening in March, I attempted to tally the number of people joking on Twitter that they were going to spend their $1,400 Covid stimulus payment to fix their local McDonald's ice cream machine. I lost count at 200.

A decade ago, however, the ice cream headaches at McDonald's hadn't yet become the subject of social media notoriety. In 2011, when O'Sullivan and Nelson first decided to gamble their careers on the frozen confection business, they had to learn about the quirks of the soft-serve industry the hard way.

The two met at Bucknell University and started dating in the late 2000s, then went off to careers in accounting—Nelson at Deloitte,

O'Sullivan at Ernst & Young—which they both found deeply dull. After a few years, they began brainstorming business plans of their own and zeroed in on the frozen yogurt craze that was dotting the country with Pinkberry and Red Mango outlets.

Here was a business that was essentially constructed around a bunch of ice cream machines—largely Taylor ice cream machines, ones without the pasteurization step that would kill the yogurt culture—and yet froyo vendors were paying for hundreds of square feet of real estate and human employees, by far their biggest monthly expenses. The froyo industry seemed ripe for disruptive automation.

So Nelson and O'Sullivan, then based in the Washington, DC, area, began to develop what they called the Frobot: a bulky enclosure built like a closet around a Taylor frozen yogurt machine, with its own TV-sized touchscreen interface and credit card reader. In other words, they set out to condense the frozen yogurt store into a single autonomous appliance. They hoped to install their Frobot in public spaces, turn it on, and let it extrude revenue. (Toppings remained an unsolved problem. But they're the lowest-margin part of the business anyway, O'Sullivan confides.)

It took them three years to build their first Frobot prototype with a Taylor machine bought from Craigslist. After an initial, uneventful trial run at a West Virginia medical school cafeteria, Nelson and O'Sullivan set up the Frobot in a Washington, DC, coworking space, and the towering cabinet proved a moderate success. The couple took the leap, quit their jobs, and moved to San Francisco to work on their startup full-time, putting a next-gen Frobot prototype in an events space next to the Palace of Fine Arts, where they say it began generating as much as $500 in sales a day.

But now that Frobot was out in the world, its inventors had a problem: They wanted their machine to be fully autonomous, to convert tangy dairy ingredients into money with minimal human intervention. Regulations set by the National Sanitation Foundation required them to periodically monitor the temperature of the product to make sure their machine wasn't selling putrid refrozen yogurt. That temperature data was locked up in the Taylor machine inside Frobot, where they couldn't access it. They were intrigued, however, to see that the technician they called out to service their machine could summon up exactly the figures they needed—by entering the 5-2-3-1 secret code that appeared nowhere in their owner's manual.

Around the same time, O'Sullivan reached out to a contact at the Shenzhen-based Hax hardware accelerator, who invited the startup to come work on Frobot at the Hax workshop. They'd receive both

"It was a real aha moment," Nelson says. "Why are these features that are so important hidden behind this menu that most people don't know about?"

O'Sullivan and Nelson's first product was Frobot, a fully automated froyo dispenser built around a Taylor ice cream machine. But the Taylor machine was so prone to breakdowns that they gave up and focused on a device to fix its flaws.

a $100,000 investment and the consultation of Hax's advisers, including Andrew "bunnie" Huang, the legendary hardware guru who first hacked the Xbox 20 years ago. O'Sullivan and Nelson saw that offer of technical expertise as their chance to get over their temperature-monitoring hurdle: Could Huang and his fellow hackers help them pull out the machine's data and send it in real time to a remote interface?

O'Sullivan and one of Frobot's contract engineers moved to Shenzhen in late 2016. They got to work in Hax's warehouse space, above one of the city's famous electronics markets, trying to reverse-engineer Taylor's ice cream machines to understand and intercept their internal communications. Huang remembers O'Sullivan being more business-minded than technical, but he was impressed with the clarity of the Frobot-filled future he imagined. "It was pretty clear from the beginning they had a vision," Huang says.

Huang also remembers pointing out to O'Sullivan that the Taylor machine they were using to build their Frobot was, like a lot of food industry appliances, technology that hadn't fundamentally changed in 50 years. "It hasn't benefited from Moore's law, hasn't even benefited from web 2.0," Huang recalls telling them. "It's a product everyone eats, and the machine that makes it is just in the dark ages."

O'Sullivan and his engineer nonetheless forged ahead, and by the end of their time in China, four months later, they'd built the device that would become Kytch—a hack to bring their Frobots in line with US sanitation requirements.

O'Sullivan and Nelson did all of this, they're careful to note, with Taylor's knowledge and, in some cases, enthusiastic participation. A top Taylor exec had attended their prototype launch party in Washington, DC. Later, the company offered them 10 of its ice cream machines on consignment to work on and adapt. The company even shipped an ice cream machine to Shenzhen for them. After all, Frobot didn't represent a competitor to Taylor so much as a promising new source of sales.

At one point while in Shenzhen, O'Sullivan wrote to an executive at Taylor to ask for advice about a technical question they were stuck on. The executive wrote back that "if you want to tap into the controls or sniff data packets it will need to be without the assistance of Taylor at this time due to our current security policies."

That response may not have been entirely friendly. But O'Sullivan read it to mean: We won't help you hack our machines, but we know what you're doing, and we're not asking you to stop. In other words, as he puts it, "carte blanche."

In 2017, Frobots began to catch on. Tesla installed two in a factory cafeteria. Levi's Stadium, home of the San Francisco 49ers, installed another six, and the football team's owners invested in Nelson and O'Sullivan's company. Taylor, meanwhile, remained amicable enough toward Frobot that it invited Nelson and O'Sullivan to present it at Taylor's booths at food industry trade shows.

At those trade shows, just as their Frobots were getting their first field tests, Nelson and O'Sullivan say they began to hear whispers from Taylor customers that echoed bunnie Huang's warning about Taylor's engineering: The machine inside of Frobot, despite its industry dominance, was simply very hard to keep running.

In their eight Frobots across the San Francisco Bay Area, they began to see the same mysterious failures and error messages that plagued those Taylor customers. They'd find that their Taylor machines were throwing up error messages saying the froyo mix was too cold. Or too hot. Or too viscous. Soon they found themselves constantly driving out to Levi's Stadium to help befuddled staff troubleshoot and rebuild the Taylor machines inside their Frobots.

As their problems continued, they went so far as to mount Nest security cams in the Frobot cabinets to capture video of what might be going wrong inside. On one occasion, they watched as the ingredient mixture inside a Frobot at the Tesla factory bubbled up and out of the Taylor machine, catastrophically hemorrhaging liquid yogurt into the surrounding cabinet. Seven hours later, they saw a Tesla food-service worker casually open the cabinet, leave the sticky mess untouched, and quietly replace a missing plastic paddle component he'd forgotten when cleaning the machine.

Their business, it soon became clear, was the very opposite of automation: No one at Levi's Stadium or Tesla seemed capable of setting up or maintaining a Frobot without the constant hands-on help of Frobot's founders. And the problem was the Taylor machine at Frobot's core. "Holy shit," O'Sullivan recalls realizing. "These machines just suck."

It began to dawn on O'Sullivan and Nelson that they would need to pivot. And they had already unwittingly built the prototype for a different product, one that offered a solution to the very problem killing their current business.

For about the next year , they honed the little computer component in the Frobot that eavesdropped on the Taylor ice cream machines' data. They built features that allowed visibility into and control of the machine's variables (including some that automatically bypassed the 5-2-3-1 code to access its service menu), a software interface for diagnosing and troubleshooting the machine's many hiccups, and a sleek case for the Raspberry Pi minicomputer that powered it.

In the spring of 2019, they relaunched their company, this time as Kytch. (In a sign of the grandeur of their ambitions, they chose a name that suggested the idea of an entire connected kitchen, leaving open the possibility of products that went well beyond Taylor's ice cream machines.) When Kytch launched in April of that year, Nelson drove around the Bay Area looking for any restaurant that used a Taylor machine, pitching them on LinkedIn, and offering a six-month free trial before a $10-a-month subscription kicked in. After finding a few initial customers at Burger Kings and Super Duper Burgers, they finally began to tap into their real target market, the people who represented the biggest single collection of Taylor machine owners and who used the most complex, most often borked digital version of Taylor's product: McDonald's franchisees.

In the fall of 2019, as they began to penetrate the baroque inner workings of the McDonald's world, O'Sullivan and Nelson were stunned to learn that most restaurant owners had never accessed or even heard of the service menu that unlocked variables like the temperature of the machine's hoppers or the glycol used for its ultra-fussy pasteurization process. "It was a real aha moment," Nelson says. "Why are these features that are so important hidden behind this menu that most people don't know about?"

McDonald's owners were paying thousands of dollars a month to Taylor distributors in service fees, often for making simple changes locked behind that menu.

Meanwhile, many McDonald's owners were paying thousands of dollars a month to Taylor distributors in service fees, often for making simple changes locked behind that menu. So they added a feature to Kytch called Kytch Assist that could automatically detect some of the machine's common pitfalls as they happened, and tweak those hidden variables to prevent some of the mishaps before they occurred.

One franchisee, who asked that WIRED not identify him for fear of retribution from McDonald's, told me that the ice cream machine at one of his restaurants had been down practically every week due to a mysterious failure during its pasteurization cycle. He'd scrutinized the assembly of the machine again and again, to no avail.

Kytch's device, built around a Raspberry Pi minicomputer, is designed to be installed inside a Taylor ice cream machine.

Installing Kytch revealed almost instantly that an overeager employee was putting too much mix in one of the machine's hoppers. Today the franchisee wakes up every morning at 5:30, picks up his phone, and confirms that all his machines have passed their treacherous heat treatment. Another franchisee's technician told me that, despite Kytch nearly doubling its prices over the past two years and adding a $250 activation fee, it still saves the franchisee "easily thousands of dollars a month."

McD Truth confides that Kytch still rarely manages to prevent ice cream machines from breaking. But without Kytch, restaurants' harried staff don't even notify owners nine out of 10 times when the ice cream machine is down. Now, at the very least, owners get an email alert with a diagnosis of the problem. "That is the luxury," McD Truth writes. "Kytch is a very good device."

As word of mouth spread through McDonald's franchisees, Kytch's sales began to double every quarter. O'Sullivan and Nelson hired a salesperson as their third full-time employee. By the fall of 2020, more than 500 of their devices had infiltrated the innards of Taylor's ice cream machines around the world, and based on their trial subscriptions they projected 500 more by the end of the year. But the ice cream empire they were taking on was about to strike back.

Within two days of Kytch's late April 2019 launch, O'Sullivan and Nelson noticed that an executive they knew at Taylor had placed an order for a device. So they wrote to their Taylor contact, politely asking what Taylor's stance was on their product and what the company intended to do with it. When they got no response, they canceled the order and refunded Taylor's money.

A couple of months later, they saw another strange order, this time from someone at Taylor's outside law firm, Brinks Gilson. Recognizing the firm's name, they canceled that sale too. Over the next months, the suspicious buying attempts continued. While most franchisees would order Kytch sent to their restaurant, these supposed customers were asking for them to be sent to home addresses.

Checking those addresses against public records, Nelson and O'Sullivan matched one with someone listed on LinkedIn as an employee of Marksmen, an investigation firm specializing in intellectual property cases. They came to suspect that Taylor had hired private investigators, who were using fake names to try to get their hands on the device that was hacking their machines.

Around the same time, Taylor sent Nelson and O'Sullivan a cease-and-desist letter telling them to stop using Taylor's branding in their displays at food industry trade shows. The days of their Frobot friendship had officially ended. But as Kytch hit its stride over the months that followed, the strange orders stopped and there were no more signs of animosity from Taylor.

In February 2020, the partners were excited to see an email from Tyler Gamble, head of the equipment team for the National Supply Leadership Council, a flagship group of McDonald's franchisees. Gamble was hearing "lots of buzz" around Kytch, his email read, and he wanted to look into using it in his own 10 restaurants.

On a phone call, O'Sullivan remembers Gamble being friendly and interested in Kytch, but also warning them about the device's ability to bypass Taylor's secret menu code, which he described as a risky move that might incur Taylor's wrath. Nelson and O'Sullivan were nonetheless tantalized by the possibility that Gamble could use his enormous sway with other franchisees to promote their product. They gave him four Kytch devices to test.

That October, at the annual conference of the National Owners Association, the biggest trade group of McDonald's franchisees, Gamble gave a speech pledging to fix the audience's ice cream woes. "On the shake machine, I want to assure you guys that I will not feel

All these components of a Taylor ice cream machine have to be disassembled, cleaned, and lubricated every two weeks. A single one out of place can cause failure. The machines are "very, very, very finicky," one McDonald's franchisee's tech manager says.

my tenure as your equipment lead has been a success unless we find a way to ensure that McDonald's is no longer the butt of the joke," he said, with an earnest smile. "We won't stop until we get this right."

Then he gave Kytch a free, minute-long infomercial. "I've had the opportunity to have their devices in my restaurants over the last several months," Gamble told the crowd. "This is not a McDonald's-approved piece of equipment, and the suppliers are not yet fully on board with it," Gamble continued. "But it's my job to bring you feedback on equipment and best thinking as it relates to the industry, and I really think that this device can reduce complexity in your restaurants, make the lives of your teams easier, and help drive cash flow."

O'Sullivan and Nelson, watching the speech on a webcast from their sales booth at the conference, were elated. They hardly registered the "not McDonald's-approved" and "suppliers not on board" parts of Gamble's comments. It seemed they were about to sell a Kytch to practically every McDonald's in America.

Then, on November 2, the ax fell. Kytch's shocked salesperson forwarded Nelson and O'Sullivan an email that McDonald's had apparently sent to every franchisee. It warned first that installing Kytch voided Taylor machines' warranties—a familiar threat from corporations fighting right-to-repair battles with their customers and repairers. Then it went on to state that Kytch "allows complete access to all of the equipment's controller and confidential data" (data belonging to Taylor and McDonald's, not the restaurant owner), that it "creates a potential very serious safety risk for the crew or technician attempting to clean or repair the machine," and that it could cause "serious human injury." The email included a final warning in boldface italics: "*McDonald's strongly recommends that you remove the Kytch device from all machines and discontinue use.*"

The very next day, McDonald's sent another note to franchisees announcing a new machine called Taylor Shake Sundae Connectivity that would essentially duplicate many of Kytch's features. The note ended with a repeat of its boldfaced warning not to use Kytch.

As McDonald's restaurant owners canceled hundreds of subscriptions, trials, and commitments to install Kytch over the next months, the startup's sales projections evaporated. Finding new customers became impossible. Their sole, flabbergasted salesperson quit.

When WIRED reached out to McDonald's and Taylor, both companies reiterated the warning that Kytch presents dangers to employees and technicians. "The operation and maintenance of the specialized equipment developed by Taylor and used to produce soft-serve and shake products can be complicated," reads a statement from a Taylor spokesperson. "The checks and balances embedded in the controls of our equipment are meant to protect the operator and service technician when they interact with the machine."

As for Taylor's Kytch-like internet-connected machine, the company states flatly that "Taylor has not imitated Kytch's device and would have no desire to do so." It argues that the connected device has been in the works for years, along with a different connected kitchen device called Open Kitchen, sold by another subsidiary of Taylor's parent company, Middleby.

None of the franchisees who spoke to WIRED had ever even heard of the Open Kitchen device. Nor had they seen a Taylor Shake Sundae Connectivity machine in the wild. McDonald's says that only a few dozen restaurants have been testing the new models since October.

All the franchisees agreed, too, that the notion that Kytch could

cause harm to humans was far-fetched, if not impossible: Kytch's commands don't generally affect moving parts, and Taylor's own manual tells anyone servicing or disassembling the device to unplug it before working on it.

McD Truth argues that those Kytch-killing emails stem from Taylor's goal of building its own Kytch-like system and the long-standing relationship McDonald's has with Taylor—which, after all, makes not only its ice cream machines but also the grills used to cook its mainstay burger products. McDonald's may have also been spooked by Kytch's ability to collect proprietary data on ice cream sales, McD Truth speculates.

Another franchisee called the slapdown "suspicious" and "very heavy-handed." In more than 25 years of owning McDonald's restaurants, he told me, "I've never seen anything like this."

In the aftermath of the bomb that McDonald's and Taylor dropped on their startup, Nelson and O'Sullivan came to believe that somehow the two companies must have gotten their hands on a Kytch device—at least to test it, if not to copy it. But Kytch had required its customers to sign a contract that forbade them from sharing their devices. Who had handed it over?

Nelson and O'Sullivan began sleuthing. Tyler Gamble, they recalled, had told them six months earlier that one of his Taylor machines equipped with a Kytch device had suffered a broken compressor. When they saw Gamble at the National Owners Association conference, he'd mentioned that the machine was still in the shop—which struck them as strange. Compressors don't take six months to fix.

After their business cratered, O'Sullivan and Nelson began looking up the logins on Kytch's website and saw that one of the user profiles associated with Gamble's machine in the shop had been deleted a couple of months after the fateful McDonald's email in November. That deleted user was named Matt Wilson. Was Wilson one of Gamble's employees? They began to check his locations based on the IP addresses of the networks where he'd logged in, and found IPs from Arkansas, Tennessee, and Louisiana.

When they placed those points on a map, none of them appeared at Tyler Gamble's restaurants. All the pinpoints were instead on top of facilities owned by TFG—a Taylor ice cream machine distributor.

Nelson and O'Sullivan had been on friendly terms with TFG executives back in their Frobot days. So they began digging through their old contacts there. They found a business card for Blaine Martin, one of TFG's owners, which he had given them with a handshake at a trade show. To their shock, his cell phone number had been used to create the "Matt Wilson" Kytch account.

A Taylor distributor, it seemed, had obtained their device. And, contrary to the broken compressor story, they came to suspect it had been handed over by none other than friendly Tyler Gamble.

Even as Gamble was praising Kytch on the conference stage in October, Nelson and O'Sullivan now allege, he had also been helping Taylor as it engineered their company's downfall—the coldest betrayal of all.

Revenge, Nelson and O'Sullivan now hope, is a dish best served—well, through a long and elaborate legal process. The lawsuit they're planning is based on their claims that Gamble and likely other Kytch users violated their contracts with Kytch when they allegedly let Taylor analyze their devices, in an effort to curry favor with McDonald's and its corporate allies.

But Kytch's cofounders make no secret that their legal threats don't end with those defendants. They say they intend to pursue their case as far as it leads, all the way up the McDonald's food chain. "We're very confident that we'll learn everything we need to know in discovery," O'Sullivan says forebodingly, "to hold every guilty party fully accountable."

Taylor counters that it "does not possess, and has never possessed, a Kytch device" and "has no knowledge of anyone logging onto a Kytch device." But it notes that "our Tennessee distributor reported to Taylor that its servicer removed a Kytch device from a customer location in order to service our product." Taylor distributor TFG didn't respond to repeated requests for comment, and Tyler Gamble didn't answer WIRED's questions. But in an emailed response he described himself as "Kytch's biggest advocate" and argued that he had supported the startup both publicly and privately. "Weird they would sue someone that has been in their corner and is a paying customer," Gamble wrote, "but the facts will come out."

Regardless of how the legal conflict unfolds, Kytch's old technical adviser and investor bunnie Huang argues that the efforts by McDonald's and Taylor to crush this tiny startup represent a form of validation. "When big guys come along and start thumping their chests around you, that's sort of a recognition that you're a threat to the alpha male," says Huang, whose Hax accelerator still owns a small investment in the company. "It shows there was a demand for Kytch and it had an opportunity to disrupt things. But when that happens, if the big guys can't keep up or they want to take the idea, then sometimes it's easier for them to just sort of bury the body."

As for Nelson and O'Sullivan, they have no illusions that their legal efforts will ultimately protect Kytch from the efforts by McDonald's and Taylor to destroy it. In one of our final conversations, O'Sullivan admitted that he saw this very article as perhaps a postmortem on his company after it had been successfully murdered by the fast-food superpowers. "You're kind of writing our obituary," O'Sullivan told me.

At times, he seemed to acknowledge the admittedly low stakes of Kytch's story, the cutthroat battles his tiny startup has fought and continues to fight over such a trivial thing as a fast-food ice cream cone. "We want the world to know this because it's such a ... I mean, this is about ice cream!" O'Sullivan said at one point with exasperation.

But at other moments, he described Kytch's story as a kind of David and Goliath right-to-repair struggle, or even in grander terms: a valiant effort to fix a very noncritical but ubiquitous piece of the world's infrastructure. An effort that had been defeated not by the flaws of that machine but by the people controlling it—some of whom would rather it remain broken.

"There's the ice cream machine," O'Sullivan says darkly, "and then there's the machine behind the machine." They haven't found the secret code to crack that one yet.

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