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Lake said "The Future by Degrees" was inspired by his fascination with thermal superconductivity. "*Seeds of Change* looked like the perfect market to tackle the topic directly, given that such a concept would be just about the most profound revolution ever seen in technology," Lake said. "Think about how much of the design of any electronic device is concerned with waste heat management. Likewise internal combustion engines. Or the heat transfer issues in climate control within residences and commercial buildings. The list is endless."

The entire text of this story appears here courtesy of the author.

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The Future by Degrees **by Jay Lake**

"It's a simple concept, really."

Grover hated public speaking. Which was ironic, given his job in sales development for Quantum Thermal Systems. A half-empty church basement full of metal folding chairs was a special nightmare. He could hear his voice echoing off the metal half-moons topping each vacant seat, so that there was a metallic ring just a fraction of a beat behind his words. Debris punctuated the scuffed linoleum floor: candy wrappers, folded over flyers, and — improbably enough in the function room of the Second Methodist Church — a torn condom wrapper.

The chairs were mostly empty, the rest populated by a bored collection of farmers, ranchers and small town businessmen. Most were already nodding off, the rest sat in exaggerated poses of doubt, like a particularly truculent line of Hummel figurines. Salt of the earth, his mother would have called these men. Salty old bastards, more like it.

There were no women present this evening.

Grover held up his model. It was built from styrene sheets bought on sale at Hobbytown, glued to a styrofoam core with a few strategic wires dangling out of one end, simply because nobody ever believed in a prototype without exposed copper. The whole thing was spray painted matte black, with a bit of silvery duct tape for added effect. Any engineer knew what a casing was — skin for the reality within, bearing no more relationship to performance than the line of an automobile's fender did to the drive train.

People, though, regular people who went to work every day and drove pickup trucks and had trouble balancing their checkbooks...they needed to see the semblance of a thing before they could understand the reality beneath the skin. Farmers knew their nitrogen from their phosphates, but physical chemistry was as foreign to these people as Russian literature or Indonesian rijsttafel.

Damn it, he thought. His mind was wandering again.

"This little device," he said, then stopped to clear his throat. *Try again*. Pale, pasty and too fat to look authoritative, Grover had to rely on the words. He didn't have the convincing manner of a born salesman like Brody in the San Mateo office, and he'd never mastered the art of dressing his inconveniently round belly to look anything but sloppy-pudgy.

"This little device will save you more trouble and money than you could ever have thought possible."

He spun the prototype in his hands.

"The production model will weight about twenty pounds. It will cost you about a hundred dollars. It will store about 18,000,000 joules of heat."

Grover paused, took a deep breath.

"That's one day of peak thermal output of a cubic yard of fresh horse manure as it begins to compost. The equivalent of almost 800 kilowatt hours of electricity, the energy an average American household uses in a month. All of it with a loss of less than one percent efficiency per month."

The collective yawn was palpable. Chair legs scraped as some of the men gathered their weight to walk away. But he could see two or three chins tilted, two or three thoughtful looks.

Two or three people who understood what this thing would mean!

"It's called thermal superconductivity," Grover told them. The real details were a closely guarded secret, but the idea...the idea was priceless. "The future is here in our hands, if you can just imagine what this will do. The world has never seen anything like it. Not since the discovery of fire."

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"This material has two states," said Minnie. "Balanced and gradiated."

Grover shifted in his chair. The PowerPoints were either overly detailed or mysteriously vague. Or maybe it was just Minnie. He could imagine her hair undone from its bun, floating in wiry curls around that sensuous face.

Who knew Puerto Rican girls were so hot? Especially physical chemists.

"We've got the gradiated state working now," she went on. "It's in the form of a textile, for ease of manufacture and use. In the near future we'll have rigid forms with high ductility for applications requiring shaping or specific topologies. Transfer rates aren't optimal, but even now we can keep up with domestic uses. We're not far from internal combustion engine temperature ranges.

"As for the balanced state, I can't tell you much more than to say we expect it to be stable and replicable before the end of the next fiscal quarter."

As an engineer, he was lost among the sworn-to-NDA money men in the room. Grover's job was sales development for the product. Minnie's job was product development itself, and the high level sell of the concept.

And, well, to finish inventing it.

"The gradiated state moves heat. It's that simple. Flow direction, intensity and maxima are governed by extremely low voltage electrical inputs which realign the channeled carbon nanostructures."

The room was quiet, with the intensity of a dozen pairs of ears straining toward the biggest payoff in the history of venture capital.

"She means we can turn it off and on," Grover offered in a quiet voice. He'd taken a few yards of the lab castoffs home to play with, on the Q.T. Sales development, after all. Plus maybe a meaningful prototype, if he could get clearance for that. And it *was* cool as hell, even if the thermal gradiation was

uncontrollably locked into place on the stuff he had. "Like a faucet. Hot, cold, trickle, flood."

"Right." Minnie made a face at him, somewhere between sweet and prissy. "That's very, very useful, but it's only a form of transference."

"So..." said one of the money men in a thoughtful voice. "We could remove the car's radiator, but the block heat still has to go somewhere."

"Right." She smiled, warming Grover's heart. "That's where the balanced state comes into play. Think of it as a really big sponge, storing that block heat until we want to let it out again."

That elided a lot of detail, but the real nut and bolts of this process were still burn-before-reading secret.

"What do we do with the heat later?" asked the money man.

"Anything you want," Grover said. "Heat is power. Power is everything. The entire energy production and consumption system begins to feed itself, increasing our efficiencies dramatically across the society. Hell, this thing could have a net effect on global warming. It'd be nice to have Key West back, huh?"

There was a scatter of nervous laughter. Someone behind him stage whispered, "The Caymans, too. I had money there."

"Gentlemen," said Minnie in a tone of voice that made it clear that Grover's role as a shill was done. "What Quantum Thermal Systems does is all about the money. Saving the world is just a bonus."

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Grover's iPhone Pro rang. It took him a minute to disentangle from dreams of fire alarms and swimming pools filled with warm Kool-Aid, but he managed to slap the phone off the table onto his mattress and mash it to his ear.

"Grove, it's Brody." The sales manager sounded panicked. "Is that you?"

"Me?" Grover wasn't sure who else it would be. He was supposed to have been in Cleveland, but Wei Ming had taken trip that because Grover's allergies were acting up. Still, he never had a house sitter.

Brody's voice caught. "Take your prototypes and get out. Drive. Away. Borrow someone else's car."

"Wha...?"

"The office just got whacked. Dorsey says it was a Blackwater contract job. Whole building's in flames. Somebody ran Minnie off the road, snatched her, and took everything she had in her vehicle. Wei Ming's hotel room got tossed in Cleveland, he's in the ER there beat all to shit. There were two guys trying to break into my place just now, but I got out."

Shit. Allergy meds or not, Grover was suddenly very, very awake. They'd joked about this around the office, called it the Silkwood Scenario, after that poor woman killed by the nuclear power industry back in the 1970s for blowing the whistle. *What if Exxon came gunning for us? What if Con Ed sent out the utility ninjas?*

It wasn't a joke any more.

He scrambled out of bed, dragged himself into sweats, and stumbled down the short hall to his office.

Someone was standing in there, silhouetted in the streetlight glare through the window overlooking

Circular Avenue. The figure's hand came up.

Grover's next thought arrived with utter clarity. *I'm going to die now.*

"Get in here," Minnie hissed.

A hard, nauseating ripple of shock twisted through Grover. "What?"

"I thought you were *dead* in Cleveland. Then I heard your damned phone ring."

"Dead? Me?" He tried to grapple with the obvious question. "What the hell are you doing in my house? Brody says—"

"Brody's working for *them*." Her breath heaved, ragged and rough on the edge of collapsing from stress.

"Con Ed?"

She blinked. "What?"

"Sorry, sorry." He sneezed. "Allergy meds."

"Shut up." She picked up a satchel which had been on the floor by his desk. "Let's go."

Grover grabbed her arm. "What are you doing *here*?"

"Looking for that prototype battery you like to haul around. That, and your laptop."

Something wasn't adding up yet. Actually, everything wasn't adding up yet. "Did you find them?"

"Yes. Now let's *go*."

In the other room, his phone began ringing again.

"Minnie, if you believed I was dead in Cleveland, why did you think my laptop would be here?"

The phone rolled to voicemail, then started ringing again a few seconds later.

"Desperate times, Grove." She slugged him hard, then kicked him in the nuts as he collapsed. "Good luck with your house fire."

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He found himself on his hands and knees. The damned iPhone was still ringing in the other room, with that digitized jangly 1960s payphone bell he used to think was so funny. Grover smelled smoke.

The alarms weren't chirping, though.

Painfully, he looked up. His vision was swimming in doubled circles, but that was enough to see that the smoke alarm in his office had been yanked out of the ceiling.

Where's the fire?

Minnie had left him for dead. He wasn't walking out of here, that was for sure. Weren't you supposed to crawl in a fire, anyway?

Grover slid over to the office door and peeked underneath. There was flickering orange light in the

hallway. His office window opened onto view of rose bushes and a spike-topped iron fence at the back of the condo complex. Better than being burnt to death, maybe, but not much.

I am going to die now.

He was tired of that thought already. He keeled over onto his side, tried to keep from crying, then wondered why he cared if he cried. His eyes were running freely with the burn from the smoke.

Instead Grover thought about Minnie. What the hell was she doing? Brody had thought she was dead. QTS was gone in a night of murder and flames.

She'd said it was all about the money. Someone must have offered her a ridiculous amount to take the product and disappear.

An amount so ridiculous she'd kill for it?

The phone finally stopped ringing. Smoke was creeping under the door, sending gray fingers up to the ceiling. Grover's midsection no longer felt like it had gone nova, but he was stuck here. His only hope was that the fire department arrived before the fire did.

No sirens yet.

A thought made him sit upright, which in turn brought an unpleasant rush to his head. She'd been here looking for his dummy prototype. *She hadn't known he'd taken the defective samples home.*

"I'm going to live," Grover told the fire.

He dropped to all fours again and crawled to the closet. It was full of supplies, winter clothes, the sort of crap that a bedroom-turned-office accumulated. He'd tossed his sweaters back in there after dropping out of the Cleveland trip. Underneath them was four yards of strangely slick black cloth, so dark it looked like a hole in the shadows of the closet. Eighteen inches wide, twelve feet long. Enough to wrap himself like a mummy and walk out through the fire.

So long as he got the gradation right. It would do him no good for the nanostructures to pipe all the heat of the fire *inward* to his skin.

Power still seemed to be working, even with the fire. Grover tugged his lamp off the desk, switched on the bulb, and set the cloth against it to see which side got hot and which side stayed cool.

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"You can't hold me," Grover said. "And I'm going public as soon as I find a reporter." *Or a phone, at least,* he amended.

Special Agent Angela Looks Twice stared him down. "I'm not going to let you walk out that door." The compact woman from the FBI was currently in the grip of fury. Grover was perfectly willing to believe she could take him apart, joint by joint if required.

They were crowded together in the manager's office of the Denny's two blocks away from his condo complex. The complex had gone four alarms last he heard. He and the agent were crammed into a tiny room arranged for the convenience of one person. The manager clearly spent a lot of time trying to motivate low-wage workers through old fashioned intimidation, at least judging by the posters on the wall warning of all the different ways a job could be lost.

"Everyone connected with Quantum Thermal Systems is missing or dead." She stabbed a finger at him. "Your colleague in Cleveland. Brody. At least four innocent bystanders that we know of. Everyone. Except you."

"Right." Grover felt a laugh welling up inside him. He swallowed it hard. "You're never going to suck this thing down the memory hole now. Hell, I must have spoken to four or five dozen groups in past six months. A lot of investors heard the pitch. Now you're going to have victim's families asking questions."

"You'd be amazed what gets sucked down the memory hole." Looks Twice had a grim smile on her face. "You walked out of a 1100 degree fire with normal skin and core temps. The defense applications of this thing alone are worth a total blackout."

"Not to mention the firefighting applications," Grover said sarcastically. "I don't care what the hell you do with it. It just can't stay secret. That's what all the killing, all the fires are about. Covering it up. Making it go away. Just another failed startup. Except most startups don't end in a series of murders and kidnappings."

Looks Twice rubbed her temples, then gave him a long, slow look. "Ever hear of Heaven's Gate? Cults make great cover for this kind of operation. Everybody spends a minute feeling sorry for the dead whack jobs, then moves on."

"Got a lot better at it since Karen Silkwood, huh?" Grover stood up. "Arrest me, or let me go."

Her fists clenched. "I can hold you as a material witness."

Grover grabbed the doorknob. When had he ever fought back like this? *Maybe since people died tonight.* "Or you can help me..."

"Don't open the door, Mr. Ruggles. There are a number of pissed off cops out there who will stop you. They might even check with me, after you're finished resisting arrest."

"So, arrest me now or let me go."

"And you'll walk out and find a reporter? I can promise you, anyone with the resources to coordinate this many assaults and arsons in one evening will have no trouble finishing the job with respect to you. Any interview you go to will be the last thing you ever do."

"Then help me stay alive long enough to go public," Grover said with a growl. He wondered where all this courage was coming from, and how soon it would evaporate. "Go so public it won't matter. Fuck the NDAs. There's no one left to sue me for violating them."

He leaned over her desk, being as persuasive as he knew how. *Do it for Brody*, he thought. *For Wei Ming. For all of them.*

"I didn't invent this stuff, but I can explain it well enough that people with the right training will know what to do to recreate it. If thirty or forty universities and corporate labs nationwide are working on it, there's not much point in killing to keep the secret. I'll make the memory hole so damned big that even Karl Rove couldn't disappear this thing. Hell, once the Chinese or the Russians start working on the knock-offs, the QTS tech will be worldwide. And it will change the world."

Looks Twice snorted with a rueful amusement. "You don't think small, do you?"

"Almost all the time," he admitted. "I'm a small kind of guy. Just not this time. I walked through fire, remember? Think about what else that stuff will do."

The last remnants of anger seemed to leave Special Agent Looks Twice in a heaving rush. She pulled a business card from her jacket pocket. "You're free to go, Mr. Ruggles. Call me if you think of anything. I suggest you don't leave town without talking to the District Attorney."

Grover was surprised. He'd always figured FBI agents for world class hard asses when it came to law and order. That was pretty much the job description, after all. He gathered up the oversized plastic bag into which someone had stuffed the strips of thermal superconductor. The plastic was bubbled and stretched from residual heat.

"Mr. Ruggles," Looks Twice said tentatively as he pulled open the door.

Grover turned around, a state wage-and-hour poster looming large in his peripheral vision. "Yes, ma'am?"

"My mother and my baby brother died when our trailer burned. A lot of years ago. I find a... special pleasure in investigating arsons." She took another deep, ragged breath. "If they'd been able to walk through fire..."

"Sometimes it *is* all about saving the world," he said.

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Grover was on local television the next morning. The reporter loaned him her cell phone as he left the studio, and promised to give out the number to everyone she could think of who might be interested.

Within an hour, driving a rented Focus hybrid along a random set of roads through the Willamette Valley, he took calls from reporters from the *San Jose Mercury News*, the *New York Times* and *Agence France-Presse*. He couldn't do anything about the cell phone being traced except to keep moving.

Around noon he stopped at the public library in Silverton, then went by the local post office to mail samples of the thermal superconducting cloth to every major university he could think of. First class, no tracking, paid for in cash. That was as anonymous as he could think to make the process of getting the stuff out into the world.

After mailing off the samples, he drove east into the Cascades. One of the *Mercury News* reporters called back with home number of a science fiction author who was also an "A" list blogger and a feature writer for *Wired*. Grover called and told his story. The writer immediately grasped the implications of the idea, in both states — gradiated and balanced. "Waste heat alone," he said. "You're on the way to providing a manageable approach to global warming, and closing a huge portion of the loop on power generation. Those are two of the biggest stumbling blocks on the Kardashev scale."

"It's still lossy," Grover said, guessing at what the other man was talking about. "We can't escape the Laws of Thermodynamics."

"Right, but you're going from maybe thirty percent thermal efficiency on internal combustion to, what, ninety-five percent? Or more. You just keep reusing it." The writer sounded thrilled. "It's the future by degrees. This has applications everywhere. Did you know that they put air conditioners in equipment shacks in North Slope Alaska? Forty below outside, and a compressor running inside the insulation to manage the heat rise. This stuff..."

The conversation spun off into space exploration, medicine, environmental remediation, the potential for home-based power generation from waste heat, before the mountains ate the cell phone signal. Grover laughed at the waste heat idea, thinking back on his manure pile analogy.

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The Silkwood squad caught up with him just on the eastern side of Santiam Pass. Grover was surprised to have gotten even that far.

A helicopter with no markings, not even a tail number, was parked on the highway. He could see a large yellow dump truck at a curve half a mile downhill. They were roadblocking any potential witnesses.

Minnie stood in front of the helicopter, wrapped in an oversized windbreaker. Somehow she didn't seem so beautiful to him any more. There were three men with her. They were bulky, in gray suits and dark glasses. It was a scene straight out of Central Casting. Grover found the sheer lack of imagination offensive.

He pulled the car over and got out. "It's a rental," he shouted, feeling light-headed. Minnie's fire had finally caught up to him. "Probably don't need to blow it up."

Minnie nodded. "We tracked you by the car company's GPS."

"The secret is blown." Grover took a couple of steps toward Minnie. "It's all over the world now. Not the sales hokum we've been passing this whole time. The real thing, as much as I had of it. Including samples." His knees quivered. "You can shoot me now, like you did Brody and Wei Ming, but it doesn't matter any more."

"Hmm." She flicked her hand and the big men came for Grover.

"I saved the world," he shouted just before the first blow landed hard enough to crack his jaw.

Minnie's voice was distinct over the grinding thump of brass knuckles and tape-wrapped pipes. "And you pissed away a hell of a lot of money doing it."

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The biggest surprise was that they let him live. A long haul trucker had found Grover by the side of the road, and called in the EMTs, who'd evacuated him by helicopter. Now he sat in a Salem hospital, aching at every joint. His right eye had a detached retina and his left was full of blood.

Something moved in the doorway. Grover squinted, mumbling, "Who's there?"

"Special Agent Looks Twice," said the blur.

"Oh, hey." At least, that's what Grover tried to say.

"Don't talk. I just thought I'd tell you there's no air traffic control record on a helicopter near the Santiam Pass. No one saw anything coming and going. So far as the Jefferson County sheriff's department is concerned, you drove up there alone and tried to commit suicide."

"Beat myself to death?"

"I believe the press was told you'd thrown yourself off the top of a road cut and sustained injuries striking the cliff on the way down." She stood close enough to the bed that he could see her.

Grover fought to make the next words clear. "And the thermal cloth?"

"Front page news, pretty much everywhere." He thought she might have smiled. "You won."

"Heat is the engine of the world." He knew that wouldn't make sense to her, not through his shattered mouth.

"Right. I've got to go." Looks Twice stroked his arm briefly. "Hey, firewalker. They ever let you out of here, give me a call sometime."

Grover lay back, imagining what the future might be like.

[End]