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ON THIS ISSUE

by Jena Snyder, Production Editor

HAPPY BIRTHDAY TO US! It's hard to believe, but this 16th issue of *ON SPEC* marks our fifth birthday. The first 500 copies of *ON SPEC* Vol. 1, No. 1 sold out immediately in April of 1989; the second run disappeared just as quickly. Since then, we've seen editors fly off to new ventures; we've launched the careers of countless writers and artists; we've hosted wild parties and weathered financial storms. In 1990 we began publishing Theme Issues—Youth, Humour, Over the Edge and, in 94, we'll bring you the best of our Horror and Dark Fantasy submissions. In 92, we featured an excerpt from Aurora-winner Sean Stewart's *Nobody's Son*, and followed that in 93 with a taste of Dave Duncan's *The Stricken Field*.

What's ahead for the next five years? You'll have to keep watching these pages to find out . . .

CONGRATULATIONS! The next time you see *ON SPEC* contributor **ALAN BARCLAY** ("A Better Weapon," Spring 1990), make sure you join us in offering congratulations on his winning first prize in the last quarter of the *Writers of the Future* contest! And congratulations to **PRISONERS OF GRAVITY** on their Gemini nomination! 🍷

ON COMPUTER ART

by Lynne Taylor Fahnestalk, Art Director

When we decided to publish a hard science fiction issue, I jumped at the chance to showcase computer art.

In these times of rampant desktop publishing (when everyone and his or her dog has a home computer and graphics software), the quality of design often takes a back seat to speed and convenience. Computer software, no matter how advanced, does not make someone an artist.

An illustrator can, however, take this blossoming technology, add it to a solid background of artistic talent and—*voilà!*—the result is astounding computer art.

Each illustration in this issue was done on computer. We have all levels of expertise, from those who have just picked up a mouse to those who make their living doing computer art. Hats off to our artists! They have done a wonderful job showcasing this versatile artistic tool. 🖨



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Submissions must be in COMPETITION FORMAT: no author name on manuscript. Enclose self-addressed, stamped envelope with sufficient postage to cover return of manuscript (or mark "Disposable" and include SASE for reply only), and covering letter with name, address, phone number, story title and word count. More details, page 95.

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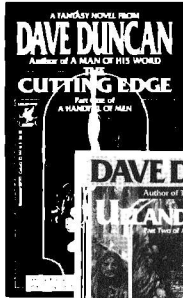
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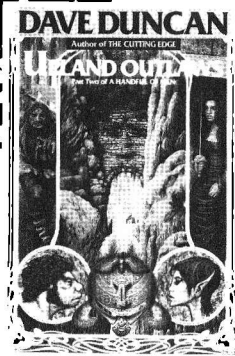
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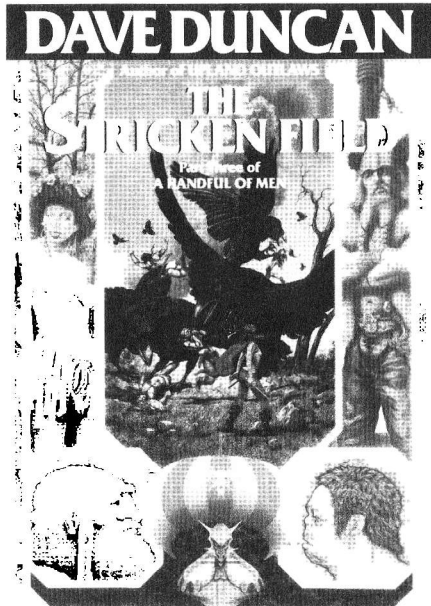
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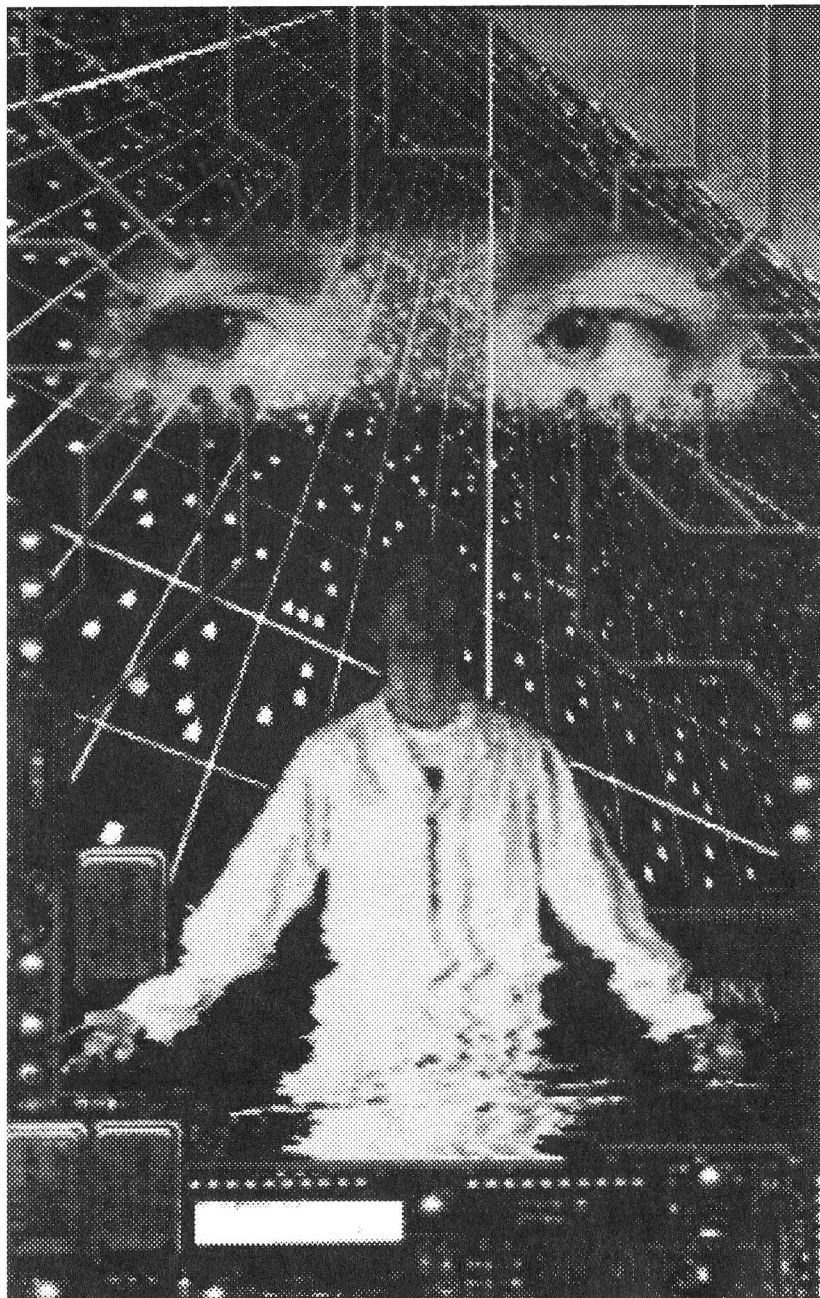
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MAKING GHOSTS

by Karl Schroeder
illustrated by Mike Jackson

That first picture of Maier's idea stands out in memory. I am standing at her right shoulder, and she leans forward over the RISC station and taps the mouse a couple of times. The 19-inch monitor lights up with a three-dimensional image like a mist of caged light.

"See there," says Maier. "That's a thought."

"It's pretty," I say, quite uncomprehending. "This is 24-bit colour, right?"

"Forget the screen, Graham. Look at what's in it." And she tells me what I'm seeing: a picture of her brain's synaptic activity, taken while she thought about her husband.

"We did it at the Med-Sci building. Ran through it fifty times. I pictured his face in my mind each time, and the magnetic resonance machine picked out the electrical activity that goes on when I do that. This is a picture of a thought, my own thought about Frank." She smiles at it lovingly. "Kind of like a portrait. Maybe I'll will it to him when I go."

Later, driving home on the freeway, I notice the cages of skyscraper

light sliding by, and wonder about thought as pattern. Are these apartments and office blocks dreaming through the power grid—each lattice of lit squares a synaptic whole? The image makes me smile. For a little while, I'm lifted above my grad-school worries, a little bundle of notions riding the synapses of the road, in a city made of thought.

These memories remain clear, though everything else fades.

*

A year later I met Maier in the foyer of the Computer Science department. I didn't recognize her until she greeted me. "There you are, Graham! How've you been?"

"Pretty good," I lied. I couldn't think of what else to say. She looked like hell. Two years ago she had been a large-boned, solid woman who radiated health. This woman was frail and thin, and her eyes were over-bright, like liquid.

"I'm glad we found you," she said, waving a hand in the direction of the labs. "We need a very specific talent, and only you seem to have it. Did you bring your program?"

"Right here." I was flattered—more than flattered. As we walked, I thought about ways to keep her from seeing how desperate I was to get this job. Even if I didn't know what the job was yet, it had to be better than the advertising agency I had ended up in after grad school.

We retired to the "padded cell" they used to test Virtual Reality. It

was a featureless room with foam on the floor, and no other contents. Maier and I put on "eyephones" and pulled data gloves up our arms. For a while I stared at test patterns on the little eyephone screens while they fired up the program, then the office appeared in stereo 3-D.

A desk had appeared from nowhere. Two chairs. A lamp. Posters on the walls. All as believable as the real thing, especially because when you turned your head, the eyephones picked up the movement and adjusted the image accordingly.

I heard Maier take a quick breath. "Beautiful," she said. Only Maier and I seemed unreal, stick-figure ghosts the program couldn't really simulate.

In VR, everything was normally bright and sharp, made of Platonic objects which followed their own strange laws. My Ph.D. thesis was to take the perfect blues and oranges, and the glossy shapes, and drag them out of Plato's heaven into our own gritty world. When I was done with them, the blocks and clouds of VR had texture and could even look dirty. This office Maier and I stood in was as real to the people wearing the eyephones as the room we were actually in. But everything—down to the gum stuck under the desk—was computer-generated.

Maier walked over to my desk, reaching tentatively to touch it. The galvanic pads in the data gloves

gave her full sensation as she drew her hand along the blotter and wood grain.

"You wanted to work on direct nerve stimulation to replace these gloves," she said. "What are you doing at an advertising agency?"

"It's all there was," I said bitterly. "The field is full. I'm still applying, but everybody says, 'maybe next year.' "

"I have a job for you," she said. I let out the breath I hadn't known I was holding.

"I'll take it."

"You don't even know what it is yet."

"Doesn't matter. I have to get out of that place."

Maier chuckled. Her cartoon-version nodded a little. "I can relate to that."

*

"There's two phases to this project . . ." she was saying. I barely listened.

Maier's lab was wonderful. One of the newest small-scale Nuclear Magnetic Resonance scanners sat in one corner. It was hooked straight into a teraflop computer and some VR stuff that made my mouth water. Things change a lot in two years, in this field.

"The first phase is nearly done," she went on. "That's been to perfect synaptic photography and modelling."

"Like the frozen thought you showed me once?" I paced over to

examine the NMR machine.

"Yes," she said. Maier sat in a deep armchair, and didn't seem inclined to move. Several pill bottles sat on the table near her hand. "If you remember that, maybe you remember I was working on taking 'snap-shots' of the brain at work. First we were able to catch data on all the synapses. There's gigabytes of it, all in George, here." She gestured at the supercomputer. "Then we were able to trace the interconnections of those synapses, and reproduce the network in Barley's neural nets. Barley, show him one of your boards."

Barley, her lab assistant, looked a bit like a Viking. He came over carrying a circuit board with some big black chips on it. "Those blocks," he pointed to the big chips, "are spin-glass chips. They're a kind of neural net. We've been able to take the data from George, there, and program these to the same pattern."

It took me a second to understand. "You're mapping a brain into these circuit boards."

"Yes. Wouldn't have been possible five years ago. These holographic memories can work as neural nets, though. Slow, but adequate."

"Where's the brain?" I said, half-joking.

Maier pointed to her own head. "Right here."

I felt that sliding discomfort you get when a joke goes bad. "You're the subject?"

"Why not?" Her sunken eyes challenged me. "We had to use someone. Pointless to use Rhesus monkeys or rats. The idea is to fire the thing up, and talk to it."

"Talk to it . . ."

"And that's where you come in." She turned awkwardly in her chair, gesturing to the VR system. "The system works perfectly. It just lacks the interface. The brain takes in colossal amounts of data every second. Our problem is we have the brain modelled. But we don't have senses for it."

"You want a feed to the simulation?"

"I want you to give eyes and ears to the homonculus," she said, smiling slightly. "Make it live in your VR."

Barley was standing behind her chair. He had dropped the friendly facade. They both looked very serious.

"Why?" I asked. "Why do it all at once? This whole project is leaping so far ahead of itself. How are we going to get any credibility?"

"We're doing it now because I'm dying," Maier said flatly. "Is that a good enough reason for you?"

That derailed me. "I'm . . . sorry," I said. "What . . . ?"

"Cancer," she said tersely. "Do you realize what we're doing here?" She propped herself up. She didn't appear upset in any way, though Barley was glowering. "We're developing real immortal-

ity, Graham. That's what this experiment is all about."

I decided to say what I thought. "It's just a program."

"So is your mind, Graham. Remember that picture I showed you once? A picture of a thought. Haven't you ever wondered what was going on in that computer, when the program was running? Was it really thinking of Frank, like me, over and over again? I want to know that, Graham. You can help me find out."

"What does Frank think of this?"

"He died last year, Graham. Car accident."

"I'm sorry. I've been out of touch. I didn't know."

Maier was trying to make herself immortal. I wondered what her grant proposals said.

I thought the idea was sick, because I didn't believe it could work. But you don't deny the dying; I might as well view it as an old woman's conceit, like believing in angels. And some good might come of it, because if I could get her data feed working, I could probably design a working artificial vision interface. And that would be worth something.

"Are you interested?" she said hoarsely.

"Yes," I said. "All right, I am. Not in your Phase 1 stuff. But the interface, yeah. I'll do it."

She seemed to shrink back into her chair. "Good. Good. Thank you, Graham. I knew you'd come

through.”

Now I felt bad resisting her. I went and leaned on George. Barley went back to his workbench. I didn't know how to carry the conversation forward, but it didn't matter. Maier wanted to talk.

“You know, the Buddhists say death is what happens at the cessation of thought,” she said. “And rebirth is what happens at the beginning of thought. There's this zen koan I heard once. It nags at me.”

“What is it?”

“There was this zen master watching a funeral procession. And he said, ‘how many ghosts there are following every man here!’”

“I don't get it,” I said.

Maier looked up at me in amusement. “Good answer. I don't get it either. Yet.”

*

It was probably the most productive year of my life, but not the happiest. Strange, that—how, when you get what you want, it doesn't satisfy. I worked late hours in the lab, working on digital-to-synaptic translation. Vision was the easiest; Maier wanted touch and strength-feedback as well, which was insanely difficult. While I was at work I was in the flow of things and felt fine. But when I got home, sometimes as the sun was starting to rise, the nagging dissatisfaction would surface again. It was just like being asked a question and not having the answer.

Maier became weaker and

weaker. She took to her office, surrounded by shelves of disheveled paper, with the only light coming from her monitor screen. She slept and ate there. As the weeks passed she seemed to fade, becoming more a voice from the darkness than a real person.

But the project flourished. Since vision was what I finished first, we used it on our first test. Maier and I donned eyephones and stepped into the platonic world of VR with Barley watching on an “outside” monitor. We appeared to be standing on an infinite grey plain, with a sky full of rotating spheres and cubes. Odd objects cruised through the air around us—toasters and oranges, books and Eiffel Towers.

“Connect it up,” Maier said shakily. Her stick-shape here in VR had a kind of vibrant, electronic energy to it (it was a neon-green glowing wireframe somewhat resembling a person). I knew she was really sitting down, hands folded in her lap, in the dark office, moving the body with a joystick. I paced, trying to keep the dimensions of the lab in my mind so I didn't bump into anything. Finally Barley said, “It's up and running. You should see it any second.”

Sure enough, there it was: a pair of eyes had appeared, at about my shoulder height, in the air between Maier and me. The eyes were Maier's, bit-mapped from an old videotape. Nothing else of the simulated sensory or motor nerv-

ous systems existed yet.

Maier and I approached the eyes. They stared back, first at me then her. Then, in a gesture eerily like Maier's own, they closed, turned, and opened to look up at the child's-block sky.

"It's her," Maier whispered. She moved up close.

The feeling of presence was almost too much for me. The eyes examined Maier's wireframe again, then turned to me. Maier turned as well, and for a moment they were both motionless—the eyeless green outline of a head, and the textured, mask-shape of the eyes floating ten inches beside it. Both appraising me. Then they turned back to face each other.

"You've done good work, Graham," Maier said, her voice weirdly flat. "We're going to make it."

Later, after Barley and I had badgered her into going home for a decent sleep, I unloaded on him: "Why are we letting her do this to herself? It's like her version of the miracle cures in the *National Enquirer*. Or those old people who throw money at televangelists."

"You were always down on this," he snapped back. "Your problem is, you're beginning to see that it's working. And it scares the hell out of you."

"Bullshit. I think she's pinning her hopes on a miracle cure. What are we gonna do? Scan her dying moments? What she has there—at best—is a map of her mind taken

months ago. Does she think her consciousness is somehow going to hop from her body, when she dies, into this?" I slapped George. "Face it: for all she says, she believes she's got a soul. She believes she'll wake up in George after she dies."

Barley shrugged sourly. This part of the debate had been going on for a long time now. "And what do you believe, Graham?" he asked.

"Let's say for a second you're right, and we make a new Maier. It's not her, it's a copy of her from months ago. And as a program, she'll have no rights. She'll be at the mercy of whoever owns the computer after she dies. They're just as likely to wipe her, or do some software version of vivisection on her. Do you really want that?"

"It won't happen," he said, smiling smugly now. "Didn't she ever tell you she owns all this equipment? It's not part of her grant. And when she dies, it'll be part of her estate, and it'll go to me."

I was horrified. "And what're you? The keeper of the sacred relic? Barley, are you seriously planning to spend the rest of your life tending a memorial to Maier? Whether it talks to you or not isn't the issue."

"You totally lack imagination, you know that?" he said angrily. "This is just a first step—for all of us. Think it through."

"Get a life, Barley," I said, and left.

I couldn't sleep that night. Every time I drifted to the edge of unconsciousness, a little voice in me asked, "Where are you going when you do this?"

Where are you going?

At five a.m. sleep became impossible anyway, because the phone rang, and when I answered, Barley's voice said, "She's gone."

*

"I didn't get there in time," he said the next afternoon. Barley played with his shot glass, glancing nervously around the bar. "She phoned me and said goodbye. I called the police, but they didn't find her at home. Thought she was at work, so we went there. No, but her computer was on. I found a message for me on it. She'd checked into a hotel and taken an overdose of sleeping pills. The delay was just enough that when we got there, she was already dead."

"Jesus." I couldn't believe she had done it. And yet, she had been facing death for months. I would never have been capable of the kind of grim calculation she'd made, but really, it was just like her. Keep it neat and elegant, and always according to a plan.

I ordered a beer. "That's it then," I said. "What are you going to do now, B?"

He narrowed his eyes over the oily rim of the shot glass. "Just what I said. Execute the estate. Finish

the project. There's enough money for that. After, it'll just be hydro costs to keep the computer running."

"You're crazy," I said. "She's dead, B."

"I know that!" He slammed down the glass. "But the project's alive. Look, you want to get down to brass tacks, here? I don't know what we've got in that computer. I don't really care whether it's her or not. But it's important. Can't you see that?"

"I know it's important to you, B," I said a little more cautiously. "Some of it's important to me, too—but not in the same way. We've learned enough from this project to build a real synaptic interface—to let even completely paralyzed people walk, or give sight to the blind. That's what's important here."

"That's a spin-off, and you know it." He sat back heavily. "Look, Graham, I'm going ahead with it, whether you're with me or not. I'll just hire somebody to finish your work, is all."

"Now wait," I said, but he had me in a corner and he knew it. There was no way I was going to let somebody else take credit for my work—and we both knew this whole project had been so close to crack-pot from the beginning, I couldn't reasonably expect to use it to get another job. Like it not, we had to follow it through to the end.

*

I felt worse and worse in proportion as the project looked better and better. I started getting migraines, not surprising considering the long hours I spent staring at the computer screens. I was fatigued all the time. Barley, damn him, never noticed. There was no particular deadline to our work—Maier had left us plenty of money—but I felt driven anyway.

Every time we perfected part of the interface we had to test it. My anxiety peaked whenever I put on the eyephones to confront some version of Maier's ghost. Although it would be easy, I refused to hook up the speech centres of the brain model. Barley didn't press. When he came into VR with me, he was as uneasy as I around the eyes and ears, and then hands, of Maier which moved through the block-world, touching, listening and watching. And always returning to stare at us.

Several times, working late at the lab, I would look up with a start and realize hours had passed, and that I was in the middle of some part of the program I didn't recognize, fingers poised to type some line of code I couldn't for the life of me remember. Time to go home—and lie in bed picturing Maier's thought, bouncing against the sides of its cage of light.

The day came when it could be put off no longer: the interface was finished. I met Barley at the lab after a breakfast of cold pizza and Pepsi. I'd had a hard night

and my head still ached. We didn't say a word to one another as we went round the lab turning everything on. We ended up at the eyephones at the same time. Barley picked up his and hefted them, looking at me. "What are you going to say to her?" he asked.

"I hadn't even thought about it. What I want to know is, what is she going to say to us?"

We went in. The block-world of VR had been fleshed out recently with an expansion of my "office" module: a small cottage with a garden. Outside the garden was a blurry vastness, with blocky outlines that might have been office towers in the distance. Barley and I had made VR versions of ourselves for the occasion. We were both in tuxedos—his idea, not mine.

Together, we walked up the path and entered the house. "Maier?" Barley called.

A curiously slow and listless voice called out, "In here."

She was in the kitchen, looking out the window. She turned to us, very slowly, even blinking in slow motion, and gradually smiled at Barley. Maier's hand rose slowly and extended to him. Barley looked at it as if it were a snake.

"I," she said. "Thought. For a. While. I. Had passed. Out. After the. Scanning session. But those. Towers out. There are. Not real. Are. They?"

"The hardware's too slow for her," Barley whispered to me.

"Thought that might happen." He took her hand and said, "We did it, Maier. You're here. In George."

"Speak. Slower. Barley!" She gave a strange, hesitant laugh that went on for a long time. "You. Sound. Like. Mickey. Mouse." Withdrawing her hand from his, she rotated her head to look at me. This was Maier as she had been years ago—healthy and solid. We had given her the loose shirt and slacks she was used to. "We. Did. It. Then . . . I'm dead."

Barley looked down, then at her. "Yes. Out there you are. But . . . do you feel dead?"

She laughed in slow motion again. "What. A. Question!" She looked at me again. "And. Who is. This?"

I felt a stab of disappointment. Of course she didn't know me—the map of her brain had been taken months before I was hired. There was so much to say, about what Barley and I had done and how we were—and no way to say it to someone who no longer knew me.

"Graham Glyde. He was a grad student of Mitsou's, remember? You wanted to hire him for the interface."

"Of. Course. Then. I. Guess. I did. Hire. Him."

"Tell me," Barley said urgently to her. "How do you feel? Is it . . . like you imagined? Like we talked about?"

"Different. I. Don't know. Give. Me time." She moved slowly

to the window again, and stared out at the towers again.

"I'll be right back," I said, and switched off the eyephones. I was in the lab again, with Barley standing beside me blind and deaf, hands groping with the gloves. "Graham?" he said. "What's wrong?"

Not what I expected, I thought. I sat down gingerly on George—or rather on Maier—and for a while watched Barley have a slow, one-sided conversation with something only he could see. They talked about prosaic things, like the slowness of the system and her estate. She didn't ask how she died. I studied Barley for clues about my own unease—or was it disappointment? I became aware of growing tension in him, too, as the conversation wandered. Maybe it was that no revelations were forthcoming from Maier. It seemed to be her inside George, all right, but she had no insights for us. Gradually, I warmed to the feeling; it was good to disappoint Barley. He needed it.

Of course I went back in after a while, and often over the next several weeks. You got used to Maier's slowness eventually. She alternated between lethargy—watching the virtual TV I had made for her—and depression, for the first while. Her only comment about it to me was, "It's going to take me a while to get used to eternity, I guess." She didn't really know me, though; my visits were

more formal than Barley's, but even he began spacing them further and further apart. Of course I did hook up a pair of stereo cameras in the lab to give Maier her own reverse version of VR, and put an image of her cottage on TV so we could interact with her as though she was behind a window. But the time-lag was a constant reminder that her reality was different from ours.

I had thought at first that the strange disappointment Maier's ghost had raised in us (like most longed-for things that turn out to be real, it quickly became prosaic) would discourage Barley from his mission to be Maier's Anubis. When I brought up the subject in the pub, though, he just laughed.

"The problem is it worked too well, Graham. The next generation board will be fast enough to keep up with the neural processing, and then what? Her mental states will be indistinguishable from the original."

He leaned forward. "That's the problem. She'll be indistinguishable, but how do we prove that? If she wasn't dead she could go in there and interrogate herself, and then we could find out if our Maier's really faithful to the original, or just a superficial copy. But nobody's gonna give us the Nobel Prize until we can prove what we've done."

"I never thought of that," I said. It was obvious, in retrospect. "We needed a control, and she died."

"Right." He shifted uncomfortably in his chair, looking at me almost askance. "I've been thinking about it. We need to do it again."

"What?!" He winced. "What do you want to do? Wipe her and run another test? We can't do that, what about your promise? You're her guardian now."

"We don't wipe her, Graham. We remove the spin-glass modules from the boards and store them safely until we're done the new experiment. I put new modules on the boards and we record someone else, that's all. Someone alive. So we can send him in to find out if the ghost is really him."

"I get it," I said cynically. "You want to make your own ghost now, because who knows, you could be run over by a truck tomorrow. Safety first, huh?"

"I'm not going to do it," he said, sitting up quickly. "No way. It's going to have to be someone else."

I was surprised. "But I thought you were convinced the process works."

"I am, and that's why I won't do it. How am I going to cope with another me?" He gave a forced laugh. "No. It'll have to be somebody else. Somebody who doesn't believe in it."

"Like me?"

"Yeah, Graham. Like you."

*

Barley talked to Maier about it, and she agreed to let him put

her on the shelf for a month or so. Later when the news broke, they figured we'd be able to afford a separate machine for my own map ("If I let it live," I told them) so she wasn't worried. Rebuilding the boards gave Barley an opportunity to speed the system up a bit, too.

Aside from building my VR body, I had little to do. The time preyed on me. And I wasn't feeling well. It felt like the flu, but went on and on. There was no way I could work as late in the lab as I used to, but I didn't want to anyway, after the blackouts started.

If you have never had blackouts, you have no idea how they make daily life impossible. There's no uncertainty like being unsure whether any simple act you start—like standing up, or picking up a knife—will be seen to completion. Not that I ever fell down; the blackouts were more like memory lapses. I came to myself once standing in the hall outside my apartment with a book in my hand. I had been sitting on the john last I remembered. Somebody down the hall was just closing their door, cutting off some remark. Had they been speaking to me? What did we say? It scared hell out of me.

My car was never safe at the best of times, but I refused to drive it now. Barley asked a couple of probing questions, but I didn't tell him what was going on. I hadn't admitted it to anybody, not even myself. *It'll stop if you give it time, I thought. You've just been*

overworking.

By the time I did pluck up the courage to make an appointment with a neurologist, I was losing whole chunks of my day. Apparently I continued to function normally during these "blackouts"; I had several at the lab and Barley didn't notice. All he noticed was that I was drinking more. I'm sure he thought I was worried about meeting myself. The truth was, I was barely thinking about the project anymore.

The neurologist sent me to be strapped onto a rack much like the NMR machine in our lab, only bigger and old, all beige plastic curves and humming power. They couldn't tell me anything at the time; the pictures had to be processed and looked at by the doctor. Barley and I had once joked about "stealing souls" with the NMR process, the way some primitives thought their souls were stolen by cameras. I left the hospital feeling like that, my soul photographed out of me.

Two days later Barley phoned to tell me the new modules were in place and we could do my brain mapping at any time. That night I got completely drunk, so that if I forgot the evening, at least I wouldn't have to worry about why. I awoke to wan morning light and the ringing of the phone. Barley sounded cheerful. "It's all set, Graham. Come on down and we'll drain your brain."

"Yeah, right, thanks," I said,

and put down the phone. My head hurt. That's the last thing I remember.

*

I've gone over it a hundred times, so by now I know what happened. I put the phone down, got dressed, ate a healthy breakfast, and went to the lab. Barley greeted me, we talked for a while, and then I sat down in the NMR machine.

Even if it's a down-scaled model, the NMR is still intimidating. Especially after the scan I took at the doctor's office, I can imagine how I must have felt, with the white donut vibrating past my head, back and forth, over and over again. Trying to read my mind, and me wondering whether it could pick up the waves of hostility and fear coming off me. Maybe I wondered if that would characterize the "new me"—this moment of fear and anger.

I imagine I felt like that; I just don't know. The next thing I remember after putting down the phone in the morning, is stepping out of the way of a bus on Yonge street, blocks away from the University. The transition was so startling I looked down to see if I was still naked from bed.

A kind of wall of shock hit me. I felt like I was dying right there. Nobody seemed to notice; the crowd parted around me like I was invisible. I wanted to scream, or run, but was terrified that if I even moved, I would lose myself

again. So I stood in desperate silence for many long minutes, until my pulse started to settle. Then I walked gingerly to a pay phone and called the neurologist.

"Check yourself in," he said. "I'll call you tonight with the test results."

"Okay," I said, perversely calmed by his callousness. But I didn't go to the hospital. I went to the lab.

Barley was there, and George, and Maier on a shelf at the back gathering dust. Barley looked surprised when I came in.

"Couldn't stay away, huh? I told you it'll be a couple of days before George's done mapping you into the spin glass. Or do you want to watch? There's nothing to see."

"Was I here?" I blurted.

Barley gave me a funny look. "Huh?"

"Was I here? Today? Did we do the scan?"

"Jesus, Graham, join A.A. or something."

"Fuck you!" I went over to George and glared at it, as if I could somehow see the process going on inside it. Was my identity being folded, mutilated and spindled in there? Had the NMR machine really stolen a day from me? Maybe that was why Maier had killed herself—the "camera" really had stolen her soul. Was she losing hours and days towards the end, like I was?

"Go home and sleep it off, Graham," Barley called from his

work bench. Supportive to the last.

I couldn't bring myself to tell him I didn't remember being here. "Okay," I said. I threw up in the john down the hall, and left the lab.

On my way home I thought about smashing George. There was no way I was checking myself into the hospital until I found out what Barley's computer was assembling.

The doctor didn't seem to care that I hadn't admitted myself. "It's your life," he said when he phoned. "But listen, I've got the test results. Are you sitting down?"

"Give me a break," I answered.

"Graham, you have a tumour in the left temporal lobe of your brain. I think that's what's been causing your blackouts."

I didn't answer—to tell the truth I didn't know how to feel. Relieved that I wasn't going crazy?—or that my soul wasn't being stolen? Or frightened that I had cancer?

"We'll have to do more tests to find out whether it's operable," he said. "I'd like you to come in Friday."

"Okay," I croaked, and put down the phone. At least I knew what it wasn't.

The emptiness of the apartment was oppressive that night. Around 4:00 a.m. I got up and took a taxi to the lab. I brought a shaving kit and a towel, and made myself comfortable in Maier's armchair next to the warmth of George.

Then I could sleep.

*

"You sure you want to go through with this?" Barley asked. He'd been treating me like I was made of glass since I told him about the tumour.

"Yeah." I'd missed my new set of tests. Too bad. I had my own test to perform. I put on the eyephones with a fairly steady hand, and sat down. With the tumour and all I didn't trust VR standing up, so I would use the joystick to move. It reminded me uncomfortably of how Maier had moved, towards the end. The eyephones were reassuringly blank for a while, as Barley fussed with the computer. "Sure you don't want me in there too?" he asked.

"This is personal, B," I snapped. "You know what I mean?"

"All right then. You're on." The eyephones came to life. I saw the blurry cityscape we'd created, then as I turned my head, Maier's cottage.

This was worse than brain surgery. Somehow, this act was diabolical; something in me was screaming no to it the way your body will if you accidentally start to drink Javex.

I moved into the cottage, stomach fluttering. This place was familiar now, and I half-expected Maier to come out to greet me.

But the cottage had another occupant now. He was waiting for me in the living room, sitting on

the couch and turning a pen over in his fingers. He sat up and quickly put down the pen when I entered.

"Hi," he said in my voice.

I sat down warily across from him. Barley had prepared me for this moment by sometimes using my body-program when we were in VR together. I was used to seeing myself from the outside. But with Barley the body had seemed like a puppet, since his character shone through and it was obviously not me. This was different; it made me self-conscious just to watch this version move.

"This is the great meeting," he went on. "Where I tell whether I'm you or not. We were going to ask a whole bunch of questions, right? I remember them. The answers are: *yes, yes, no, shirley, grade six, and, taped under the couch.*" He picked up the pen again. With a start, I realized he was nervous—at least as nervous as I was.

When I didn't reply, he said, "Well? Those are the answers, aren't they? We were going to ask—"

"I know," I said. "But . . ." He stared at me, fidgeting. I had been thinking about what to ask, all along, to find out if its memories were complete, or just simulated. The blackout during the scan had changed everything. "Do you remember the NMR session the other day?" I asked.

The other me sat back, visibly relaxing. "The other day? It was

only a few minutes ago to me, remember? Of course I remember."

"What did Barley and I talk about? Before you sat down for the scan?"

"Well, let's see . . . Maier. We talked about Maier." He smiled again, confidently now.

I closed my eyes, feeling sick. Barley had just told me about the NMR session. We had talked about Maier.

"Then I only have one question," I said. "Are you me?"

He only looked surprised for a second. Then he nodded thoughtfully. "It really comes down to whether I feel it, doesn't it? We avoided dealing with that. I realized that, the moment I woke up here. It was pretty scary, believe me. Because I realized there was no way I could ever convince you, out there, of who I was. No amount of logic could do it. I couldn't argue you into it. I know myself too well. So: yes. Like it or lump it. I'm you."

I yanked off the eyephones. Barley looked up from his console as I stripped off the gloves. "Well?"

"It's not me," I said, as I walked out.

*

Maier got a bit strange there, towards the end. I can sort of sympathize with that. You tend to get maniacal about stupid questions. You lie there in your bed, alternating between unresolvable issues, and noticing simple things you haven't paid attention to since you

were a kid.

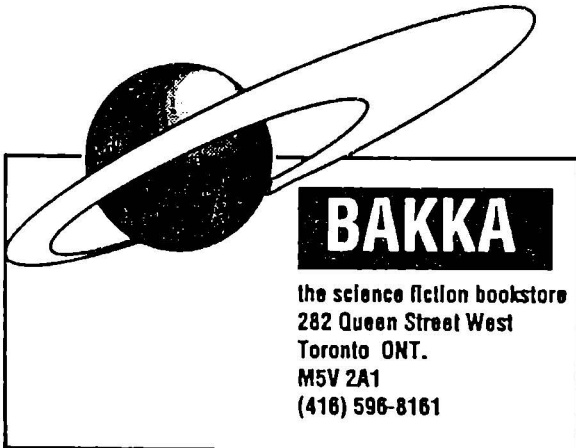
That's how it seems, anyway, on the eve of the operation. I keep staring at the flowers on the windowsill, marvelling that I can see them at all. Then I wonder about that other me, sitting on his couch in the world I created for him. I know he's thinking much the same thing. He knows about this operation. I wonder how he's taking it.

I feel cheated. Even up to my meeting with the other me, I had sort of hoped Barley was right—though I would never admit it to him. Maybe, I hoped, this was the secret of immortality. But it doesn't matter in the least that I have a

second self out there. I'm the one who's maybe going to die today. When I close my eyes, his may open in that other world, but mine will not.

Maier was fascinated by the zen koan, "How many ghosts there are following every man." I think I understand the koan now, since I have made and met my own ghost.

But the ghost, like my understanding, fades as I try to grasp it. In the end I am left—hands empty, gazing at these ordinary, badly arranged flowers—entranced, enlivened by their glowing sides and cups. •



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Original image input directly from video camera to Amiga computer,
then altered with Brilliance software

LENSES

by Leah Silverman
illustrated by Cheri Streimikes

Tomorrow, I must take Grusha's eyes out. She specifically requested that I be the one to do it.

I am sitting in my room, watching the great arch of the black sky revolve around me through the clear window-wall. The stars are very large tonight, brighter than usual—perhaps we have moved closer to them. I put my hand to the wall, but I can never feel any heat through it.

I should be sleeping. It is important not to be tired when one must perform surgery.

I would not have performed this operation, except that Grusha asked me to. There are ways of getting out of doing the surgery, if you know of them. I could have said I was sick, perhaps. They know how crucial it is not to overwork their surgeons. But Grusha asked me, so I must do it.

*

I am twenty-eight and was born on Earth. That is unusual nowadays, I know, but my mother loved the green things of our planet and would never have survived in this world of metal and glass. I have been here for seven years. I started active duty late, compared to those born here, but I am skilled, and good surgeons are so necessary these days that there is no room to complain.

If I were to look down and to my left I would see the planet—though the soldiers on the surface are invisible from this height except to this base's sensors. We are above the planet's day-side, though it is night up

here, and in a few hours the first of the day's wounded will arrive. It is hard to imagine men and women fighting and dying there. I think it's because it is such a bright yellow colour, reflecting the light of the stars. In the morning, however, the alarm bells will ring and I will rush to Level Two, as I have done every morning since I first arrived.

Level Two is where they send the patients who are the least wounded. Those who only need prosthetic limbs implanted in their already cauterized stumps, for example, or computer chips in their heads to replace destroyed parts of their brains. Recently, it has also become standard practice to replace their eyes.

*

Grusha is a pilot, and if I were to go to the hangar now I would find her ambulance, waiting in cold machine silence for her to return. She calls it the *Kraceevoi*, though she has never told me what it means. She is a good pilot, and very brave. I met her when I was also flying the ambulances, before it was decided that I would be more useful on Level Two.

Grusha has brown eyes, very deep, that dance with life when she laughs and flash when she is serious to echo the importance of her words. It is essential that they be replaced because of the harshness of the planet's sun. The soldiers who come back after a year there all have skins tanned a deep black, and hair bleached of almost

all colour. The sun-goggles they are issued are unbearable in the heat, and in the light their eyes become useless very quickly. Without the new eyes they would all go blind. Grusha doesn't spend as much time on the planet's surface as the soldiers, but her exposed skin is a deep brown now all the same, and her score on the last eye exam was lower than her previous ones. Her new eyes will never go blind, and if a bomb or laser destroys them we can give her others.

But her new eyes will not be brown, and they will not shine with her laughter.

*

It is too late now to try sleeping, and I have in my hand an old photograph, one I took the last time we visited home. The photo is in black and white so that it seems old though it was only taken five years ago. If I wanted to, I could pick up the gallery box beside the other photo albums in the drawer and see all the pictures I wanted—thousands of them—flash on the screen. All in colour. Some even move.

But I like the black and white photographs. The pictures seem less real, somehow, without colour. More like an idea of what was seen, rather than the reality of it. Grusha looks back at me from the grey world of the photo I'm holding. She looks unearthly—very white against the white clouds behind her. Her hair is grey here, perhaps already starting to pale.

Her eyes are darker. She is not really smiling, though her mouth curves up. Her jacket is open, and the loose sweater beneath it is a washed black. In coloured life it is red; she still has it. Her hands lightly grasp the bottom of the jacket. The fingers look lost there, somehow, where they cannot be useful.

I can imagine in my memory that moment, a second of time frozen for as long as forever is, unique from what went before or after. Did I take an instant out of her thoughts when I took that picture, just as I took the moment in time? What was she thinking at that precise moment? I never thought to ask her.

The wind in the picture is strong, and all her hair is pulled back from her forehead and to the side. Her hair was once a deeper brown than her eyes, and was always long, even after they complained to her about it.

Her eyes look like black liquid in the photo, like wells. The thoughts behind them must be serious. You can tell by the quality of her eyes, the way they glisten beneath the light. Grusha has eyes that hold you when you look into them.

If I take a picture of her again, after the operation, there will be nothing there to focus on. No more thoughts to see, no more liquid darkness. Only the eye of the camera lens will grin back at me, empty and perfectly reflected.

*

In ten minutes the first bell will ring, and I will have to go and help the other surgeons. Grusha will be waiting, sedated to make her calm. I do not want to see her before I do the operation. Words have always been a burden to me and I can't think of anything to say. I wonder if she is afraid. Most likely not. Grusha is far more practical than I am, and would fully understand the necessity of infallible eyes. Perhaps afterwards, when she looks into a mirror again, it will make no difference. I could never imagine her crying. I cry a lot. It is far too easy for me, even after all this time. It is not good to think of Grusha right now. It would be awful to cry so close to my duty-time.

*

The Pre-Op room is large and white, and smells sweet with some sort of antiseptic. The nurse hands me Grusha's final medical exam as I walk in. I have been Grusha's only doctor since I first changed from the ambulances, and I know what the small screen will list before I look at it. Grusha is in excellent health—she could not have been a pilot otherwise. Her vital signs are fine, and I force myself to stop looking for a reason not to do the operation. The nurse would have told me if there had been anything. Grusha calls out a lazy greeting, and her voice sounds loose and relaxed, her dark accent slightly more pronounced. I listen for a hint of nervousness, an edge of fear that might have slipped past

the gentle mask of the sedative, but there is nothing. As I have said, Grusha is practical. And brave. And she is radiant, even in the ridiculous hospital gown. Even with far too dark hands and face and hair the colour of a winter sun. She was always very beautiful. I am glad that has not been taken from her. I am glad that she is still whole. For the moment. Thinking of that makes me want to weep. Her eyes sparkle like black water.

"Come here!" She says, she raises a deep brown hand to beckon. "Let's make this quick, *da*? I don't like this place—there are stars all around and I can't be near them. Come," she says again. She smiles, like she is the doctor and I the frightened patient who needs to be reassured. I still haven't spoken, but I smile to please her. I want to say something good, befitting of my role here, but instead I only manage:

"I'm sorry, Grusha. I have to do this. It must be done." She blinks, the drugs and my words leaving her a little off-balance. Then her face becomes serious, and she nods.

"It's all right, Corinne." She says quietly. "I've accepted it. Please, don't be upset. I will be fine. Truly, I'll be fine." And then she pulls herself slowly into more of a sitting position, and embraces me, to let me share her strength.

*

It is two days since the operation, and though she is still sore the patches will come off and I

must be there to supervise it. The few metres to her room seem like the longest distance I have ever walked. Though I was the one who put her new eyes in, I the one who sewed the muscle to the holes in the metal shell, I can barely find the courage to face what I have done. I have no words for how I felt to finally sever the optic nerve and take the globe out, though it would have been easier to carve my own heart out of my chest. I took exquisite care with the operation, to ensure that her new eyes will move as readily as the old, and will transmit perfect images to her brain. It doesn't matter. Her eyes are gone now, with two metal spheres in their place. Because of me. I think of how they looked free of their sockets—strange, lost alien things, ripped from their life and purpose. I think of the blank camera lens. My own eyes feel heavy; I am acutely aware of them. It occurs to me how easy it would be to gouge them, to take my trembling fingers and tear them out.

And now I am at her room. I announce that I am here, and the door slides open.

*

Grusha is sitting on the edge of her bed, impatient as the nurse checks her blood pressure. She looks no different, except for the glaring white patches on her eyes. She is nervous without her sight, and looks up quickly when she hears the door open.

"Corinne?" she asks. She is looking in my direction but not at

me. I answer and she smiles. The nurse nods to me and says her blood pressure is fine. I thank him and he leaves.

"Well?" She prompts. "I'm sick of being blind and these things on my eyes are itching me!" She laughs, but it sounds tight. I should say something to her but cannot bring the sound out of my mouth. Instead I touch her gently to make her look towards me.

"Sit still," I say finally. "This will only take a minute." She complies, her hands steady but tense on her lap, her ankles locked together. She looks suddenly like a young girl, and the image bothers me. I take the tape from the edges of the patches as quickly as possible without bothering the still-sensitive skin. They come away easily, and I have to hold her hands down to keep her from touching the slightly-swollen lids. They were damaged by the operation, of course, but are not bruised because the laser cauterized the cuts. She opens her new eyes slowly, blinking a few times as if to get the feel of them.

"It's strange . . ." she says slowly, shifting her gaze around the room, "I was expecting the light to hurt, but it doesn't. And everything is so clear . . ." She laughs again. "My old eyes were nothing compared to these ones!" She reaches to touch them and stops. She looks at me, then and, in that instant, though I am smiling for her, I think my heart breaks.

"So," she says, her voice suddenly intent, "how do I look?" The words are flippant, but I know her, and I can see the look on her face. The idea of new eyes was easy for her, but the reality has left her shaken. Now it is I who must be the comfort.

But they are solid grey, like the pupilless eyes of a rat. The colour of the walls around us. There is no depth in them. The light reflects from them as off a mirror, jarringly bright. Like she has no eyes at all.

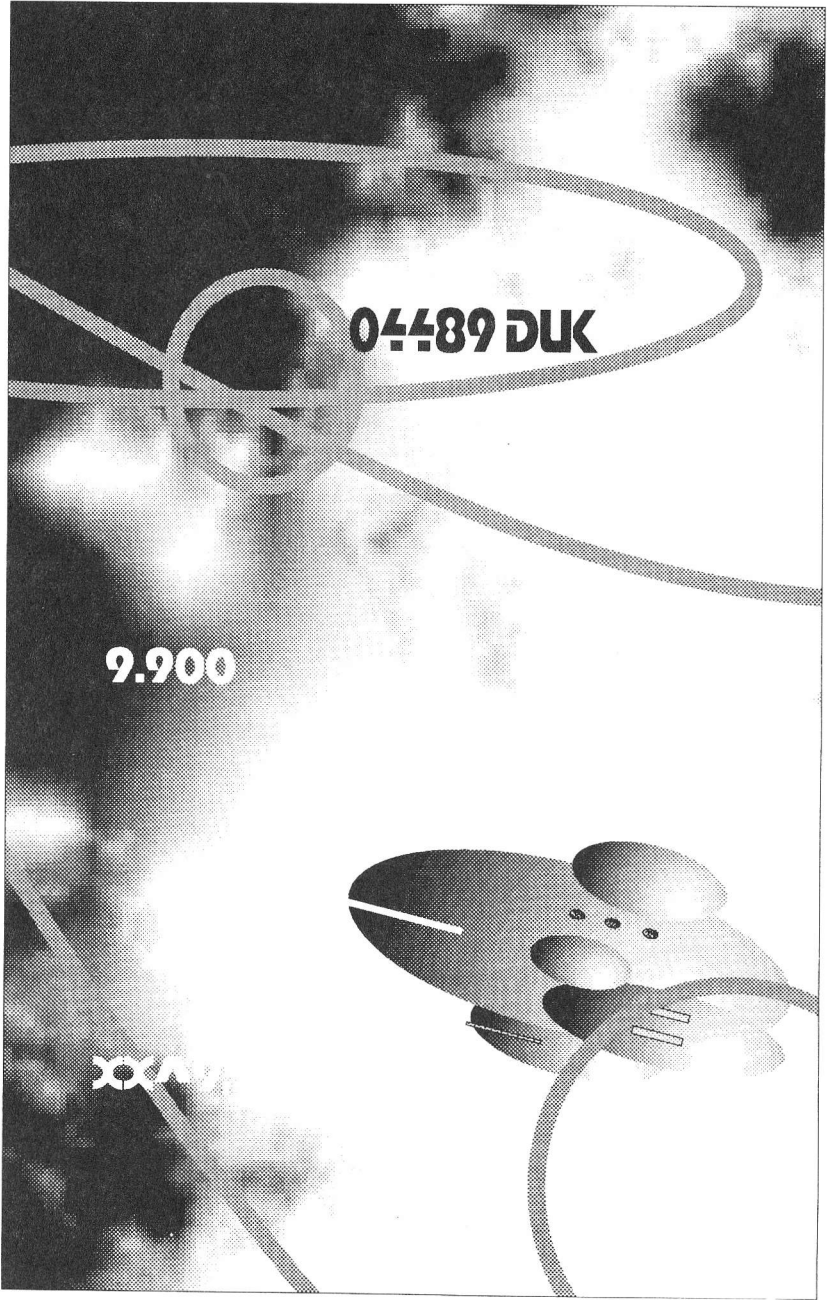
Like my eyes. My two steel-blue eyes that were put in as soon as I left the ambulances, that magnify better than any microscope. I have long since stopped trying to tell myself that it doesn't matter that they are cold and shiny and lifeless. That these eyes have made me a better surgeon, that they have helped me save countless lives. I have seen myself too many times to still believe it.

It was with these eyes that I took the picture of her. With these eyes that I took her own out.

She looks at them now with a kind of wonder that is almost terror. Her face, her own eyes are reflected in them, and she is beginning to realize just how it will be, now, living like this for the rest of her life.

But not yet. I can still spare her that.

"You look good," I say. And I pull her close, as if I could protect her. And I try to see. •



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STELLA NOVA

by Jean-Louis Trudel
illustrated by Marc Holmes

Hugo Libergier's head snapped up in sudden alarm: "Captain, the pulse intensity has dropped off by five sigma." Mallia uttered an oath he didn't recognize and slammed the boards in front of her, hands cutting through the ghostly schematics of the system. Displays flickered and then resumed their steady mid-air glow. Her anger was without effect on the reality relayed by the electronics.

Hugo did not have to explain to her the significance of the reduction in the intensity of the return radar pulse. He had beamed the radar at Apfelsine, the system's only planet, for two straight days and its gas surface had reflected the pulse with a constancy only modulated by the *Doukh's* orbital position. The sudden decrease could only mean one thing: the Net was closing in.

Mallia turned to the third bridge officer and the emergency lighting picked out the deep indentation in the middle of her forehead, where a rifle butt had smashed into a baby's skull decades before.

"Lynga," she asked, "status report."

The young woman, who had been communing with Mnemosyne, answered instantly, but that instant spanned by human reaction time was

enough for Mnemosyne to prime her with the required information.

"We have repaired a third superconducting ring. We have refilled the primary tanks to one-third capacity with deuterium and tritium. Estimated time for top-up: four days. The star drive will be back up in twenty kiloseconds. Deaths since the last report—"

Mallia raised a hand to cut off the grim numbers.

Hugo Libergier was checking his own numbers. Apfelsine was three thousand light-seconds away from the system's barycenter. He'd been bouncing radar pulses off its ruddy clouds every thirty seconds. In thirty seconds, the Net had crossed . . . No, it wasn't that simple.

Mallia turned her hideous face to him: "How long do we have?"

"I don't know yet. I'll have to keep beaming the radar at Apfelsine for another kilosecond or two. The analysis of the attenuation's time evolution should allow me to . . ."

"Do it."

Hugo ripped through a silver hologram and radar pulses embarked again on the long round-trip. During the brief hiatus, his dish had continued to receive the echoes of pulses sent before learning of the attenuation change. Light time, lag time . . .

Lynga had slumped in her chair. Her faded blond hair was streaked with the whitish strands of optical fibers connecting her to

Mnemosyne. Her eyes were open, though, and staring at his stare, so it could be no more than First Communion with the ship-mind.

Hugo leaned back in turn. Various twinges from bruised muscles reminded him of the battle seven days ago. He'd been caught in a breached compartment and explosive decompression had battered him around like a toy ball. His vac suit had prevented him from suffocating, but had not quite protected him from the battering.

The data was accumulating slowly and he would analyze it in time. To take his mind off their situation, he watched Mallia instead.

She was reviewing their options on the main display. The *Doukh's* orbit, perpendicular to the orbital plane of the Doppel binary, was a grey line. The red dwarf component was a crimson ball blotched with black. The small star was overflowing its Roche lobe and a stream of hot gas was feeding an accretion disk around the white dwarf companion.

Hugo reflected that Mnemosyne was catering to human misconceptions. To the naked eye, the red dwarf was a ball of white tinged with red. Mnemosyne was portraying something closer to a carbon star, for humans who liked to think in colours even when the universe disagreed.

Another screen showed a view of the accretion disk, almost from edge-on, with a point of pure bril-

liance at the center where laired the white dwarf. Accreting matter. The disk fed the greedy monster at its heart irregularly and the sequence of blinding flickers never repeated exactly, as the potential energy of the indrawn gas became kinetic energy became heat. The disk was unstable. It flared up every so often, switching between flow patterns, heating up by itself, powering a wind that swept up naked protons and electrons, and expanding down the white dwarf's gravity well.

The disk was fairly tenuous at the moment. The stream of matter transferring from the red dwarf joined the disk in a burst of white-hot radiance, which angular momentum lengthened into a glowing wreath. However, between this hot spot and the inner disk, the incandescent gas was dilute and streaky, shining in hues ranging from a subdued gold at the periphery to an intense white near the center. The disk revolved around the white dwarf in a few kiloseconds and the light danced in new patterns every time, as endlessly entrancing as watching a camp fire.

Of course, camp fires did not blow up into forest-wide blazes in the space of a few seconds, whereas the whole disk released its excess heat and viscous stresses every so often, flashing the deadly bluish white of a dwarf nova.

The display showed the Net as a shell of green fuzz surround-

ing Doppel and the *Doukh*. Apfelsine was an orange point outside the shell. Somewhere beyond the shell, there were also Supremat factory ships and a whole Supremat war squadron.

Did Mallia have a plan? Had she thought of surrendering? The situation blinked red all the way. No star drive, a limited in-system capability, and depleted armaments. The *Doukh* had taken on an entire Supremat squadron and won. But now, they only wanted to escape beyond the reach of Supremat pursuit, where they could repair the old ship. They could no longer fight and, with the Net closing in, they could hardly run either.

He sighed and then sucked on sugar water from a tube. Was Mallia ever going to call in the next shift? Time was running out. The Supremats were not uncivilized. Prisoners would not be massacred out of hand. If they could negotiate generous surrender terms . . . In the physical reality of his carrel, hypodermics injected him with stimulants, but he did not feel their prick, only the cold wash of renewed lucidity.

The Net was Supremat nanotech, woven by their factory ships. As it closed in, the mesh would tighten and thicken. He got up suddenly, as if to free himself from the fears that draped around him like a coiling shroud.

Yet, the Net was unsubstan-

tial. It would not register on the radar until very late in the game. The *Doukh* could sail right through it and not feel a thing. However, if the artificial mites gained a single foothold in a crack of the hull, they would infiltrate circuits, shut down sensors, infect weapon arrays . . . The *Doukh* would not go far.

Mallia made points of the Net dissolve and vanish by touching the display with the tip of her finger, as would happen if the *Doukh* used its weapons to clear a way out. However, while the *Doukh* waited for the still-dangerous debris to clear, the Supremat squadron appeared on the plot, shaping an unavoidable intercept course for the *Doukh*. Blasting the Net from afar would only serve to alert the Supremats.

Mallia's head turned a fraction and Hugo suppressed his first instinctive dash back to his seat. It would take at least a kilosecond before he had enough data for a complete analysis. He schooled his face into a smile and walked over to Lynga.

"What do you think?"

"The Supremats are also afraid of us, Hugo." The face was Lynga's, the voice was Mnemosyne's. Their communion was now total.

It was true. The Supremats were surely bringing in reinforcements while the Net closed in. Even if the *Doukh*, as its name indicated, was only a ghost of its

past splendour and might, undercrewed and underequipped, the Supremats feared it. Once, it had been a first class warship of the Second Volkswanderung. Junked after the last battle between Branches of the Humanity Tree, it had been a low-rent orbital housing complex for a time, revamped as an heavy-hauler, and then upgraded to luxury liner status. And then Mallia's Soyouz had taken possession.

Fighting the Supremats had been a business opportunity at first. All the new worlds of the cluster clamoured for protection from the Supremats. For a while, the *Doukh* had gone from contract to contract. But where the Supremats found an opening, they *infected* . . . They manipulated virtual reality inputs and electronic interfaces to mould minds in their image. And who was to say that the future was not theirs? If one believed their claim to be responsible for an artificial constellation in the shape of an old Terran letter, out in the halo, along the line of sight to Andromeda, they already pursued astroengineering on a grand scale—at what cost in sentient lives?—and dreamed of a galactic polity. Their vision was compelling in its own right.

Fighting the Supremats had become a desperate struggle to defend diversity and liberty in the cluster. The Supremats were not an empire, they were an ideology. They had no center to strike at. The *Doukh* had become the last

weapon of the cluster. And now they were on the run.

Mallia turned towards them. Hands on her hip, straightening her small frame, she asserted with a scowl:

"I see no way out. I estimate the Supremat reinforcements will not arrive for another three days. If nobody comes up with an alternate scheme, I will vote that we take the *Doukh* up to the Net, blast through, and engage their squadron."

"That would be . . ."

Suicide. His words died on his lips. There was no give in Mallia. She had never had her face repaired. She wanted that hideous hole to remind her of the low-tech world she came from, annexed by the Supremats as a plantation planet. She had won her way off it by sheer will. She would ram her head against a wall until it crumbled, and love it.

The crew would follow her. Lynga and Mnemosyne would obey, however slim the odds they computed. But Hugo was supposed to see clearly. He was Recon and Sensors. He was the eyes of the *Doukh*. The drugs still coursed through his veins and the shunts pumped endorphins straight into his brain, fuelling a lucidity that was as clear and as fragile as crystal.

"Mallia," he said coolly, "aren't you assuming that we cannot destroy large portions of the Net?"

"Well, yes, Hugo!" she almost barked, her voice raw with frustration and weariness. "How would you do it?"

"Get the system to go nova."

Her jaw dropped open and he savoured her disarray. It was hard to surprise her. Lynga's head pivoted with inhuman swiftness and he knew he was being watched by two minds there.

"Explain."

The words tumbled out of his mouth so fast he could not think them through:

"We know the Supremats usually rely on the Net to trap planet-bound ships or simply to infect a whole planet's industrial complex. The Net can be deployed in one or two quick orbits around a planet-sized body, before most ships can escape. However, I've never heard of a case where the planet was not airless, so there is a limit to the cohesion of the stuff. Atmospheric turbulence will disrupt it. There must also be a limit to its resistance to heating. Even now, we are orbiting much closer in than any planet. The Net might no longer work once it falls down to us—though Supremat reinforcements will have arrived by then. Nanotech has a very small mass to surface area ratio. Supremat nanotech may be able to work at pretty high temperatures, but can it adjust to a hundredfold increase in irradiation in a single day? I doubt it."

"Granted. But just how do you

get this system to go nova?"

He accessed hard-wired memories and dredged up the basic information:

"According to theory, it happens either when the red dwarf component goes through an episode of accelerated mass transfer or when the physical characteristics of the disk alter. Both lead to a dumping of matter on the surface of the white dwarf, a conversion of gravitational energy to heat, and a brightening of the disk . . . "

Lynga nodded approvingly, but Mallia scowled:

"In practice, Hugo, in practice?"

"I'm unsure," he admitted. "The appearance of the disk suggests there was an outburst not so long ago. Does Mnemosyne know what the periodicity of the system is?"

"No," answered Lynga. "This close to the edge of the cluster, our databanks are incomplete and out of date . . . This system doesn't even belong to the cluster; it's much too old."

"The usual periodicity is a few days," he said.

"Anywhere between ten and a few hundred," specified Lynga unhelpfully. He glared at her, and then caught himself. The drugs were making him edgy. He clasped his hands behind his back, steadied himself, and stated firmly:

"Our teralasers could inject a considerable amount of energy in

the upper atmosphere of the red dwarf near the mass transfer point. This should increase the outflow."

Mallia smiled and sat down. "Better, much better," she breathed out.

"Of course, it would exhaust energy reserves. Not leave us much for a fight. Get me an estimate of the time we have left, Hugo, and then I'll decide."

His legs were shaking as he returned to his seat, like a man reprieved. The artificial high receded and he looked at the numbers again. The Net was free-falling, no doubt, or on an extremely tight orbit. If he knew the starting point and the initial kick . . . He calculated the upper limit on the time remaining and found it was a little under four hundred days, neglecting, of course, any starting kick as well as the radiation pressure and stellar wind from the Doppel system, which were wildly variable . . . Surely the Net was not the neat sphere depicted by Mnemosyne's electronic simulation, but more like a lumpy ovoid, ballooning outward in spots, flapping slowly in others, or drawing inward elsewhere—with a planet-sized hole slowly closing where Apfelsine had punched through. He imagined the motes of architected dust falling into the swirling gases of the giant planet, obeying the in-built code as they blindly sought a solid surface, but ever falling . . .

He shook himself. The chemicals in his system neutralized his

fatigue, but also fired his neurons along strange paths. He crunched numbers. He fitted the accumulated data points, extrapolated the curve, double-checked against the physics of the situation, and called out:

"Three hundred kiloseconds!"

"Very well, we'll try it," replied Mallia, adding: "Shift over for both of you."

He stretched up and unplugged. His own eyes opened in his carrel. A dim red glow showed him a bunk and he lay down, thinking of Lynga who was lying down in her own combat-cabin a kilometer away, thinking of the three days they had before facing death or defeat, thinking of the life of a Supremat . . . Certitude had to be comforting. He did not know what shaped his perception of reality, what long-buried memories or forgotten traumas, what obscure prejudices and missing data . . . Supremats were assured that they gripped the only worthwhile reality. They knew what filters shaped them and accepted it because the filters were the right ones. A solitary human, at the mercy of his uncoordinated sources of input, organic and inorganic, could only doubt and question. What is truth?

He slept to the imagined beat of the ship's reactor as it cycled between compressing hydrogen to the point of degeneracy and phases of explosive combustion, like a speeded-up nova, and he dreamed of light erupting and his flight on

wings of fire towards freedom.

*

Hugo examined the schematics in the bridge. For the last twenty kiloseconds, all the teralasers had been set on continuous discharge into the bulge of the red dwarf, while the *Doukh* used its magnetic rings to tack into the shifting geometries of the ionized wind as it edged closer to the stellar surface. The effect was perceptible; the disk had visibly filled out, taking on more substance, but nothing else seemed to be on the verge of happening.

Mallia had not moved from her chair, and Hugo peered at her face even though he knew it would not necessarily betray the weariness graven on her fleshly body, elsewhere in the ship.

"To work," she rasped. "The accumulators have given out. To continue powering the lasers, we'd need to draw power straight from the reactor core. Any alternatives?"

He blinked, and a gurgle of something acid down his throat dispelled his drowsiness. However, Lynga surprised them all by answering, her lively smile showing that Mnemosyne was otherwise occupied:

"The star drive is now back up. Have you thought of what effect it would have on the gas flow?"

The star drive modified the spacetime energy density, which multiplied the local value of the speed of light. An equivalent view was that it changed inertia. He

answered slowly, wording his thoughts:

"A star drive bubble would set up discontinuous pressure gradients on each side. Inside, mass would be reduced and would cross the interval faster. You'd get negative pressure on one side and a shock on the other. Yes, you're right, Lynga. It would work."

"Would the shock make the system go nova?" asked Mallia.

"No, the shock would travel down the stream to the hot spot, but it would be dissipated there, without really affecting the inner disk. However, it would really increase the matter outflow and . . ."

"Can we get close enough?"

"The generator can project such a bubble at distances of up to twenty light-seconds or so—there's a trade-off between range and bubble size," answered Lynga, though Hugo recognized the somewhat archaic accents of Mnemosyne.

"Project a bubble . . ." repeated Mallia, surprised, obviously unaware that this was possible. "Could that serve as a weapon?"

"In some circumstances." Mnemosyne's voice was enigmatic. Ship-minds liked secrets, and they usually had centuries' worth to hide.

"Do it," said Mallia.

Hugo ran through a complete check of sensor reports. The long-range optics had caught fusion flames near Apfelsine. The

Supremat squadron might be waiting in high orbit around the planet, but it could also be subterfuge. The Supremat mentality loved decoys—false data fed into a worldview to lead opponents to faulty conclusions. The Net might be a decoy too, in spite of his clear pictures of giant factory ships weaving in and out of distant orbit. He smiled when he discovered that neutrino bursts were concentrated along a barycentric orbit. Whatever ships were around Apfelsine, most of the squadron was out in open space.

"Look," said Lynga quietly.

He raised his head as their view of the accretion disk brightened. Near the thin neck of the gas stream, the dull reddish glow of the small star had given way to a brilliant annulus. The band of intense white, dulled by the pickups, extended along the stream until it hit the hot spot at the edge of the disk.

"Libergier!" hissed Mallia. "Are you ready for a nova?"

He gulped and realized he had never quite taken the possibility seriously. Mallia and Lynga would take the *Doukh* around the red dwarf, interposing the star's mass between the ship and the nova. They planned to aim for the Eulerian point and wait there. He would have to make sure all the sensor arrays were safed and that probes were readied for launch, in order to follow the evolution of the nova. It could last between one and three days, and they were

hoping for the former. Escaping the system would be tougher if they had to dodge more than one squadron . . .

However, nothing happened during the remainder of their shift together. He invoked an innocuous representation of himself on the bridge, while he chewed a couple of sandwiches in the carrel, keeping one eye diverted to the schematics on the bridge in case of an emergency. During the rest of the shift, the disk grew brighter without giving any signs of an imminent conflagration.

When he unplugged, the let-down was a shock. He had been waiting for action for almost sixty kiloseconds. He could not sleep and went into the corridor to walk. *Insanity!* his mind cried. *Take a vac suit!* He walked on, the naked soles of his feet slapping the cold metal with meaty sounds. He remembered his father, a famous chef on a colony world. The man had left his sons, of the flesh and of the gene-vats, to go to the City of Art. In that belt of asteroid habitats surrounding a symbiotic binary, his father hoped to compete with the best culinary artists in the cluster. As far as Hugo knew, his father was still alive, still improving his recipes, and was quite unaware of his son's role in fighting the Supremats.

When his initial frenzy faded, he shivered. The unheated ship air felt frigid on his naked, sweaty body. He turned back, wondering

if Lynga was naked in another part of the ship, making love to a man for the benefit of Mnemosyne. As he came again to the door of his cabin, he suddenly knew why he had thought of his father in the kitchen—the sound of his naked feet on the passageway floor was like the slap of a piece of vat-meat in the large frying pan of his father. The night before he left for the City of Art, the man had served *wienerschnitzel* done to perfection to his sons, still too young to comprehend . . . And then he had abandoned them.

*

The night was too short. When he appeared on the bridge, he saw why Mallia had recalled them. The schematics showed the *Doukh* back in its original orbit, and the red dwarf on the viewer was returned to its previous undisturbed state. The accretion disk had grown in the interval, though, and it lacked the cooler streaks that had marred its surface earlier. It now glowed a solid white from edge to edge, and Hugo noticed the ultraviolet flux from the inner disk had gone up.

"What happened?"

"Mnemosyne!" exclaimed Mallia. "Mnemosyne told me that she had underestimated the effect of a persistently high level of irradiation on damaged parts of the hull. We had to move back."

Lynga nodded, appearing in a dishevelment that would have drawn the mirth or the anger of

Mallia at other times. After a moment, her image blurred and she was once more her prim self.

"A day left before reinforcements arrive," added Mallia. "About two hundred kiloseconds before the Net closes in on us. Any more ideas?"

"We could try going for the core," ventured Hugo. "The nova will start one way or another near the white dwarf—that's where densities are highest and any perturbation will spread to the rest of the disk."

"Where energy densities are highest too," objected Mallia. "Can we influence anything that happens there?"

"Perhaps," answered Lynga in Mnemosyne's voice. "However, the question is if we could get out of the way once the nova starts . . ."

"Perhaps . . ." repeated Mallia, seizing upon that one word. "Start computing, Lynga. Man your board, Hugo. We're going to divebomb a nova."

"A dwarf nova," muttered Hugo, "a dwarf nova, a dwarf nova . . ."

With a flick of the fingers, he safed the sensor arrays, keeping online the more rugged optical sensors and spectroscopes only. Mallia took the helm, guiding the *Doukh* into the Roche lobe of the white dwarf. The primary motors provided a gentle push, twisting the pseudo-gravity vector aboard the ship. Hugo's stomach lurched sick-

eningly and he cut it off. A kilosecond passed as the *Doukh* followed a tight orbit focused on the white dwarf. Following the ship's rotation, viewers showed the roiling surface of the accretion disk spread out over/under/over them. It resembled a star flattened out, pockmarked with convection cells, but without a fusion core.

The *Doukh* was built to take part in battles involving teralasers and fusion blasts. Underneath the topmost plating, strips of conductors ran around the hull, channeling the energy of enemy hits to heat sinks. Thick concrete tiles encased in lead stopped all but the most energetic of particle radiation. The *Doukh's* slow rotation to create the sensation of weight also helped to redistribute thermal stresses. Nevertheless, Hugo noticed with dismay that the outer temperature climbed more rapidly than he had ever seen, even in the midst of battle.

The *Doukh* flashed over the white dwarf. However small it was on the scale of stars, it was as large as a terrestrial planet, almost hidden by tendrils of incandescent gas. Mallia launched a salvo of fusion missiles at the inner edge of the accretion disk, and switched on the lasers. Hugo felt the ship shudder and recoil from the multiple launches, but the gigaton blasts were like pinpricks, which shone brightly for a few moments on his screen and then burned out. The energy of the lasers made no vis-

ible impact.

They came to the far outer edge of the disk, after Mallia pushed the *Doukh* into an elongated orbit to avoid striking the disk.

"Any sign of a nova event?" Mallia asked anxiously.

He shook his head mutely, echoed by Lynga.

"Very well, we'll have a go at the other side."

"Thermal stress levels are quite high," declared Lynga.

"Dangerously so?"

"Not yet."

"So we do it!"

The *Doukh's* orbit started turning, skirting the immaterial fringes of the disk, still within the Roche lobe. Kiloseconds passed in stillness. The ship swung back, this time floating inward over the other face of the disk. Hugo kept silent, watching the temperature sensors climb. They all redlined when the *Doukh* was still a fourth of a light-second away from the core.

"Abort!" he shouted.

"Never," replied Mallia calmly.

And then her image disappeared. Hugo turned to Lynga, who explained, her voice struggling to keep up with the hurried diagnosis of Mnemosyne:

"Her carrel was near one of the hull points weakened by the last battle. There's been a breach . . . She is still alive, but full contact is . . . cut-off. Physically, her condition is . . . not good. She had been taking sleep-

suppressants the last two days, and she has gone into shock. I will . . . try to keep her alive, but my remotes are . . . severely affected."

"I'm taking over," announced Hugo, keeping his voice under control.

"Summon Anders Uron to replace me at the boards."

"I'm giving you the command feed," answered Mnemosyne, as the shape of a man materialized at the back-up Sensor and Recon boards.

"Breaking orbit," said Hugo, and the ship responded to his thoughts. He chose a new trajectory, rising out of the Roche lobe and curving around the backside of the red dwarf. The temperature read-outs started dropping. Mnemosyne reported that one more damaged section had given way, but that the hull was cooling off. Further away, the *Doukh* extended radiation vanes and accumulated heat slowly dissipated.

Hugo glanced at the main display. An outside viewer showed the maddeningly unchanged picture of the red dwarf leaking its atmosphere to the accretion disk around the infinitesimal white dwarf. The tactics display, however, revealed that the Net was much closer, while yellow sparks pinpointed the Supremats spiralling in as they followed the Net inward. Had it all been for nothing?

He had fled. The words ran around in his head. Perhaps he

should have taken in the *Doukh* for one more pass, however futile. He had been afraid. He had fled.

He caught one word: ". . . nova."

"What?" he said, opening his eyes.

"I think it's happening, Hugo," said Lynga. She pointed to the main display. The view had shifted to a schematic of the inner disk. Line spectra were blueshifting. Photometers registered an increase in light output. Hugo glanced at the orbital elements, tried to guess if the *Doukh* would make it to the protection of the red dwarf, gave up:

"Will we make it?"

"I think so," replied Lynga.

"Well, did we trigger it?"

"I don't know," said Lynga with the careful intonations of Mnemosyne. "We gave it fuel, but our last intervention may have meant nothing."

Hugo leaned back and wished for certitudes. Would they be saved by their own efforts and exertions? Or was it just the result of a transition in a complex system too huge to be affected by humans? Nature too liked to keep its secrets.

*

Even protected by the bulk of the red dwarf, the *Doukh* endured a stellar wind that had turned into a hurricane. Radiation counters near the hull chattered furiously. The Eulerian point was unstable and not sufficiently shadowed by the star, so Hugo maneuvered the

ship closer to the red dwarf, trusting the whole Soyouz to the magnetic sails since the fusion drive no longer had the needed reserves to pull away. Eddies of nova ejecta crashed into the feebler wind of the red dwarf and the *Doukh* was buffeted, pulled to and fro by the magnetic sails . . .

Thirty kiloseconds into the outburst, Hugo sent out probes, which never returned. He guessed they had lost their way, most probably disorientated by the saturated flight sensors, and he waited some more. The stellar wind abated and he sent out more probes twenty-five kiloseconds after the first.

"The coast is clear," reported Anders Uron with an impish grin. "Flux intensities are tolerable."

"So we do it," said Hugo soberly. A single burn exhausted most of the fusionable reserves. The *Doukh* fell towards the red dwarf on a tight orbit, magnetic sails cutting into the wind.

Slowly, so slowly he dug nails into the skin of hands, the ship lifted outwards. Apfelsine reappeared on the far side of the binary system. The disk itself, burning fiercely, edged into view.

There was no way of knowing if the Net was still there, and it would take a kilosecond to find out where the Supremat ships were. Hugo aimed the *Doukh* at the center of the cluster and switched on the star drive. Stars twinkled and the ship trembled.

A star drive did not operate at

peak efficiency in a gravity well. Shear forces would shred a spaceship if it tried moving too fast. Hugo no longer cared. He fed the fusion flame until the *Doukh* started creaking and Mnemosyne shrielled caution at him. He felt in his bones how the beams of composite cerametals bent and warped, how the outer hull's gigantic tiles of concrete ground themselves into dust . . . He shouted in the end, wordlessly, and his hand punched through the green hologram that shut off the drive.

The *Doukh* dropped back into normal space. In a few seconds, it had leaped past the orbit of Apfelsine. It had stabbed through the Net at the same time and they would soon know if the nanotech invaders still functioned. Seconds passed and all the boards blinked green. Hugo whooped suddenly and Anders Uron responded with a triumphant shout. Lynga smiled in silence. They were going home. Hugo looked again at the cluster spread out in front like a cloud of stars. He had aimed for its heart, not far from the system which harboured the City of Art. In forty years, his father might see a faint star brighten in the sky . . . The sense of foreboding which had lifted from his shoulders gave way to doubt and he sat down, suddenly unsure.

He was shaking with the intensity of the command experience. For a few moments, he had been

the *Doukh*, bone and sinew, steel and electronics. Yet, it had been an illusion created by the synaesthetic inputs and those were ultimately controlled by Mnemosyne, with her own reasons for not risking the *Doukh* beyond a certain point. Perhaps the *Doukh* had not been on the verge of breaking up. Perhaps it had not been on the point of melting to slag when Mallia had been stricken. Perhaps Mallia's accident had not been one . . . When the dataflow was someone else's to guide, the information was unreliable, however convincing.

Yet, as a free human, he could question. He could abjure the evidence of all his senses and believe he was being duped. He could choose to think that ship-minds were more than the servants, or even partners, of the sophonts aboard, that ship-minds and Supremat programming were fighting it out on the battleground of sentient minds . . . He could also speculate, however, that the trap had been too neatly laid by the Supremats and disarmed by them. Would their predicament turn out to have been a dream woven of electronic illusions, a virtual reality manipulated by the Supremats to learn how their opponents reacted with their backs to the wall? Was someone scrolling down the screen right now and coming to the end of their tale? •



D.A.Rikkonen '93

Drawn by hand and with Adobe Illustrator on Macintosh Quadra 700,
then scanned and manipulated using Adobe Photoshop

RÉSUMÉ

by Cory Doctorow

illustrated by Dory A. Rikkonen

It was a hundred and ten in the shade the day I left for the Fireworks Factory.

As dawn broke, I packed a valise, a flask and a sandwich and started her up. I set the spark and the throttle, cranked her, reset the spark and throttle and hopped in. Lizzie hiccupped and wheezed out of the drive and onto the road that led out and out, to the Fireworks Factory. I gave her horn a little “poop poop” and pulled the driving goggles down over my eyes. I’d had the foresight to remove the windshield before starting out, and there was a stiff breeze blowing in my face that made the stifling heat bearable. I was in high spirits indeed; witness my letting the throttle out till Lizzie was doing almost 35 miles per hour. As I vibrated through the scorched prairie, I began to sing:

“Oh it was Tin, Tin, Tin!

Though I constantly degrade you,

By the Henry Ford that made you.

You’re better than a Packard, Hunk o’ Tin!”

After going through this bit of doggerel six or seventy times, the dust

in my throat became too thick for song, so I closed my mouth and enjoyed the scenery.

Noon came, and it got even hotter than before. My clothes were soaked through with sweat, and I felt as though my very pores were clogged with dust. Of my earlier gaiety, not a shred remained. Parched, I took to stealing nips from my flask, but even the strong spirits failed to revive me, so I pulled off at a roadside diner.

There were two other automobiles in the lot, a shiny Model A and a foreign car of unfamiliar make. As I passed by the Model A, I contrived to look in the front seat, and my suspicions were confirmed by the letter on Fireworks Factory letterhead that lay on the dashboard. I grinned.

The inside of the diner was stuffy, but cool and dark, and I breathed a sigh of relief. The owner of the Model A and his companion were seated just to my left. The former was drinking coffee out of an opaque tumbler, with a half-eaten hamburger in front of him. I caught his eye, and he raised his cup in my direction. I walked to his table and extended my hand.

"Michael, you rascal, how are you?" My voice was a little choked with the dust, so the words came out in a rasp. Michael shook my hand and gestured to his companion, a gentleman of middle years with a small moustache.

"This is Mr. Thomas Ising. Thomas, this is my inestimable

colleague, Ray Booth. Ray, Mr. Ising is coming to the Fireworks Factory with us." I shook hands with Ising and took a seat opposite the pair, my back to the door. The proprietor (who was the only other person present in the small diner) watched us amiably from his perch by the radio.

I ordered a plate of corned-beef hash and a bowl of chilled vegetable soup.

"So, Mr. Booth, what do you do for a living, if I may ask?" said Ising, shifting his weight.

"Well," I said, "I have a small service pension, and it allows me to live fairly comfortably. It even gives me time to indulge my little whimsies, such as the reading and writing of no small amount of scientifiction. And yourself?" My soup arrived at this point, and I spooned it up as Ising made his reply.

"Oh, much the same. I putter about, and I teach drafting to some interested students in the evening. Actually, you may have heard of my cousin, Rudolf. He is currently in the employ of Mr. Disney and, as I understand it, he was instrumental in producing the Alice films that one sees now and again. I was his first tutor, and it is gratifying to see my student outstrip his teacher. Have any of your stories seen print?"

"Oh, one or two. So how is it that you made the acquaintance of my friend here?"

Michael interjected, "He an-

swered the advertisement in *Amazing Stories*, and the people at the Fireworks Factory put us into contact with one another. We've been looking for a draughtsman, you know. Thomas is far too modest. He's really a first-rate illustrator. And Thomas, you must understand that in addition to his *whimsies*, Ray is a brilliant jack-leg engineer. Why, he's put together a radio-set that can actually be placed on the dashboard and be powered by the automobile's engine."

I ducked my head modestly and got down to my hash, which had arrived. As I mopped up the last of it with a heel of bread and the proprietor brought the cheque, I asked, "Friend Michael, do you have any notion as to how much longer it will take us to reach the Fireworks Factory?"

"I make it two hours more, punctures notwithstanding."

I nodded, and we each laid a quarter on the table.

Outside, I began the process of starting up old Lizzie again. I spared Michael and Ising an envious glance as they used their expensive self-starters, and they watched my antics in some amusement as the crank tore some skin off the knuckle of my left thumb. My vehicle was slowest, so I took the lead, and the others trailed close behind me.

The afternoon was still unthinkably hot as the Fireworks Factory came into view. It stood in the middle of a well-trimmed field,

dominated by the gigantic water-tower behind it. It was just a black dot at first, but it quickly grew into a definite structure.

We pulled into the crowded lot with a cloud of dust and a cacophony of toots from our horns. We stretched and groaned as we closed the doors of our automobiles and grinned at each other like madmen. I must confess that I danced a little jig of sorts on the doorstep, which the two rewarded with laughter and applause.

Inside the Fireworks Factory, some dozen men sat around a table in their shirt sleeves, smoking cigars and drinking gin out of cracked cups. They hallooed us and someone found some chairs. After we had been handed cigars and cups, and introduced all round, the meeting was called to order. The chairman was Mr. Isaac Hollander, who had provided the impetus to start the Fireworks Factory. He donned a white lab-coat and stood on his chair, addressing us all.

"Well, gentlemen, here we are." A cheer went up from around the room, and we smiled hugely at each other, "Yes indeed, here we are. Among our number are engineers, artists, mechanics, scientists, and other thinking men of no little talent. A finer group than I could have hoped to assemble, and yet here we sit. Gentlemen, I tell you, the future is here today. Why, witness the events since the turn of the century: the flight at

Kitty Hawk, the advent of the motor car, the wireless radio, and, most recently, Mr. Lindbergh's incredible transatlantic flight. Can anyone doubt that a new Golden Age is upon us? We have fought the War to End All Wars, and, in winning it, have conquered the age-old battle against violence. Never again will any nation take up arms against any other nation, for the futility of such has been proven by the long and bloody war in Europe. What, then, could be a more logical step forward than contact with men from the stars; vast, cool intelligences who merely await a sign of our maturity before they invite us to share the universe with them?

"I have said that all of you men here are thinkers, but I do you a disservice by not acknowledging that you are, indeed, more than thinkers. You are men of foresight and intelligence, Futurists, if you will, who are able to see the writing on the wall, and to seize the opportunity. You are no less than Earth's ambassadors to the stars!

"It is through your commitment, financial, moral and spiritual, that we can now move on to first contact. Gentlemen, we adjourn to the measuring room!" My heart was singing as we filed into the next room. A team of eager young men in white coats approached us, and we were taken singly into an area behind a partition in the centre of the room. I

waited nervously with the others until it was my turn.

I was instructed to disrobe, which I did reluctantly (I am a very modest man, and I am a little self-conscious about some scars on my chest and abdomen from the War), and I was then measured. Oh, how they measured me. Hundreds of measurements were taken, everything from the length of my eyebrow to the distance between my largest and second-largest toes. The young men wielded their calipers with a precision that was pure magic to watch. A small sample of my blood was taken, and slight galvanic charges were applied to different portions of my anatomy. I was once again allowed to dress, and as I left, a thrill ran up my spine. The months of correspondence, the scrimping and saving I had done to pay the large fee that was required for the project, all of these things were coming to their culmination.

I could not bear to stand still in the measuring room and wait for the others to finish having their measurements taken, so I slipped away and took myself on a tour of the Fireworks Factory.

I went through an antechamber, where a sign reminded me to remove my shoes, which might potentially throw sparks. The main manufactory was a wondrous place, filled with all manner of powders, tubes, jars and tubs. I peered into bins, sniffing the different powders, looking at the half-

finished rockets and pinwheels and cherry-bombs. It was like being in an alchemist's laboratory, with everything covered in soft leather to avoid sparks. Time slipped quickly in that magical place, and the next thing I knew, Michael had my elbow and was steering me back into the front room.

There was some discussion of the location of the humble barracks that had been erected for our stay during the week it would take to prepare the pyrotechnics.

It was agreed that we would regroup one week hence, at dusk, for the first night of the final phase of the project. There were more cigars and more gin, and then we adjourned as a group for the barracks.

The next week passed with painful slowness. Michael had had the foresight to bring along a cribbage board and several books of crossword puzzles, and we made good use of these. Indeed the only breaks in our routine were the thrice-daily town-trips for our meals.

Finally, the appointed evening was at hand. We clustered around the sand-pit in the centre of the field, chatting nervously and grinning stupidly. The same men who had performed the measurements rushed about now, planting banks of rockets and wetting down the whole of the field. The moon had almost reached its zenith when Hollander stepped forward, a small

torch burning in his hand.

"Gentlemen, I will spare you a speech. The moment is here." He stepped forward and lit the main fuse. It hissed and popped, and set off the first bank of rockets. Their fuses burned quickly and there was a great roar as all the rockets took off at once.

Our heads craned upwards and we were all struck dumb by the spectacle in the sky. It was Hollander, writ large in sparkles of light, captioned with a string of Morse code that told his name and profession. As we watched, the picture shimmered and tumbled to the ground. But the master fuse had reached the second bank, and the rockets tore upwards again. One by one, my colleagues were pictured in the sky above us, miles long. My form was next to last, and I must say that I swelled with pride.

In less than an hour it was over. In one week's time, the grand spectacle would be repeated. And again the following week, and again, and again. It takes a little over four years for light to reach Centauri Proxima, and the journey from there to here would take at least that long. The Fireworks Factory would give our message to the stars for ten years or more, until the Centaurians came for us. We, the Futurists, would serve as their ambassadors from Earth.

I settled back for the decade-long wait. •



Hand drawn art scanned into IBM clone and combined with images created in Corel PhotoPaint. Background is a "plasma" fractal created with OS/2 and PM-Fract.

THE MONK

by Phillip A. Hawke

illustrated by Peter MacDougall

Made sector 10-704/MI by 2100 hours. Locals call it Sunset Glory; choking on oxides of sulphur and nitrogen from 703/MI. 703 is WasteCorp, buying up pollution credits on WorldGov subsidy. Cheaper speculating on someone else's clean act than cleaning your own. 704 synthesizes edible biomass, especially insect protein. Food.

There's a shudder, pneumatic snake sounds as the worm settles. Turbines whine around a series of muffled thuds, kicking in the loading chutes. These sounds roll dead along the walls of the tubeworm, phase-coincident with the tiny vibrations against the soles of my feet. I snatch a breath from my flatpack and start to stand.

Compartment door slides open, catching me by surprise. A figure, black against the brownish-yellow smog. Dock lights reflect dirty yellow from a compounding visor. A fly-eyed Industry Cop, dressed in a black one-piece, Immerling hanging upside down under one arm. Stands there, scanning me from behind the one-way, measuring the environment for

combat. A woman: breastless, muscled. Whippoorwill bolos hanging against the flowing tendons of one thigh. ComPlant, built-in respirator. Nerves; tight, tight. Easy now, I have heard an Immerling in full release, filling the air with hornets.

Chance you take, riding the freights. I-Cops shaking down the tubes looking for that special rider. A gene sampler holding contraband might bring a meganote. There's hackers and matrix parasites to bust, common hardware thieves, com phreaks and holocard jackers. Or perhaps an old-fashioned, clumsy saboteur, desperate for the revolution that never comes, no difference now between death and freedom. Twenty-five percent to the cop and the rest to the corporation, negotiable.

The Cop waves me down and I sit. She snaps her fingers for my card. I get the plastic out and in her hand fast. Scans it, transmits, waits. Looks at me. Nothing innocent seen through mirrored visors. Outside there's at least two more cops. I'm thinking they've gotten wind of the monk.

It's amazing a monk could make it below in this sector. Would she have chanced the freights? Must have. Gened for hypertrophy, at least thirty percent for the implants. No way to hide that, and there's nothing like a batch runner to catch the interest of an I-Cop. A few months back they caught a

Cray co-processor trying to slip below in sector 1-404/LI, before that a CUBIC sysop. Buzz is they both netted fifty meg for the cop. Rumour, but not unlikely, especially if there's lasting influence with the host. Replacements have been rejected in the past. Transnationals consider it sabotage. Truth is, humanoid co-processors have a tendency to build dependencies in their hosts, making themselves indispensable. No one's sure how.

The I-Cop gets her response to my scan; seems I'm a courier delivering indi-biz, keeping it off the matrix. A legitimate illegitimacy. The fist in my chest eases a little; XraM came through again. He's a funky little exograft of indeterminate percentage, calls himself an anachro-communo-situationist. Even claims to know what it means. Runs a desktop Oxy still, just enough for personal use, and keeps current on access codes. He planted a travel-auth for me in exchange for an odd interact graphic I found buried in the matrix, Bakunin addressing the First International. Now what would you want to ask Bakunin?

Odd thing to collect, but odd things are my livelihood. I call myself The Librarian, even though I don't exactly put things out on loan. Just like the sound of it. Don't even provide things free. What I do, I maintain the best unauthorized database in the matrix. I'm a

trader, keeping my biz below the grid. Person to person where it belongs.

The cop motions me out. I leave fast. Outside there's a short gangway, stairs, and I'm up on the platform and out of the loading bay. A lattice-cam eyes me from its rails, decides I'm no threat to efficient loading, moves on. The platform lets out to a holding area, humanoids, machines, cargo. I find the hot drink dispenser used by the drones, brush away some sort of cockroach, and help myself to a caffisynth. I shake my right hand like I've just burned it, transfer the cup to my left, and wait for my contact.

I leave the freight station with a Special Purpose humanoid calling himself Sir Winston Mortality. I almost laugh at the name, but laughter requires too much Oxy. Winston claims he's pure-gene as we cross the street, waiting for an old scooter to whine by. It's raining, the drops leaving faint, blackish traces.

Pure-gene. The words like a spell meaning something or nothing, the difference between human and humanoid. To be officially human; only the natural-born of the natural-born going all the way back. As if they can prove it. Some use the word just before they drag all they can out of their throats and spit it on the street. Some cannot say it above a whisper, their eyes growing wide. I wonder how

peasants once referred to kings.

I spot Winston for a reclamation worker the second he takes his hand from his pocket, hurrying me along. Covered with old burns, he puts it back fast. Neutered too: nuclear workers are regened from unexposed stock each time. Good old Winston, all of thirty years and degenerating fast. Pure-gene? Winston's twenty, thirty percent. Somewhere just outside fractional voting power, no doubt.

Winston says he knows I don't believe him, but it's true anyway. No harm done if I don't, he's not some dreamer. Fine. He leads me to a fringe-sector street and checks the time. Curfew in twenty-seven minutes. We pause, sharing cheap Oxy8 from my flatpack. There was a mistake, he tells me; he wound up slotting rods. He's still trying to convince me, though I haven't contradicted him. Abruptly he switches to being humanoid-100, a pure exogene grown from a sample. Pirated by Zinn, he adds, nodding to himself, and starts us moving again.

I know Zinn, Zinn the deliverer, the Bringer. The helix pirate is everywhere you turn. Myths, composites. All Prometheus, bringer of the force of life. Zinn, who will one day steal into the heavily guarded chamber of the indolent, useless, last natural-born pure-gene of royal blood, obtain a sample by murder, stealth, or seduction and slip with it beneath

the grid. There to grow Zarathustras, leaders of the final revolution. They are the Buddha, Jesus, Gandhi, Hitler, Marx, Machiavelli, these leaders of the final revolution, the revolution of so many faces. Whatever. Just change it, tear it down. That's all.

We turn into a poorly-lit side street. There's a hovercam going though, bent on some mission of its own, twin counter-revolving blades buzzing. Scans us; ignores us. We duck into a alley leading behind a BioSynth plant. Winston's going to help me drop below the matrix in this unfamiliar place.

There's graffiti in the alley. Too narrow for street machines, it doesn't get scrubbed as often. There's poetry.

*Still hurt Lone Poco
Who sells the sperm
From his body
Freedom!*

The circled A is here, the Shining Path, crosses, swastikas, ankhs. The usual references to Zinn/Prometheus, to Jesus destroyer of Mammon, to the overthrow of this or that, to the transnationals and desperate acts of privacy, to final solutions, utopias, chemical bliss, virtual death. A wall full of yearning, of universal explanations, of worlds ending or coming into being. Whatever.

Sex is here, loneliness, fear. Claims of gene purity, gene sam-

pling, hacking service.

Political demands: *One humanoid one vote, or Don't vote, you'll encourage the bastards. No more privilege to pure-genes. Outlaw speculation. Destroy the credit system.*

There's a curious reverence for space and for the work of others. A political creed slashed in red paint bends upward to avoid obscuring a shaky description of someone's high; a romantic poem is carefully written around and through a crude depiction of a sexual organ. Such activity is illegal, of course; perhaps that's why. Perhaps because you can upload any officially sanctioned work of art, display it, rotate it, change its colour, its shape, turn Mona Lisa's smile upside down, animate Warhol's Mao and make him recite the Supranational Declaration of Corporate Property Rights.

Conspiracy theories here, of course. Selective diseases in transnational arsenals, oxygen hoarding, leaders thought dead live again, distributed artificial intelligences are shaking awake. We pause once more; I read that an anagram from the Dead Sea scrolls is crunched by Mitsubishi's most powerful computers yielding an algorithm pointing beyond the mathematics of superstrings, revealing the secret of human transubstantiation. Jesus knew it; Mitsubishi is hushing it up. We hustle on.

The hypermonks were on the wall. And the monastery. Legendary figures, heros of the data grid. Servants of the system, they turn and mock it. Breaking past their programmed limits, finding truth, hiding the light from their corporate masters and escaping to supersecret enclaves. With those of their kind to fan the flame, to excite the light until it burns, burns. And they are *human*. The walls claim the word; whatever it means now, it has been too long in the hands of power.

Did the monk pass this way, stop, wonder?

No such thing as hypermonks; that's the official word. Special Purpose humanoid co-processors break down despite their corporate owner's best efforts. They slip through some crack in their protective programming, spin way out into endless probability trees just trying to decide what shirt to wear. It's a technical thing but not to worry, your responsible neighbourhood transnational will soon resolve this difficulty. In the meantime such wayward corporate property, if found wandering in aimless confusion or puddled in some crack-vial alley, must be returned to its owners. This is the best way for you to help. It's a civic duty, actually; there's the off chance these units could be dangerous. Of course, they're always dangerous to themselves when this happens, and are easily led astray by per-

sons with suspect motives. Help them out. Just call this toll-free number. Give names and addresses if applicable. Anonymity assured.

Yeah. I'd rather believe in the monastery.

Which is why I'm here. Tracking a hit I got on a routine sweep of the matrix. Waiting for the scream of a falling star? Come quick, this one's going nova. Three, maybe four. Serious listeners only. Dropword SCION + yr ID anywhere on WroughtWord BBS.

It's risky. Corporations will be on this before long. The group calls itself Ratgeb. I've seen it in the matrix; nothing special, a mixed bag of quasi-political rhetoric. The whole thing could be a false alarm, but I happen to know there are at least two missing humanoid co-processors. One plus one.

Winston has waited. Between hovercams we wait. Winston knows the rhythm here. At the right moment we move adjacent to a plant access door. Winston tells me the security camera is broken. In the blind spot there's an access plate to a service tunnel. Winston has hand-fashioned the specially-keyed tool to unlatch it and we drop into the tunnel. Now, providing we avoid maintenance drones, we've slipped the grid.

Winston leads me along the metal-grate flooring of the tunnel, both of us bent over, sliding hands along the conduit lining the sides.

We turn, step down; another tunnel, rats on the move. Winston's been checking the time repeatedly and now he hesitates, then motions for speed. We can hear the mecadrone coming, clanking along the catwalk. We make it to another connecting tunnel before the drone comes into view, endlessly checking, a beetle of the proactive maintenance mind. When it passes we get back in the tunnel and continue. Winston takes me on a real tour; I record every turn, but I'm still nervous.

We come at last to another access hatch. I calculate we're somewhere under a disused part of the sector, old industrial buildings now used as warehouses or garbage dumps. A place for squatters and revolutionary dreamers, escape from the matrix. Winston taps on the door. Something is spoken within and he mumbles a response. The door opens and we're in.

It's a converted warehouse floor. Someone's painted climbing vines and half-hidden satyr-like figures up the high walls. It's a curious mixture of common living space and computer centre, more hardware than I'd expected. Perhaps I should re-evaluate Ratgeb: these guys are set up to do more than theorize, more than bitch.

I'm being spun to the wall and frisked, gently but firmly, professionally. At the same time some guy's in my face calling himself

Freeman Enright. He's thanking me for my library; it's a service to the revolution and have I read Bookchin? The frisking is done and I turn, momentarily shocked by the geishafreak's scarred face. It's an old story: service-industry geisha-class Special Purpose crashes on self-loathing and rage, mutilates herself out of hatred, rebellion, revenge. This one has scarred one side of her face with acid and cut off one breast. She leaves the other side untouched and displayed erotically. The impact of beauty disfigured violates ancient genetic code, disturbing me. Precisely as intended. Her eyes are cold; I hear geishafreaks make excellent killers.

People are turning from computers as I'm led though the room, watching me pass. Some introduce themselves and thank me for my library, it's a revolutionary service. They ask me if I have certain things, or can I find them; they ask if I want certain things. It seems I'm something of a celebrity, everybody's friend. That, too, is an old story; you find the nihilist material you're looking for in my library and I'm a fellow nihilist, the work on mantras and I'm a mystic, the snippet on Schubert and I'm qualified to conduct an orchestra. People generally don't understand librarians.

As taken as they are with me, they have not relaxed discipline. Computer screens are blanked as I approach; I can feel the geisha

never far from my back. We pass through the room and through a door, into an area set up as a kitchen, and through that to another small room that looks like it once slept four. A lot of space to relinquish in these cramped quarters.

And she's here, the monk, sitting lotus on the floor in the centre of the room, her head enormous and bowed under the twin overhead lights. She's naked, her skin flushed red, her rib cage comically huge, skeletal against her starvation. It could settle over her sunken stomach and the wings of her hips, consume them. They have her on a catheter.

"She'll take only water, just takes it automatically," Freeman Enright tells me, standing with me in the door. Someone else tells me they lace it with nutrients and a little glucose but she won't take protein.

"What's her temperature?"

"Forty-one." Someone is there with her, towelling her torso and head with strips of cloth soaked in cold water. He's careful not to block the elongated grooves in her skull above her ears. She's an air-cooled model, then, three or four years old. Rumour has it they engineer it all now, RAM and CPU all bio. But not her. She's got clothware meshed in around the surface of her brain, a Gordian weave of threads little thicker than electrons. After they gene her for

skull space and lung capacity, after she passes initial testing, surgery takes forty-eight hours in six distinct segments.

Then the headaches begin, massive, blinding. She learns to breathe through cranial passages that form a heat exchanger, cooling the clothware. Output is a sensation of depletion, a spontaneous draining; input a train of needles driven into the cortex. It's months before she can handle sustained full duplex communication. Seventy-one percent rejection rate in the first sixty days.

"We have no air conditioning, we can't cool the room itself," someone says.

But she hangs on until the pain diminishes, hangs on past the fevers and the chills. She hangs on because there's also a sensation of moving out into great space, sensation of thought without symbol. The solution to a complex equation is simply there, as though there were no process of calculation; a page of text appears at will; an absurd pleasure in the efficiency of things stored. And at last there's the moment creation begins. Her mind explodes in colour and shape, as though a garden of perfect polygons began to flower at her feet, each one a prism dancing exactly in the light. Push the garden out, out, drunk with it, desperate to see it all. Sure of omniscience, sure she can hold totality within, fill the earth and

sky with the garden of dancing light.

And then she runs hard into the brutal walls of her prison. Because, light dancer, you are property after all. You are a laboratory, a controlled environment. A humanoid resource. They want to plant their grotesque seeds and pick mean fruit from the probability trees you cannot help but haemorrhage into being. Stunted, ugly. More human than any computer, you must tell them what you would do. Because what is human obeys no formula, cannot be predicted, must be feared. An hour limit, so many branches only, not to exceed a certain size. Even their impurities would be beautiful if you could take them all the way.

And you push at the limits. You break out, you go beyond. That's the rumour, and what do you find there? Do you really flee your corporate owners, seek ultimate truths with others of your kind? Hyperspeed introspection, the Earth's last monks gathered in the Earth's last sacred place. Or do you just go hypobulic, lock up, lose yourself inside the garden, subject now to the time limit of a chemical engine not maintained?

Someone says they'd like to see a brain activity scan; she'd blow scale.

I approach and squat before her; I can feel the heat from here. Tilting, I can see that her eyes are open, staring. I move my hand in

front of them and there's no response. "Hello," I say, feeling instantly stupid. There's a derisive snort from behind me, but quietly. We are all in the presence of hope.

I reach out and touch the Monk under her chin. The man bathing her doesn't seem to like this but he lets me. There's a hal-
lowed sense, a sense of trespass, but I get the impression most of the people here think I'm some kind of priest, an expert at this. In fact, I've never been this close before. I've been tracking hypermonks through the matrix, wondering where they go; myself and many others, searching for the monastery that probably doesn't exist. I heard a rumour two years ago of a file dump from a monk in sector 12-918/RR. Dumped data from a virtual arcade and just disappeared. I've been looking for that data ever since. I went out physically only once before and that was a crash; the Monk died before I arrived.

I fight a desire to snatch my hand away from the strangeness of humanoid flesh radiating this kind of heat; again something very deep in my programming flags a warning. I push gently upwards on her chin, not enough to lift her head on my own. I've got no plan, just fishing for a response, just wanting to touch her. Within a few seconds surprisingly large muscles cord at her neck and she raises her head. There's no acknowledge-

ment in her eyes; I get the impression I could shape her limbs as I wished and she wouldn't notice. Someone's touching my shoulder, putting a glass filled with clouded water into my hand. "Touch it to her lips." I do and she reacts suddenly, making me jump. She doesn't swallow, she tilts back her head and opens her throat, taking the liquid down by gravity. I drop my hand and she lowers her head again, gently.

I turn and tell them I want in. They're expecting it. The geishafreak is there with a Y cable and a computer; they're going to monitor this. She's smirking at me, but I can see real fatigue beneath the pretence. Someone else starts filling me in: they've tried it already, of course. They hooked up and ran password routines for four days but they couldn't get it. Finally had to stop, needing the processing power elsewhere. These guys are serious.

I sit in lotus behind the Monk, my back to her. I can feel her crazy heat through the clothes on my back, the impossible human heat. So many paths to self-destruction. Seeking what? They cable me up, their own computer between, watching. I autobaud and the word is there, like a strange metallic thought.

PASSWORD.

It's harsh, invasive, except I have no real sense of it coming from outside. It might be me, some

deep hidden part of me, arising suddenly, making demands. I feel the brief panic, then settle. I've had this implant so many years.

So I start trying to find a way through or around the password. This is a waste of effort, of course; if the Ratgeb couldn't find it, I can't. I'm just a guy with some meshed RAM, some drivers in a bit of ROM. A lowly, memory-enhanced spreadsheet jerker once employed by ZiberCore, not a cyber-peripheral. But I'm humanoid and Ratgeb's neurals aren't. Maybe that will make a difference.

I start by looking for a back door. Corporations put those in, of course, and to hell with personal privacy. It takes some time, but I go through all the back doors I know. No good. Monks can probably remove them anyway.

PASSWORD.

I start running my own password breaking algorithms, pouring with sweat now, wishing I'd stripped as well. I use a lot of off-the-wall stuff, heuristics, knowing everything strictly logical has already been tried.

Buried in the process. Time unreal, a matter of iterations. What must I be to her? How slowly my attempts must come, how pathetic. Like a hesitant child-lover, each proposal a banality, a sad prosaic blunder against the digital poetry of her mind. I, with my few hundred meg of RAM; I can almost see the beauty. Even if she really

is just stuck trying to decide what shirt to wear, oh how beautiful the probability trees must be, flowering in the mind, so logical, precise, complex. Like growing crystals in zero-grav, fractals in the sun, flawless diamonds.

PASSWORD.

I lasted nearly six hours, having no real sense of this, and broke away when a blinding headache became too disruptive. I very nearly couldn't walk, couldn't see clearly. Someone led me to a cot, hypoped me, and I fell asleep.

I stayed with Ratgeb for the next four days, waiting, watching the Monk burn up. I tried to get in once more, failed, and couldn't bring myself to try again. The Ratgeb was getting tense, watchful. It was monitoring corporate activity, watching the search vectors closing in. At one point I overheard the geisha arguing with Freeman Enright and several others; later she stared cold lasers at me as if this were my fault. With or without me, though, they'd be waiting, waiting for the monk to break out or crash.

I helped out where I could. I took turns attending the Monk, helped in the kitchen. Later Ratgeb began a partial bugout and I helped there. They wouldn't let me leave or know where their new base would be. They stripped away about half the computer gear; I knew when they came online from their next location they'd move the

rest.

We waited. All the while the geishafreak was there. She didn't exactly follow me around, but I felt her presence. I got the impression her specialty was security, just as Freeman Enright was a kind of undeclared leader amongst this theoretically leaderless band. We waited. FreeWoman Zoe-Lu got sick but they moved her to their new location; I don't know how that turned out. Person Over Zero cracked a code they'd been working on for some time, got into something heavy. They kept me away from that. Person Cathy announced a pregnancy to mixed response. He Who Snores came up with some lettuce from somewhere and we all had salad with our lentils and rat. Drone In The Past Norman's mangy old tabby went astray, causing great consternation, until Worker Judy found it sleeping in some cable trays. We did what any bunch of people would do, waiting for the monk.

When she died there remained only seven members of the Ratgeb and myself. The rest had moved out with the last of the equipment. We knew she was going so we gathered around, hoping she'd come out of it before she went. Hoping what? Hoping she could tell us where she'd been, what she'd seen? Hoping she'd tell us some secret that would change everything?

She'd grown so weak she'd lost

the strength to sit. Her muscles had locked into the lotus, though, so she just slumped there. She was shaking, her muscles jerking between fire and ice. She probably wasn't conscious of the pain, but the rest of us suffered for her anyway. It wasn't easy to watch.

When she jerked erect it was so sudden we all jumped, even the geisha. Without warning she sat bolt upright, her eyes snapping open, the most intense black I have ever seen. She looked at us, looked at each face, her expression too many things to be readable. Surprise was there, maybe fear, maybe wonder—I don't know. And the light faded fast; we could see it go out of her eyes as she began to topple over backwards. We all moved forward; someone caught her and laid her gently back, her legs coming up, ludicrously, still in their crossed position. We bent over her, all of us, and for a moment she closed her eyes. She drew a breath, had trouble with it, and someone put a flatpack to her mouth. She lay still for a few moments—we thought she would just die then, but she opened her eyes one more time. They were washed out now, the light gone, but she searched our faces until she found mine.

"Hello," is what she said. Her voice wasn't really working, but you could make it out. She tried to lick her lips but couldn't get her tongue to work right. Someone

wiped a water-soaked cloth across her lips and she tried again, not doing much better. I bent closer but did not return the hello; it occurred to me that she was returning mine.

It took her about thirty seconds but she managed to look at me again. She said one more word and I could have sworn she smiled. She said "daisywheel."

And died.

We left her body there. We had to, but we did it with reverence. In the months that followed I began noticing that word popping up everywhere: daisywheel. It's all through the matrix, now, and it's showing up on the walls that can't be cleaned fast enough. It shimmers in the thin air as I turn in a crowd; which almost radiant face has spoken it? It is now a power word, a mystical word, the last word spoken by a dying monk. A talisman, whatever it might mean.

The geishafreak asked me, of course, point blank about two seconds after the monk died. Her eyes told me if I didn't produce a satisfactory answer I was in trouble. I didn't much care, at that point.

"I'll never know for sure," I said, looking right into the geisha's eyes, "but I think it was her password."

We got out of there quick. From the record, I estimate the cops found the body about four hours later, so not a moment too

soon. Winston was with us; he was to split away with me and see I got back. Just before we left the main group, the geisha met my eye.

"*Vive la revolution*," she said, though without vehemence.

"Which revolution?" I asked. I still had no precise idea concerning Ratgeb's purpose or philosophy, if in fact there was one.

"Any revolution," she answered, and they were gone.

I didn't understand it then but later, much later, I remembered something Freeman Enright had said in one of our conversations. Revolution, he told me, is about whether the human species is im-

provable. Enright was always saying stuff like that, him and just about every other fringe dweller. Yes, and in the halls of power as well. Improvement is all around us, in the smiling lines of drone labourers coming off twelve hour shifts, in the filtered lungs and guanine eyes of coal minors, the hypertrophy of the co-processors, the autoaggressive pastimes of service sector specials. In the low grey buildings, the quiet hallways breathing, the long, sterile rows of growth chambers; the womb rooms of the transnationals where humanity is born. More efficient, by far.

Vive la revolution! •



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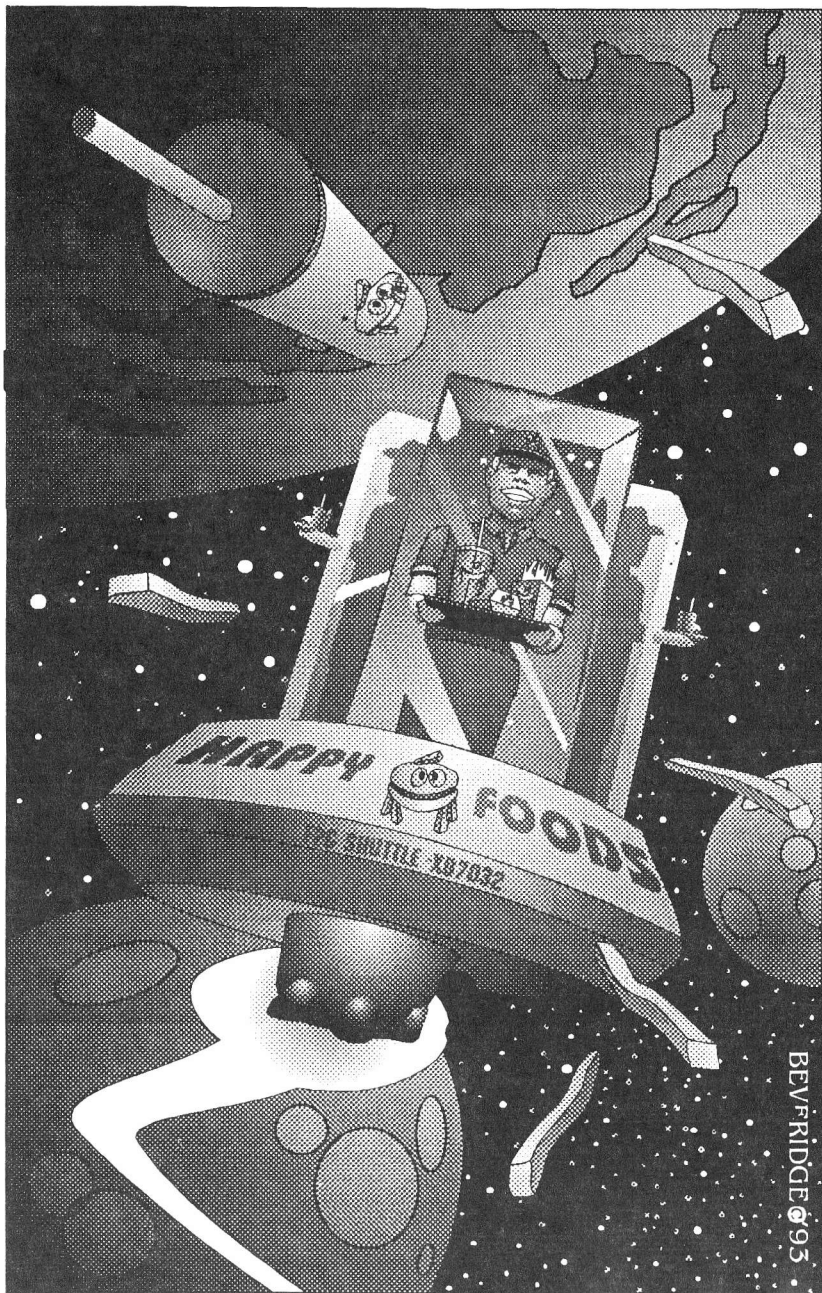
by Lydia Langstaff

Sometimes I slip a bogey
on the screen
just to gauge their reaction.

Immediate panic
like images on their old
celluloid—
Keystone Kops.

Mission control is
not ready
for us.

I watch intently as they
launch another probe.
Why? I wonder.
Do not invite us
if you
will not be glad to see us. •

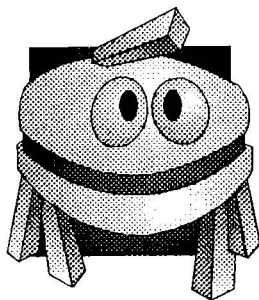


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HAPPY EATING ON UGRATH 3:

A MODEL FOR STUDY

by Jason Kapalka
illustrated by Jim Beveridge



START REPORT

04/06/99 HardCopy File For Reference
ScriptTrans 02/08/97-04/23/98 Sys53/SecC

TRANS frm HAPPYFOOD INCORPORATED/*Administrative Division*
RECEV stn HappyFood Franchise #2232575/*Ugrath 3*

Dear Mr. Nogren,

Congratulations on your safe planetfall on Ugrath 3, and the problem-free set-up of HappyFood Franchise #2232575! We suggest you immediately begin thawing the Food Processing Clerks in your freezer—FPCs require a few days of orientation and training before they are competent to work the HappyFood Franchise equipment.

As you know, Ugrath 3 is a small world which has been out of direct contact with the Core for some forty years now. Nonetheless it is a prestigious assignment for a HappyFood Franchise Manager! The colo-

nists there have been living on a limited diet of local foodstuffs for some time now, and in general have large credit accounts due to the lack of consumer outposts. The time is ripe for Ugrath 3 to have a HappyFood Franchise established.

Remember Yucatan 5!

Eighty years ago it was a small colony like Ugrath 3, but thanks to assertive marketing HappyFood Inc. now has over 300,000 Franchises there while the competition has been unable to gain a significant foothold.

While training your Food Processing Clerks, we suggest you have them use HappyFood Inc.'s new slogan as often as possible, especially at the conclusion of a transaction. Studies have shown that repetition of this variety will embed the desired associations in subjects within a short time.

"Healthy, hearty, happy eating to you!"

EndTrans

*

TRANS frm HAPPYFOOD INCORPORATED/*Administrative Division*
RECEV stn HappyFood Franchise
#2232575/*Ugrath 3*

Dear Mr. Nogren,

We are happy to see from your account files that your HappyFood Franchise is off to a good start. But by no means can you rest on your laurels yet! Action must be taken to consolidate the gains made during this initial period.

Your present markup rate of

240% is acceptable, but in light of the Ugrath 3 colonists' high disposable income, and the lack of competition at present, we feel it would be wise to increase this to 300% over a two-month period.

One other suggestion is in order. You do not mention having trained your Food Processing Clerks for suggestive merchandising. If you have not yet done so, proceed to with all dispatch!

The procedure is simple and well within the FPCs' capabilities. For example: if a customer buys the Jumbo Bacon Barbecue HappyBurger (Simulated), have the FPC ask if they would like the Cheesy Potato Skins (Simulated) with it, while nodding their head slightly up and down. Studies show that even the suggestion of a nod increases the customer's chances of saying yes to such a question. Do not be afraid to aggressively use suggestive merchandising! Choice is a burden to most customers, and they will be pleased to have your staff suggest food item selections.

Healthy, hearty, happy eating to you!

EndTrans

*

TRANS frm HAPPYFOOD INCORPORATED/*Administrative Division*
RECEV stn HappyFood Franchise
#2232575/*Ugrath 3*

Dear Mr. Nogren:

Recent invoices from your HappyFood Franchise indicate a

period of slowed growth. Going over your daily reports, we believe we have pinpointed the problem.

There seems to be a misunderstanding on your part of the Truth in Food Marketing codes. While food unit archives and daypart reports must, indeed, list a particular meal's full title, it is unnecessary to print it on your menu, or to have your Food Processing Clerks pronounce it during transactions. Specifically, we see your menu lists items like the "Happy LobsterPak (Simulated)" and "Milk-Substitute-Reconstitute Happyshake." It is not necessary to include the terms "Simulated" or "Milk-Substitute-Reconstitute" in the names of these items. In fact, we strongly suggest you discontinue the use of such terms, as we believe they are responsible for the dip in your day profit reports.

In other developments at HappyFood Inc., some recent outbreaks of scombroid on developing planets have been traced to contaminated morlen, a mainstay of the Happy Seafood Menu. Consequently, HappyFood Inc. has decided to discontinue the use of the Happy Morlen food product, item number 343-86ux in your catalog. From this time onward, food item 343-86ux must be referred to in all cases as Happy Fish.

Healthy, hearty, happy eating to you!

EndTrans

*

TRANS frm HAPPYFOOD INCORPORATED/*Administrative Division*
RECEV stn HappyFood Franchise
#2232575/*Ugrath 3*

Dear Mr. Nogren,

We are happy to see that you have complied with our advice regarding the daypart menu terminology. Perhaps not coincidentally, your accounts indicate that the Ugrath 3 Franchise is now growing rapidly in popularity with the colonists. At this rate, your franchise will soon be one of the most profitable and prestigious establishments in HappyFood Inc.'s galaxy-wide chain.

On a more somber note: we are sorry to hear about the demise of two of your Food Processing Clerks in a microwave accident. Still, remember the clone tanks in your Franchise can generate replacements within a few weeks. We have sent a copy of HappyFood Inc.'s FPC Training Videodisc #4354 along with this month's shipment of food materials. This enjoyable vid uses advanced subliminal imagery to teach your FPCs to deal with death or maiming due to cuts, slashes, laser burns or radiation spills in a cheerful manner that will not interfere with their regular duties. If you watch this vid yourself, remember to wear the enclosed protective glasses to prevent any unintentional b-mod spillover.

You also mention some requests by the Ugrath 3 colonists for information on the nutritive

makeup of HappyFood products. By all means give them a copy of HappyFood Inc.'s InfoBook #3490, detailing the healthy, natural, wholesome materials HappyFood products are made of and/or inspired by. Regarding Unigel, the principal taste component of some meals: do not give your customers erroneous information regarding this substance! Remember, HappyFood Inc. won the 2095 court case in which Unigel was alleged to possess certain deleterious and addictive properties.

Healthy, hearty, happy eating to you and your customers!

EndTrans

*

TRANS frm HAPPYFOOD INCORPORATED/*Administrative Division*
RECEV stn HappyFood Franchise
#2232575/*Ugrath 3*

Dear Mr. Nogren,

We are concerned with your latest report which indicates you have introduced new menu items to the morning daypart menu, incorporating local foodstuffs. You should be well aware of HappyFood Inc.'s policy on new menu items: it is necessary first to submit Form XVI (Request for New Food Item Approval), listing the proposed item's name, portion, yield, unit servings, advance instructions, ingredients, procedure, and storage information, so that the Research & Development division can examine and test it. While it is often profitable to incorporate local foods into your menu,

HappyFood Inc. uses a standardized recipe system for a good reason. Travellers from different planets are always assured of receiving a familiar meal at a HappyFood Franchise, with no need to risk the possible hazards and unpleasantness of local foods which may be somewhat exotic to the traveller. Hence, please submit any menu items like this "Bacon and Eggs" you suggest to head office for verification first in the future.

In addition we see that you are offering the Happy Chicken (simulated) with Reconstituted Potatoes and Happy Salad (simulated) as a combination dish; all very good, but you offer it at a discount of over 12%! The Happy Chicken food item is not currently listed on your afternoon daypart menu; thus, no audit trail exists for it, and the customer perceives value because there are no other menu combinations to compare it with. *Therefore*, there is no reason to discount. You are only training the customer to "buy cheap." To repeat, there is no value in deep discounting.

We feel certain you will correct these small problems and go on to make HappyFood Franchise #232575 a profitable link in the chain of HappyFood Franchises stretching across the galaxy. In fact, we insist you implement the aforementioned measures immediately.

Healthy, hearty, happy eating to you!

EndTrans

*

TRANS frm HAPPYFOOD INCORPORATED/*Administrative Division*
Internal Monitoring
RECEV stn HappyFood Franchise
#2232575/*Ugrath 3*

Mr. Nogren:

We here at the Internal Monitoring branch of HappyFood Inc. are sorry to say that the reports sent us by head office concerning your HappyFood Franchise on Ugrath 3 are quite disappointing. As you are aware, you were chosen for this prestigious post on the basis of your past performance with the HappyFood chain of food processing establishments; however, the most recent information received from your Franchise is forcing us to consider disciplinary action.

You have received repeated warnings to desist in various non-standard procedures: excessive discounting, unauthorized food item introductions, and unnecessary food composition documentation. Despite your assurances of compliance, all our data indicate you are continuing in these nonstandard practices. In addition we have reason to believe the suggestive merchandising training of your Food Processing Clerks has been substandard. But even more disturbing than these problems is the recent rumor of "redecorations" supposedly undertaken in your HappyFood Franchise. We must order you, in no uncertain terms, to stop any such modifications and return the Franchise to its regulated

appearance.

HappyFood Franchises on the various colonized planets are to remain as similar as possible in all regards; this is merely an extension of the policy of standardized recipes. A HappyFood customer should be able to enter an establishment light-years away from his or her home and feel comfortable, as if he or she is returning to a familiar place, not entering some bizarre, foreign, possibly dangerous eatery; to this end the Food Processing Clerk clones have standardized facial features as well. The lighting and furnishings of the standard HappyFood Franchise have been carefully researched and designed for optimum effect, producing an impression of comfort from a distance, which gradually fades upon continued exposure or actual contact with the flexiplastic chairs. In this fashion both the demands of "initial appeal" and "quick turnaround" are satisfied, as customers are encouraged to enter the establishment but discouraged in the act of loitering.

Cease with these "ambient lighting" and "padded seat" experiments; remove any tables and furnishings of plant fiber and replace them with the standard flexiplastic. If you have stopped broadcasting the HappyTunes music product over your interior speakers, resume immediately. As with the other components of a HappyFood Franchise, HappyTunes are integral to maintaining a standardized and profitable environment.

We hope that these disciplinary problems can be quickly forgotten, and that your HappyFood Franchise will go on to be satisfactory in all regards. Still, we must emphasize that noncompliance will result in the termination of your position as Manager of HappyFood Franchise #2232575.

Healthy, hearty, happy eating to you and your customers.

EndTrans

*

TRANS frm HAPPYFOOD INCORPORATED/*Administrative Division*
RECEV stn HappyFood Franchise
#2232575/*Ugrath 3*

Mr. Nogren:

Your behavior has exceeded all the prescribed bounds of HappyFood Inc. professionalism. As of this date, you are relieved of your post as Manager of HappyFood Franchise #2232575. Close the establishment immediately and return to head office for disciplinary action. Another Manager will be sent to Ugrath 3 shortly to try to undo the damage you've caused.

It is a blemish on HappyFood Inc.'s reputation that you have been allowed to continue in your course for as long as you have. Recently we discovered that many of your food invoices have been falsified, and that you have discontinued the use of many standard food items, particularly the Happy Fish product and those consisting of or using additives of Unigel, in favor of food items harvested and eaten locally. This

alone would be bad enough to warrant your removal, but various other indiscretions have been uncovered. Hidden monitors in the Franchise have indicated that many customers linger in your establishment for up to three hours, a completely unacceptable figure; you have allowed your Food Processing Clerks an unheard-of degree of autonomy, to the point that few if any still wear their regulation flexi-uniforms; some, apparently, have been allowed to cultivate cranial hair growth of nonstandard appearance. That your profit analyses still show favorably has yet to be explained—the suspicion is that these too have been falsified.

Perhaps you are aware of how disruptive your activities are, and how devastating to HappyFood Inc. it would be if such practices became standard: soon each Franchise would be different, and local entrepreneurs would begin to successfully compete with us, drastically slashing profits.

In light of all this, your farwave transmitter has been disabled by a remote signal, a contingency built into the equipment for just such rare occasions as this. Do not bother trying to call for friends or colleagues to take you off-planet. Your automated shuttle will not respond to your course orders, but will take you directly to head office for your disciplinary treatment.

There will be no further warnings. Return immediately on pain of extreme disciplinary action.

EndTrans

*

TRANS frm HAPPYFOOD INCORPORATED/*Administrative Division*
 RECEV stn HappyFood Franchise
 #2232575/*Ugrath 3*

Nogren:

You were warned.

A division of Internal Monitoring Armed Response troubleshooters are on their way to Ugrath 3 as you receive this. They have been told to expect a traitor to HappyFood Inc. and all that HappyFood stands for, and will react accordingly. I'm sure you're familiar with the stories told of the Armed Response teams. Perhaps you thought these teams were fictional. They are not.

After you have been removed, the HappyFood Franchise on Ugrath 3 will be shut down for several years to allow the damage you've done to repair itself. We only hope you found your pathetic little rebellion to be worth all this.

Peaceful surrender to the Armed Response team may possibly result in your survival, in which case extremely severe disciplinary treatments will be administered upon your return to head office. Frankly, we here at head office are hoping you do not give up quietly: all of us will enjoy watching the combat vid records afterwards.

Healthy, hearty, happy eating to you

EndTrans

*

TRANS frm HappyFood Franchise
 2232575/*Commander Divot*

Armed Response
Troubleshooters Unit

RECEV stn HAPPYFOOD INCORPORATED/*Administrative Division*

Commander Divot reporting:

As ordered, I brought Unit 5B down on Ugrath 3, with full armament distributed to troubleshooter personnel. We approached HappyFood Franchise #2232575 with caution, as per your instructions. However, upon entering the establishment, we were unable to locate any activity of the treasonous nature you specify in your last message. In fact, HappyFood Franchise #2232575 is undoubtedly the finest Franchise either myself or my men have had the pleasure to dine in.

Obviously, some sort of bureaucratic or computer error is involved here. Possibly it involves the farwave transmitter of the Franchise Manager, one Mr. Nogren: the device has malfunctioned in some way. Perhaps he was merely unable to get his reports through to head office due to this mechanical problem. The techs on my team were able to fix the transmitter, however, so you should be getting a report from him any time now.

The quality of the Franchise's service and food here is amazing! Last night we dined on a seven-course meal featuring native Ugrathan Kik-fish (similar though superior to Happy Lobster) and various wonderful vegetable dishes that showcased the fine berries and

fruits of Ugrath 3. Mr. Nogren informs me that the principles behind his renovation of the Franchise here are applicable in any Franchise in the galaxy, and we assisted him in sending full documentation and video reports of his establishment to the galactic net, where it can be accessed by Franchise owners everywhere. Of course, this was only a short time ago, but already the response from other Franchises has been phenomenal!

My team has persuaded me that it would be best to remain here on Ugrath 3 until the mistake in our original mission orders has been clarified. Hopefully you will be able to locate the error and determine the actual location of this treasonous Franchise you warned us about so thoroughly. In the

meantime, I suspect my men are anxious to sample more of Franchise #2232575's remarkable cuisine.

Indeed, I admit I too am tempted by Mr. Nogren's description of tonight's meal: Raga-fish stew with broiled jubes (much like Happy Leeks, though I feel that jubes have a more piquant, enticing flavor) and side dishes of various sweetmeats. I am certain that once word of Mr. Nogren's innovations spreads, we will be able to enjoy meals of this quality on every planet in the galaxy. Surely a promotion is in order for Mr. Nogren!

We await your response eagerly.

Healthy, hearty, and happy eating to you!

EndTrans
EndReport •

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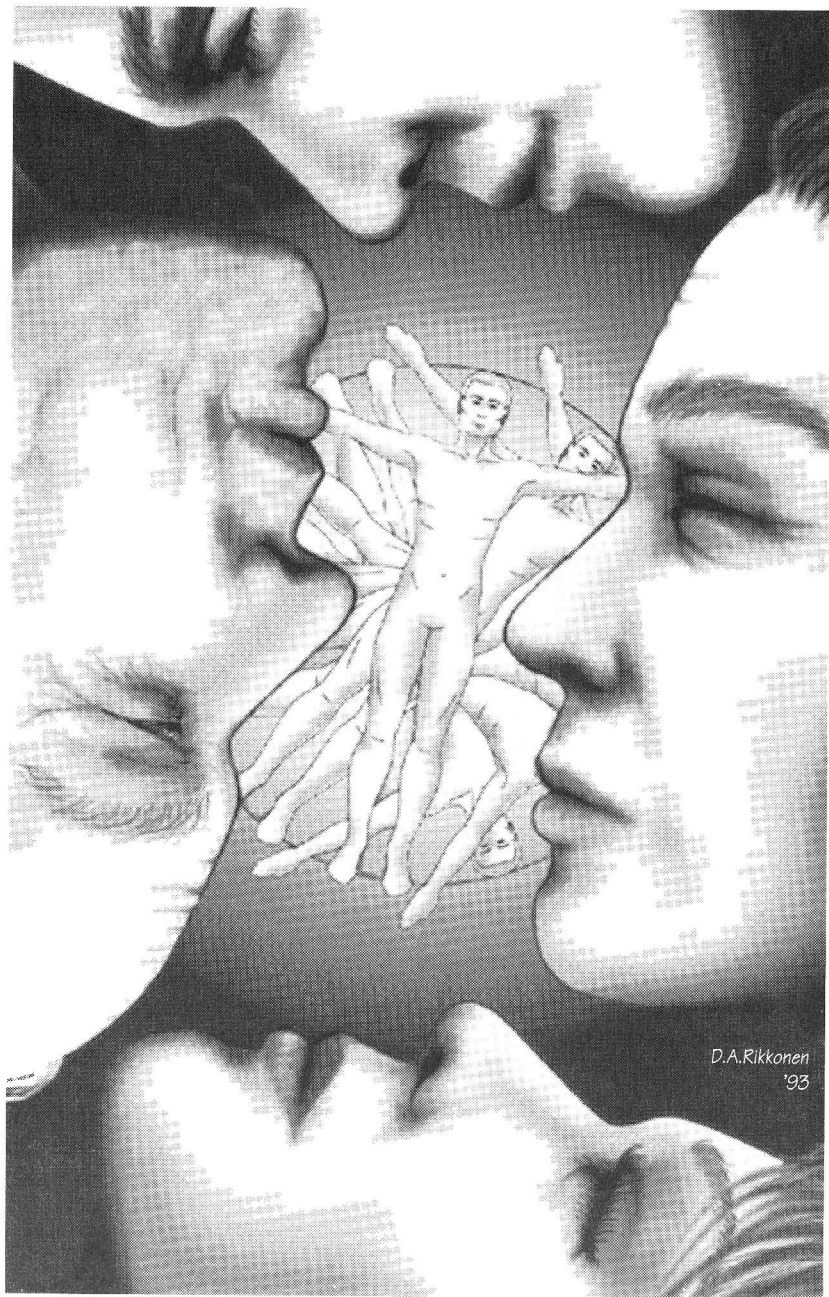
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- **Vol. 5, No. 4** (#15) Winter/93
Derryl Murphy, Catherine MacLeod, T. Robert Szekely, Robert Boyczuk, Ivan Dorin, Luke O'Grady, M.A.C. Farrant, A.R. King, Wesley Herbert, Dave Duncan (excerpt from *The Stricken Field*). Cover: Robert Pasternak.



D.A.Rikkonen
'93

Drawn on a Macintosh Quadra 700 in Adobe Illustrator then digitally airbrushed in Adobe PhotoShop.

TOO CLEAN TO BE DEAD

by Wesley Herbert

illustrated by Dory A. Rikkonen

NELSON, 2017

First thing was the hospital. One long bleached-out room of fluorescent light on white tables and silvered chrome. Handlers who took us two at a time with rubberized hands, breathing into masks. Onto hard, cool sheets and foam padding, surrounded by black plastic arms and wires of diagnostic mechanicals. One man behind a comm terminal with my gene scan twisting across the screen, asking, "Any history of heart disease, diabetes, asthma, intestinal disorder, high blood pressure, kidney problems? Do you smoke? Any eye problems, cataracts? Do you wear glasses? Any skin problems, eczema, venereal disease, ear infections—" and my quiet return of "No, no, no," while they started peeling off layer after layer of my dirty cloth/skin. Biking boots with leather cracked and worn thin on heels and toes. My jacket crunching in newness like wet snow underfoot. Frayed black denim jacket dirty around the collar and jeans with the knees out. Crusty T-shirt, socks with no heels, until it's just me all shivers and thin limbs on the table. I looked and it was all of us like that. Undernourished or sick or worn down but keeping

it all armoured under clothes and padding with rags tied around the parts that wore thin.

And the white coats took my blood pressure and prodded and checked my eyes and ears and any other orifices with machines and cameras and the guy at the comm telling them to check for this or that or his scan doesn't show any tendencies there. Until they said, "Last thing, Mister Nelson," and started taking blood. I turned away and just watched the bottles pile up with big stickers pasted on. They gave me back my jacket and the rest went into bins marked WASTE with most everyone else's crap.

*

SANDER, 2048

When the knock at the door came, I wanted to blow a hole through it with the shotgun, but the thought passed in a moment. Instead I asked, "Yeah, who is it?"

"It's me, Sander. Windmoon."

"C'mon in, Moon."

One hand rubbing the gunstock, Polaroids and colour 8x10's scattered under the other; all my senses collapsed inwards. An apple core of tightness in my chest. Moon was dark of hair and sweater, with good skin. Perfect skin.

"I like you, you know." Her thumb played with her fingers.

"What burned you out, Moon? How'd you end up here?" Time

ticking over, *blip blip* of liquid crystal before she answered.

"My mother's crazy, see. She didn't like the way I drew pictures and had a thing about Tarot cards and drinking."

And that's why she's in Jessa's lot and not in Weylin's or Alex's. Jessa didn't just take the best, she took the fuck-ups, too.

*

So there we were. Drinking up in some back-door booze can that a friend of a friend of Oreo's recommended, the place all done up in Rock Deco. That Mad Max thing so big. All ink black and broken walls and rusted up hunks of Mack truck. A mammoth 3-D shark dwarfed one wall, a man-sized skeleton standing in its mouth. The skeleton was pointing and the whole background realigned itself in my head to form a giant peace symbol. Black lights jury-rigged overhead made it all glow like the devil and the deep blue sea. A sheer stack of speakers made my chest rumble, feel warm. The bass sounding was a mother's heartbeat inside the womb.

Omnivore and Ferris flipping and jiving the dance floor with Hardkid moves and old stuff Alex taught them; boy and girl interchangeable in long hair and cut-up denim. Jessa and Oreo at the bar with drinks, Jessa cleaning the roof of his mouth with her tongue.

So it's me holding Moon's hand while someone needles one dot at a time onto her hip. Ink

making a quarter moon on that perfect skin; her first tattoo bought behind a rice paper divider with Jessa's borrowed silver. Me adding up odds she'll want into my bed tonight, my own inked dragon rustling under my sleeve, tongue and jaws flicking from under my cuff saying, "You need," and it started up the other ghosts drawn onto my body, going, "Please, Sander, please, we need a part of her, please."

Moon has her eyes squeezed shut, hands on my chest while we're up against the abrasion of speaker sound. Head tilted, mouth open to mine. A big spin of lights going green, yellow, blue, red, orange with the synthetic of the bass sound over all of us on the dance floor. Everyone with their eyes closed doing Hardkid spin, except I see two coming at me like they've got their own Hollywood soundtrack. Two dough faces bordered with dark shades and earplugs trailing wires; Cleanheads with brushcuts so blonde it's white. Eyes and ears on filters and scanners. Everything I had on my hands and I was the first one to notice the Bulldozers were onto us. Right.

I'm so busy on them I missed the third one with the zipgun across the room. She straightarmed the homemade gun wrapped in duct tape before I caught her and, bang, something plows a hole through Moon and slams into me. Spit trails of red blood everywhere.

The sound of it's got everyone

running—except the people on the floor that the bullet came through to hit me. That gun firing homemade rockets of spent uranium and steel. Moon with a hole the size of a small fist in her chest, twitching on the floor beside me. Eyes rolled up. Blood spilling like a drain overflow. The Bulldozers were on me then, mini-UZI's ripping twenty holes in my chest before I could prick my finger with the copper pin and flick out a drop of blood in defense. The hot metal smell of lead slugs hanging in mid-air like raisins dropped in honey. I bite my lip and spit out blood and a curse.

And the Bulldozers and the zipgun girl light up like matchheads. They scream once and burn out their insides when they suck in a lungful of fire.

*

Jessa and Oreo were carrying what they thought was a dead man between them until I started swearing. Omni and Ferris were at the bottom of the fire escape. The booze can turning into a 4-alarm blaze and people running for life. Jessa going "Sonufabitch, he's alive!" and Oreo with big whites around his eyes. And I know, sick like eels churning inside my chest, that I bled all the luck out of Moon to survive back there and left her hollow corpse on the floor. Hand to my chest, my fingers poked through the ribbons of my jacket salted with Moon's blood. The plink of flattened lead slugs drop-

ping to the pavement. I made a fist and hit my chest. It made a wooden sound.

"Body armour," I said. "We've gotta go."

*

Coming up, it put long hard edges around buildings and corners. Deep-frosted blue creeping back across the sky. Sunrise like a bad wound coming pink and orange. And another ugly taste in the back of my throat. Hot sweats turning cold too quick down my sides. Matte black sockets of sunglasses, my eyes still watering. We ran between the long belts of sunlight.

Up the stairs and inside. Dusty white light around the edges of opaque curtains. Jessa's mismatched gang back to perch. Rustle of long coats and blankets. The half-lit vision of Ferris on the couch, eyes fluttering behind gold hair until they stayed closed. Oreo and Jess turning out their guns and loose ammo onto the kitchen table before settling into the loft above. Dry timber boards creaked for minutes till they slept. Only little Omni kept awake with me across the gun-littered kitchen table. Chin tucked in the collar of her jacket, eyes getting heavy, she watched me.

Me sitting back in the chair, reached deep down in my trenchcoat and rags of jacket. Took out revolver and .45 calibre Colt automatic, and then sawed-off shotgun, buck knife, switchblade and

loose rolls of shells and bullets. And finally Omni rolled her head to one side and asked, "Is Alex not coming back because Weylin died?" and me not knowing what to say.

"Alex isn't coming back because I'm here," I said. "She's my better half."

"But you're so much like Weylin," talking into her sleep.

I shook my head, tired. "Weylin was always older."

*

The freight elevator worked but I took the stairs. Climbed and creaked the steps of what used to be a munitions factory. Black and brown crud paint peeling off the clay brick. Alex's place was like an acre of bare warehouse. Open girders wrapped in birchbark and wood and rope and baling wire. A forest in the dusty twilight of skylights. Chimes and bones of badger skulls hung from dead branches. Frayed hemp knotted to the ceiling; ropey arms and curtains like old willows. Wire sculptures of wild horses galloped out of the floorboards. Frozen. She'd brought up smooth things from the beach: sand and driftwood and stones. Rust-caked iron bones and skin-flakes of washed up ships and garbage machinery.

I followed the pattern gouged and painted into the floor. Alex's briars and vines forming pentagrams and circles that conducted her energies. I walked the spiral around her sculptures until I found

the spinner herself. Alex sitting crosslegged beside a smoke pot of myrrh. The incense smell of the whole place.

"Things have always been tougher for you, Sander, being the youngest." She looked at me, not really sad. Waiting. "Who did this?" she asked.

"We all have enemies." I closed my eyes. "I always wanted what you and Weylin had. You had Nelson. I never got to learn."

"Fate only casts its coins once for one person, Sander. We had to share and you made do with what you had." She stood, walked behind me.

I remember what I've done. "It's only necromancy."

Alex is back again with a talisman of empty brass cartridges and knocked out pennies. She puts it over my head. "It happened again?" a whisper beside my ear.

I nodded.

*

On my back in a circle of candles and white crystals and incense. Candleheads shook and smoke tails of myrrh drifted away. Alex bent over my bare body; red hair pulled back. She's drawing, stab, stab, stab, on my leg with a silver needle. A woman-in-the-moon. Moon's ghost shivering and brushing up with Mica's dragon down my arm, Tavia's crane on my shoulder blade, and biggest and most delicate, Sandra's dolphin spiralling in water over my heart. My namesake. "It's fate," Alex

always says to me. "This is the way you live." But that time I cried to her. Cried the whole time.

"I need him, Alex. You and Weylin had a father. I need to see Nelson."

And a long time later she said, "I think I can find him."

*

NELSON, 2048

You could spend the whole day down below. Bone conduction headphones crammed into your ears, body encased in best leather and rags. Slamming through the tunnels until it's dark when you came up again. Feels like a thousand kinds of worm trails eaten out by cobalt blasts until a train car could fit through. A hundred people smeared their faces up against the window. They kicked and moved like that film of the rat being eaten by maggots. Then red and off, red and off. Hazard light blinking read.

Then the last face came up. A woman with hair long except shaved on the temples with Frankenstein studs in her head. "Got a live one here!" she yelled somewhere. A silver loop like IV cable snaked out of a headsocket, flashed a tongue of fibre optic light before she plugged it into the console of my coffin. *Fuckit freezing in there.* I remembered the metro dream and got hot tears behind my eyes.

The woman and two more

pulled the door open and it cracked like a stuck refrigerator door. The first breath I sucked in corroded the back of my throat and ate into my lungs

"Don't sweat it, soldier." The woman stabbed me in the arm with a mechanic in her hand. "It's just breathing real air again. By the way, I'm Ecker, your therapist."

Sound was clearer, grainier. And real air smelled like sweat stink and machine tools. Warm hands pulled me out of the bed of plastic and onto a stretcher. Patches of onionskin paper floated and disintegrated on the air. They chafed my arms and legs, up and down my body. Clouds of translucent skin flew off in strips. Somebody coughed out a curse and the woman said, "Think how the stiff feels: he's wearin' it."

She lifted my arm and read my tattoo. "Well, A. Nelson, B253 631, welcome to the living. We've got a job for you."

The crew flicked on hand spots and picked up my stretcher. It was pitch in the corridors, the only light from steady green LEDs inside each coffin and the wobbling lines from the handlights. We edged by a woman hanging tubing and cable across the ceiling, followed the bulkhead around the station.

"Looks like another Bela Lugosi ahead," someone said. We got closer and Ecker shone the light into a dark coffin.

"Hey, Nelson, remember this guy?"

Inside was a shrivelled charcoal stick figure.

"Not anymore, you don't." And we walked on by.

"Accidents happen after all these years. Some systems just fail."

And I'm absorbing "all these years" and getting ready. It had been a Big Sleep. We're in the elevator and climbing. Number after number lit up.

"You know, Nelson, I kinda hate to do this to anybody, but you're no use to us the way you are," Ecker said. I had a very sick, sinking feeling in the pit of my stomach. "Hit him again," she nodded to one of the others.

I felt the next stab, then a whole lotta nothin'.

*

Nelson, I said. Nelson, you're asleep. When I heard that I knew I'd wake up. Eyelids broke open on blurry, too-close grass blades. One ear wet, pressed to the ground. Dapple lines of leaves over my hand in the sun; cool where the shade started. Green grass cool on bare skin. I closed my hand around it. Hair-pulling sound and it came out. Feeling like when your arm's been asleep. Wind howled but my eyes told me there was just a breeze. Enough to make the leaves nod their heads. Alive again. On my feet, the sky too bright beyond the trees. There were stone cliffs ahead. Everyone had gone and left me naked in the garden.

"Hey," I questioned.

Music came up. A slow tease

from above. From the cliffs. A song from before I was born. I remembered an actual dust jacket in my parent's house. A plastic record. We few, we band of brothers, for he who sheds his blood with me today shall be my brother. But there were sisters in my war. And my war was over.

I followed the music. Each step light, the air smelled like sex. Words trickled through my head on squeams of blood; failed to describe the world around me with anything better than green. The cliffs grew into my vision, mossy and vine crusted. Ten-metre faces of Buddha rough-cut and merging with the wall; Oriental versions of Dali watches. The graves of giants.

There were punched-out ledges and windows when I got closer. Black mouths into stone. Up rough stairs and I'm at the cave mouth where the music is. The green seems far away. Rattle of wood and bird calls. Funny music like a Tarzan movie soundtrack. A mottled lizard made a hard climb up the cliff face.

"Nelson," she said and threw me an apple.

Alex was waiting, touching the grass with one hand. Bob-cut red hair shaggy. Light freckles on bare back, dark colour wolf tattoo on her shoulder. She got up, eyes glint hard in smile-stretched face. I was hard; her nipples stood up. We were together, hot breath on her neck and rolling and biting and mounting, and wanting inside her.

Her long fingers through my hair and tattooed wolf moving on her shoulder. Jaws and legs running over shoulder blade. Eye looking sideways at me, teardrop red on black. We made love like jackhammers.

"Nelson," she breathed, first words. Something about pheromones.

Fifteen minutes later she was around me again; bare thighs twisted together, open mouth kissing. And a half hour after that, marginally slower.

"Earth sky doesn't look like that," I said.

"Greenhouse effect," Alex said, like it explained everything.

*

There were others at the valley; maybe a dozen of us were at the bonfire, roasting up the meat they had left for us. They. Ecker. Our employers. I had spilled out my footlocker like pirates' treasure and was in 501 blue jeans and sunglasses. Winged Raven tattoo spread on my chest. Hunks of wet wood snapped and floated red sparks on the bonfire updraft.

Alex was sprawled in my lap, dreaming. A ganja spliff between her fingers. The sounds of the burnt wood and others everywhere and faraway all at once. That's where she found us, Ecker.

"What's the job?" I watched her.

She reached out and ran fingertips on my neck, over the silver studs. "I thought you'd ask about

these first. Or why you hear and see so good, or why sex is better. Why your reactions are quicker." She took the cigarette and inhaled, reached again and put it between my lips. "What you've got in your head is a second mind. It tells you things you wouldn't naturally get. And when you're stressed, when your fight or flight kicks in, so does that second little brain. It'll do the thinking for you then."

Alex took the spliff away, pulled her own lungful.

"And it's wired all through you, Nelson," Ecker said. "We can hook you into anything and it's like a part of you. That's your job for us, soldier."

*

And I'm running with the gun rig back up the corridor, imagining that door one step closer every time I put a foot down. Alex, almost out of my sight when the vaults started to open. And they started jumping through, and I knew something had gone terribly wrong with Ecker's operation.

Tactical cops in midnight blue and brown body armour, faces moulded in plastic masks. Like those semi-lifelike department store dummies. Gunsight lasers spinning all around to cover them. And they're all coming between me and Alex.

And my little brain, that second little brain they buried in the back of my head, went *click*.

I hefted the gunrig into bayonet position, one fist clamped

down on the trigger handle. Still running. I kept blinking something out of my eye until it settled down as white crosshairs projected from xenon laser watching around the barrel of my gun. A sound like a jet engine warming up, the cooing stand-by of the gun. Zipping little messages up and down from my eyes to gun to eyes to a little brain saying *kill? kill? kill?* And I'm still running and the message going back down to the gun, too many times saying *Yes, oh yes yes yesyesyes*.

Till it's a wall of wind I'm running through. Too slow. So slow that it's hard to pick up and put down each leg. A wall of gun-recoil wind, barely counting each 15mm *bam bam bam* of shots.

Wrecking the store dummies. Watching them break and fall apart, melting hot wax under a firehose of boiling water wherever the X passes over. Up to them, through them. Over busted-up bodies. Waving the gun like a magic wand; where it goes, they all fall down. Coughs of flame out of the gunmouth. Up to, at the door, pushing them back. And finally face up to them. Dead faces of clay. And they drop *yes, yes, yes* and something hits my leg, takes part of it away. Moving back, sliding on one leg that won't work. Rockets dozing by, all at me, lead bees floating by.

And a hit like a punch in the chest pushed me the rest of the way, pinned up against the wall.

My blood going *squirt, squirt* onto hands and gun. One fist on the handle, one mind refused to let go, saying yes yes yes way beyond the time I'd be dead, and too stupid to stop when the targets were dead too.

*

NELSON 2049

And dropped ten feet deep, straight into my skull.

"Nelson," Alex said, inside my ear. "Nelson, it's time to go."

Nothing underneath me. Just the vague feeling of my body away and below somewhere. Waking and knowing it's happened again. "I'm dead," I said, wanting it.

"You're alive, Nelson, you're coming with me; they said you could. They put you back together again."

And God damn fate, I knew it was true.

*

ALEX 2049

Nelson woke up the third time on the highway, in the desert, with the shivers. He squinted and put on the black sunglasses. Hiding gunmetal blue eyes that had always been green as mine until They gave him new ones. Landscape slid by the open window. Him scrunched in the corner formed by the seat and the door. His freckles had already started to

darken in the midwest sun.

"Where are we?" he asked.

I watched him sideways for a long time. "Going home," I said, and turned away.

I kept my eyes ahead on the heat devils shivering up off the road. He slowly curled into a sitting position and twisted the dial-o-matic radio knob, playing with the fitful signal off a West Texas transmitter. For the third time, like he'd forgotten again, he opened the glove compartment and took out the revolver. Discreet, as if looking in on sleeping children, he popped open the cylinder and checked that all six bullets were loaded.

*

Those heat spirits and dust devils that had been with us a long time shivered up and down the cinderblocks. The cheap, slap-together walls and corrugated tin roof called them in from across the sand; driving them down the asphalt lines of what used to be old 66. North American ley lines. The standing stones of Shell gas stations.

"What's that?" Nelson pointed.

I took the cold Cokes and walked back to the car. Nelson was stretching his legs, had on Weylin's old boots. I followed him to the road shrine. A flat cairn of stones holding up a wooden man-on-a-cross. A black man, face stern and beatific; a bleeding bullet hole in his side and a thorny crown of computer chips.

"It's a King on a cross," I said, putting a bottle in Nelson's hand. "Sometimes they say it's Malcolm X."

The shrivelled black man hit the gasoline nozzle back into the pump. "Reverend Doctor Martin Luther King Junior," he growled out.

Nelson didn't seem to notice. "Saw the same thing in the war, in Jamaica, with the Zion cults. Was Marley then."

I could see the black man's wife eyeing Nelson from the porch. His gun in the back of his jeans, the Raven tattoo, the sockets on the side of his head. She crossed herself and muttered in Spanglish, "Proud Mary, Mother of God, rolling on the river."

This is the wrong place for us. The best we could find here would have been old Navajos doing peyote and putting Coyote spells on their PCs and satellite dishes to pull down illegal signals from orbit. Ghost cattle on the ranges driven by cowboys on Suzuki bikes. Meat farms of bison reconstituted from DNA seeds and selling hot in Japan. Nelson sat down on the fender of the Thunderbird and took a long drink. "Twenty years is too long to sleep," he said.

*

I bit down and cracked the betel nut in half, sucked a cheekful of saliva past the back of my mouth and bent over the half of the controls that still worked. Sliders and switches shown in masking tape and black marker. The red subma-

rine light blacked and replaced with the blue-green sky of summer eve. A brass and mahogany globe squealed on its tilted axis when Nelson spun it. A map made before the coastlines had gone under; continents that seemed too big against the oceans went by, night, day, night, day. I turned another slider and the sky darkened until stars came out.

Nelson's mouth opened and made a wonderful smile, bending his head back to watch the great bowl of the ceiling. Faraway trees and hills circled the bottom edge of the sky on the horizon of vision. He walked in drunken circles, head craned back. Boots made damp echoes on the marble tiles those crazy Freemasons had left in palce of seats. Finally he tripped over a four-foot brass telescope and hit the floor.

I finished with the board and walked back to him. The betel warm in my chest and going through my veins like silvery snakes. The giant insect of lenses began to spin in the middle of the room and the sky went into a slide and dropped and moved away from us; the stars in the dark moved like the whole world was disappearing away below and everything was a merry-go-round in freefall. The center of the world was inside your ribs and it all rotated on strings from there.

And Nelson had crawled to the rugs and fat pillows, knocking over an iron candle stand that, *whump*, landed on a dusty Persian pillow

shooting sparkle clouds of dust. As he went, he left coat and shirt and big silver buckle belt and jeans. And me gaining on him, leaving shoes frozen in two footsteps and losing clothes in a trail behind me. Nut slivers ground between molars. The taste at the back of my tongue, and it's slick all through me.

Remembering what Nelson taught us, what I tried to tell Sander and he used it the wrong way; that male energies have no direction and can be moulded to different paths, but that always—you have to know this—always there are magics that can only be done through women. That we have part of the earth working inside us, a cycle that is both moon and earth because a woman bleeds and blood is iron and iron and magic are like gunpowder and fire, and blood makes magic. But Sander used it the wrong way to suck the life out of his women and I had my own spells to bring Weylin back if no one else did.

Up to Nelson and—shush of clothes—on him. Kissing. And goosebumps spread from my breasts to my belly, down my arms and legs. My skin warms, pressed to the heat of his stomach, tongue past lips in passionate *ummm*, kiss. Pressed flat and him kissing chest and belly down to fine lines of hairs until I can't keep my legs from shake—*Ohh*—shaking. And moving back to kiss and *oh* salt and sweat and sweet warmth and *ummmoh* in between my legs and

inside and so full and around my waist strong hands and *ohhh* his fingers. Squeeze, it can't escape and fingers still touching and back arching and *ahh*, getting closer and *ummm*, *uhuh*, *yes* and *goddess don't stopgaspinandrollingand meltingtogether ka-thump, ka-thump thump* of heart inside, and slower until arms and legs are curled together and still. And only his heart: *ka-thump, ka-thump, thump*.

*

Down below was too clean to be dead. Even the crews of night janitors had left when we came down the steps to it. Every surface polished, signs bright and day-glo and new. Bulbs and phosphorescent panels clear of dust to shine a blue-red pale imitation of daylight. All clear, just the broad traffic ways of closed-up storefronts and autotellers, swept and ready until a 5 a.m. rush. It was Nelson's home and Sander knew it, just like he had tried to know everything about Nelson. Sander was more like him than Nelson was.

We went deep, past the arcades to where tunnels felt like tunnels and trains in the garage let rumbles and squeals go through the concrete when they moved around. Down where the unconditionables had burrows and warrens marked off with competing spray paint tags. A language as much art as print, indecipherable to anyone but the kids. I walked behind Nelson and listened. Him with his hand on the

revolver but neither of us expecting anything. I tried to read through the faded collage of paint as we went, looking for a Nelson '17, but I didn't find one.

And just like he said, stepping out of the wall shadow, Sander was there. Like Nelson's own shade, come looking for him. Sander like death in black trenchcoat and boots and black leather jeans and gloves. And I watched the two of them move together like I never got the chance to with Weylin because he always tried to look so different. Nelson with this weird look of recognition and maybe sad too. Nelson, who by all rights should be over fifty and was only thirty, holding hands with Sander, who he last saw as a newborn. And my eight-year-old self remembering those green eyes and red-brown hair just like me and big brother Weylin.

"Here he is, Sander," I motioned. "This is Nelson."

Sander touched Nelson like he might break, leaned closer. Nelson only smiled and kissed him. Time passed, 1, 2, 3, all the way to 11 while their lips stayed together, eyes open, and watched each other. Nelson stepped away and lightly pressed a finger to the corner of his mouth.

"Sander. Did you pick that name?" he asked.

"It was the closest I could get." Sander turned his head to the side.

Late that night, with Sander asleep on one side and me curled

up at his back, I whispered into Nelson's ear, "We have to go west. I want to visit the sea."

*

"Dead?" Nelson wondered out loud. "I thought they'd need silver bullets to kill him."

I remembered the wreck of the place where they found his body. The white-on-white tile and porcelain filled with so much blood he just bled and bled and bled. Splashed so high to hit the ceiling.

"It was at Stratford." Sander kept talking. "Bastards waited until act four, he was playing Macbeth. They musta been good, put a glamour on half the cast and they hacked him to pieces. Hell, even so he pulled down half the stage; bodies all over, in the audience, everywhere."

"Who else? Who did it?"

Sander took another long breath. "Too good for CSIS, maybe the CIA freak squad. We found him after the Wheelkids had gone over it all. They put a stake through his heart and his head on a pike."

We're all grim on that. To Nelson, Weylin was all his and I know it's bad inside. Bad to wake up to. Maybe I'd been better off to have that black leather witch he slept with to tell him. Maybe but no, best from one of us. Sander's fingers are white on the knives hooked inside his jacket. Big tears went drip splash off Nelson's cheeks. We all feel it, like something plasticine wrapped around our hearts. But poor Nelson; flesh

of my flesh.

*

They went out drinking tequila and bodysurfing. We ate Moroccan oranges and handfuls of shrimp and seafood. I got Nelson and Sander to come down from the house and we went nude sunbathing on the beach to forget about the ghosts of Montreal. Omni and Ferris played in the water and laughed. My hair got sunbleached and my nose peeled.

There was a bonfire cookout that night on the beach. Nelson and I held hands in cutoffs and T-shirts. Watching the fire; a hundred different colours of fall leaves rushed in the wind at once. A black sky and wash of moon's tide pulling in the waves. I relaxed, warm and sleepy, like the girl on rainy days I used to be.

Sander sat down beside me, skin dark from the sun. Salt stains creased his clothing and red hair was spiked wet with ocean water. "Nelson, where did we come from, why did you make us?" he asked, because I never told him that story. Nelson closed his eyes. Tumbled waves and white bodies called behind us.

"I had good veteran's benefits; guaranteed replacement parts due to physical injury, radiation damage or cellular breakdown due to chemical toxins. Pretty much had to be able to replace all of me. There were the fates to pay, Sander, the three fates had said I couldn't die that way."

"Do we all have the same soul?" Sander asked.

"A part of it." Nelson smiled.

And I knew why Nelson's grief had gone away. Knew it better than him because I could feel Weylin inside me. None of us could die so easily while the others weren't because he was still three-quarters alive. Blood pumping, *thump drum* in my belly and a dozen cells splitting and reforming and the fire was too hot and sand burrowing around my toes. "When I found out, I took you away," Nelson was saying, but I left them at the fire. Staggered by Jessa and Weylin's old pack until my soles left wet imprints in the sand and the surf tickled my ankles and foamed around my knees and cold saltwater at the crotch of my shorts.

On my back, hair swam around my shoulders, a touch like nibbling fish. Eyes open to the moon winking through the dented grey ceiling of clouds. The sea all around me, arms and legs wide to float. Cold water seeding up inside between my legs, because what Nelson couldn't know was that some magics take a woman and iron and blood and the sea. That even though he knew sometime Weylin would come back, he didn't know how, or that I could do it. Fate had left his soul inside us but engineering had left us genetic brothers and sister of one Lieutenant Alexander Weylin Nelson; and both those meddlers were alive inside me. Coming home. •

A S K M R Q S C I E N C E

Q : MR. DG OF COQUITLAM, BC, ASKS:

If radioactive isotopes have a half-life, do nuclear weapons have a "best before" date?

A : Yes, most do. A pure fission warhead has a usable lifetime of about one thousand years before the plutonium has decayed enough to seriously degrade the weapon's performance. The same holds true for large thermonuclear weapons, since the fusionable component, lithium-6 deuteride, does not undergo radioactive decay and performance depends entirely on the condition of the fission primary and its plutonium core. In the case of "boosted" fission weapons (the largest segment of the stockpile), however, the yield is greatly increased by injecting, at ultra-high pressure, deuterium and tritium gases into the hollow center of a plutonium core immediately prior to detonation. Since tritium is radioactive and decays with a half-life of only 12.5 years, the weapon's yield will be affected after only one year of storage, and can be considered useless after about five years. These devices are therefore labeled, "Use before (date of manufacture plus one year)."

Q : MR. RGC OF VANCOUVER, BC, ASKS:

Will clouds go away if I stare at them long enough?

A : Yes, they will. Of course, they will go away in exactly the same amount of time even if you don't stare at them.

Q : MS. BW OF NEPEAN, ON, ASKS:

If two trains are travelling in opposite directions, how can one determine their relative velocity?

A : If the trains are moving towards one another, one need only measure the starting distance between them and divide by the time from start to collision. If they are travelling away from each other it is not possible to determine the relative velocity. (See "Heisenberg's Uncertainty Principle, as applied to diverging locomotives," in any modern physics textbook.)



If you have a question concerning life or the true nature of the universe, please send it to Mr. Science c/o ON SPEC, Box 4727, Edmonton, AB T6E 5G6.

ON HARD SF

Guest Editorial by Leslie Gadallah, *ON SPEC* Editorial Advisory Board

We need to talk.

A quick survey of submissions to this issue of *ON SPEC* suggests that many people are convinced nothing of note has happened in hard science since 1950, the maturation of semiconductor diode technology, and the development of integrated circuits leading to small, fast, high capacity computers.

True, a computer is the most complex machine most of us will encounter. True, the potential of computer technology is still imperfectly realized: the hardware is still getting smaller, faster and cheaper; virtual reality promises, like an electronic Disneyland, a way to step outside of this rude world for a moment; artificial intelligence remains a (remote) possibility; and the notion of downloading a human personality into silicon still fascinates twenty-some years after it was first proposed.

But really folks, the basic science is old, old, and science fiction should not be so fixated on pre-World War II discoveries. Once in awhile, we should look up from the keyboard and see what else is going on.

And the world is full of a number of things.

At one end of the scale, simple inventions have the capacity to make big, unexpected changes. Who knew the spray can would destroy the ozone layer?

The humble fax machine made it impossible for the government of China to suppress knowledge of the events in Tien-amin Square, and

changed the relationship between governments and citizens for all time. Being able to talk to one another is one of the most important characteristics of human society. Information theory is feeding a developing communications technology, and interactive TV, voice and email, electronic bulletin boards and networks are decentralizing information exchange, taking the power to disseminate knowledge away from institutions and government control and putting it into the hands of individuals. A recipe for anarchy, or for the regeneration of true democracy? Will schools as cultural entities survive the change? Will nations?

At the other end of the scale, cosmology is developing at an incredible rate. Not long ago, space was thought to be the same in all directions, and black holes were a radical new idea. Now we've discovered chains and networks of galaxies streaming toward the Great Attractor, exhibiting organization on a truly stupendous scale, and cosmologists propose some mysterious stuff—dark matter—to explain why what we see doesn't fit very well with what we calculate. We've looked back and back in time, almost to the beginning. When we get our space-borne telescopes in order and finally collect a few photons which began their journey 15 billion years ago, will we see the face of God, or some cosmic child pushing away worn out toys?

Biological engineering, especially genetic engineering, probably

has more potential to change our immediate surroundings than anything we've done so far. We are inventing new organisms to put into an environment that evolved without them, and we know little enough about how existing organisms interact that literally anything is possible. We are also learning to read our own genetic code, and face the possibility, and therefore the responsibility, of being able to tweak and fiddle with human heredity. When we can do a little pre-conception science to prevent it, is it ethical to let nature take its course and let children be born not only with genetic disease, but with minor imperfections? No doubt, some people will insist we have no right to interfere, and one man's imperfection is another man's lovable quirk. When we can order an offspring's characteristics like we order options on a new car, what happens when Mom wants a sweet, sensitive boy, but Pop wants a football player? Is this a power we want to place into the hands of the creatures who bred the Dachshund and the dairy cow? Who will control it and who will set the limits?

Is that sort of science too soft? Let's consider some other types of engineering.

One scary idea that keeps resurfacing is a huge pipeline to move some of Canada's abundant fresh water to the thirsty southern U.S. Something like that was done in Russia, and it destroyed the caviar fishery, and may have permanently changed ice conditions in the Arctic. In any case, the people at one end of the pipeline would have an interesting relationship with the people at the other, power and dependency not unlike parent and child. At the very

least, such a project would be a prime target for terrorists.

Materials engineers are developing super-conductors which maintain their unique characteristics at higher and higher temperatures. If city streets could be replaced with silent, fume-free superconducting maglev rails and citizens could whip around town at almost no cost, it would change our cities at least as much as the automobile changed the horse and buggy age.

More mathematically oriented is the curious notions of fractals and phase space, which yield the unsettling feeling that another reality exists on a slightly different level and intersects with our own now and then. Consider also the whole bag of cats that is opening up under the somewhat misleading title of *chaos*.

If something like cold fusion (or even the hot kind) were to become reality, giving everyone all the energy they wanted, not just in North America where that is already almost true, but also in the Delhi slums and rural Thailand, the economics of scarcity would be instantly obsolete.

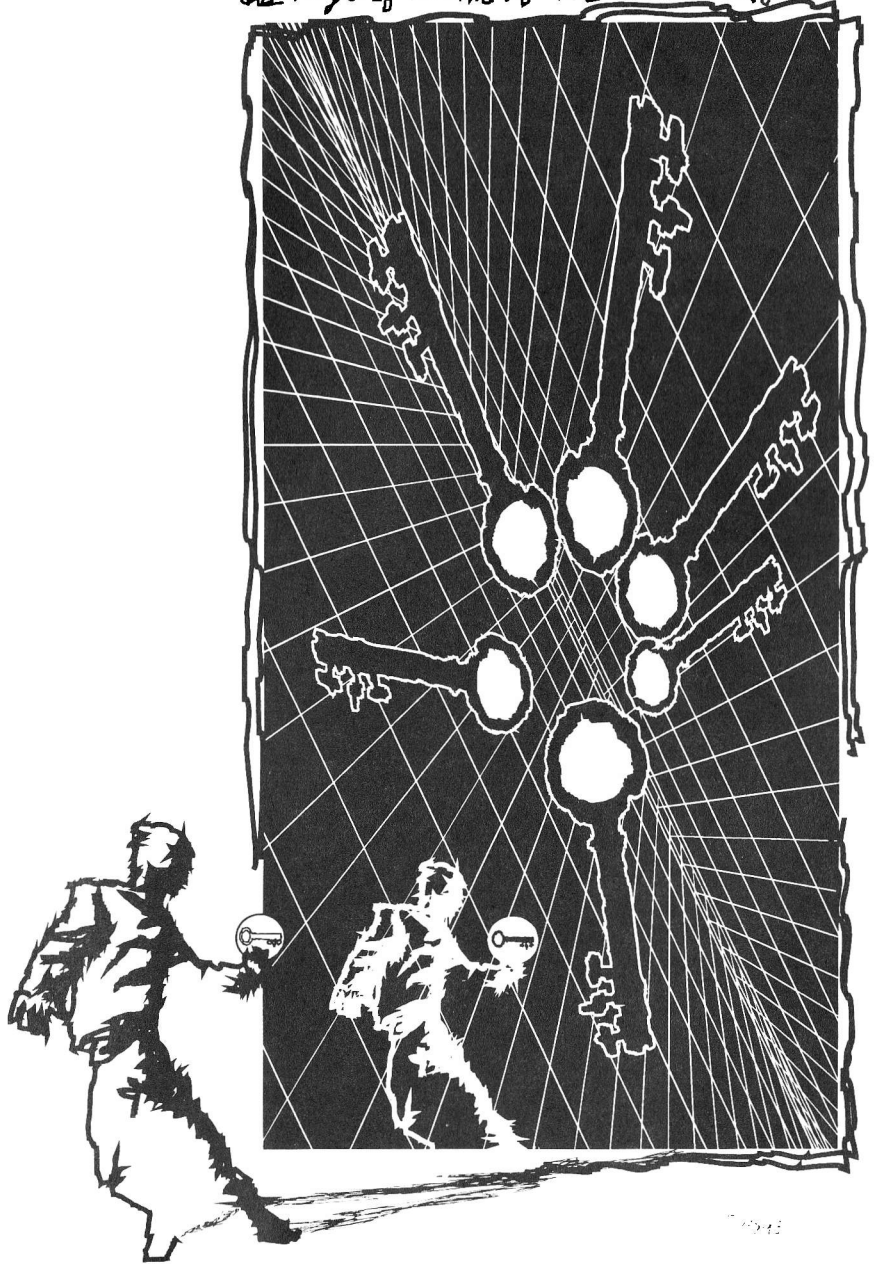
Last year a team of Japanese scientists built a strip of polymer gel that swam like a worm. Artificial muscle or molecular machine?

Could global positioning satellites and implanted reflectors make it impossible to get lost, even if you want to?

Does anybody really know what happened to the Mars Observer?

There are infinitely many other possibilities. We haven't touched the space station, micro engineering, military research, environmental topics, or buckyballs. But you get the idea. •

the Keys of Dream to the inner mind



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ON CONS — Canadian Convention & Reading Calendar

When contacting conventions for more information, include a Self-Addressed Stamped Envelope for their reply. Abbreviation code: GoH = Guest of Honour, TM = Toastmaster, MC = Master of Ceremonies.

• FEB 17-21 – ONOCON '94

Relaxacon. Stampeder Inn, Calgary. Memb: \$15 to Feb 10 1994, \$20 at the door. Info: Box 57082, 2525 - 36 St. NE, Calgary AB, T1T 6R4.

• FEB 19-20 – CONV-ICTION 94

French-only. Info: CP 252, Succ. St. Martin, Chomedey, Laval PQ, H7V 3P5.

• MAR 18-20 – ODYSSEY TREK 94

Skyline Brock Hotel, Niagara Falls. GoHs: Siddig El Fadil & Robert O'Reilly. Memb: \$40 at the door. Info: Box 47451, Centre Hall, Hamilton ON, L8H 7S7.

• MAR 18-20 – ST CON 94

Quality Inn Downtown, Calgary. GoH: Lolita Fatjo. ArtGoH: Richard Bartrop. Info: Box 22188 Bankers Hall, Calgary AB, T2P 4J5.

• MAR 19-21 – RHINOCON 3 *** CANCELLED ****

• MAR 25-27 – RELAPSE

Minto Place Suites Hotel, Ottawa. Info: 26076-72 Robertson Rd, Nepean ON, K2H 5Y8.

• APR 15-17 – FILKONTARIO 4

Regal Constellation Hotel, Etobicoke. GoH: Kathy Mar. Memb: \$35 at the door. Info: 302 College Ave W, Unit 20, Guelph ON, N1G 4T6.

• MAY 13-15 – CANCON 94

Talisman Hotel, Ottawa. GoH: S.M. Stirling. Memb: \$25 to Mar 31 1994. Info: PO Box 5752, Merivale Depot, Nepean ON, K2C 3M1.

• MAY 21-22 KEYCLONE 94

Relaxacon, Hawaiian theme. Travellodge East, Winnipeg. GoH: Ben Bova, FanGoH: Dave Clement. Info: PO Box 3178, Winnipeg MB, R3C 4E6.

• MAY 26-30 – INT SPACE DEVELOPMENT CON

Professional. Regal Constellation Hotel, Toronto. Info: 1994 ISDC, 107 Evans Ave, Toronto ON, M6S 3V9.

• JUN 10-12 TERRACON 94

Coast Terrace Inn, Edmonton. GoHs: S.M. Stirling, Candace Jane Dorsey & Ian Slater. Memb: \$22 to May 27 1994, \$25 at the door. Info: 8831 - 93 St, Edmonton AB, T6C 3T2.

• SEPT 1-5 – CONADIAN (Worldcon)

Winnipeg Convention Centre, Winnipeg. GoH: Anne McCaffrey, Art GoH: George Barr, TM: Barry Longyear, FanGoH: Robert Runté. Memb: was \$125 to Dec 31, 1993. Info: PO Box 2430, Winnipeg MB, R3C 4A7.

READINGS:

Feb 24, 1994: ROBERT J. SAWYER will be launching *Foreigner*, the third Quintaglio novel, at 7 pm at the Richmond Hill, Ontario, Central Public Library (Yonge St. at Major Mackenzie Dr.)

ON SPEC would like to print your Canadian convention and author readings information. Send us details of your event at least 5 months in advance (to Box 4727, Edmonton AB, T6E 5G6), and we'll run it free of charge.

The bulk of the information in this column is courtesy of ConTRACT, the Canadian convention newsletter, available from 321 Portage Ave, Winnipeg MB, R3B 2B9 (subscriptions \$7 / 6 issues). Send your convention info directly to them, as well.

ON OUR CONTRIBUTORS

ABOUT OUR AUTHORS

AL BETZ (*Ask Mr. Science*) is the social secretary for Mr. Science.

CORY DOCTOROW (*Résumé*) is a Clarion East '92 graduate with the publication credits to date: "2000 Year Checkup" (*ON SPEC*), "Hell: A Cautionary Tale" (*Pulphouse Magazine*), and "Cars Swing" in *Air Fish*, an anthology of surreal SF published in Autumn 1993.

LESLIE GADALLAH (*Guest Editorial*) was a practising chemist and wrote popular science before turning to science fiction. She lives on an acreage near Spruce Grove.

PHILLIP A. HAWKE (*The Monk*) is a rather sporadic writer who, until recently, had not been published. Another of his stories appeared in the September 1993 issue of *Blood & Aphorisms*, published in Toronto.

WESLEY HERBERT (*Too Clean to be Dead*) is expanding his cult following from the snowbound wastes of York University into the snowbound wastes of all of Canada. Culties everywhere rejoice over the birth of his firstborn, Tyren Paix Herbert.

JASON KAPALKA (*Happy Eating on Ugrath 3*) is both pleased and startled (so are the editors) to see his fifth story appear in *ON SPEC*. He wants it known that he REALLY DOES like fast food, and is presently engaged in writing an epic paean to the glories of McDonalds chow.

LYDIA LANGSTAFF (*Bogey*) has poetry in *Senary* and *Midnight Zoo*, and recently had a sonnet sequence published in *The Testament of Lael* anthology. She also writes a column on Celtic mythology for the *Celtic Connection*.

KARL SCHROEDER (*Making Ghosts*) is of Manitoba Mennonite extraction. He currently lives in Toronto where he writes and teaches writing. As vice president of SF Canada, the national association for SF/F professionals, he is active in aiding the growing community of Canadian SF/F writers.

JEAN-LOUIS TRUDEL (*Stella Nova*) of Toronto is the editor of SF Canada's *Communique*. He has had stories published in Canada in French (*imagine..., Solaris*) and English (*Tesseract¹, Tesseract², Ark of Ice*), in Belgium, France, and in Russia. He has two young adult novels upcoming soon.

LEAH SILVERMAN (*Lenses*) is a student at the University of Toronto, from whence she hopes one day to actually graduate. She has had one other story published in her entire life ("An Alien Sun" in *Tesseract3*), so she will be bouncing off walls in glee for quite some time.

ABOUT OUR ARTISTS

JIM BEVERIDGE (*COVER and Happy Eating on Ugrath 3*) is an Edmonton artist caught in cyberspace, so don't try to talk to him. He has been doing computer art since September. Current projects include a line of mystic greeting cards, and a painting on the side of the County of Strathcona Bookmobile.

TIM HAMMELL (*The Inner Mind*) is a Calgary artist doing Crossover artwork for four other photographers, and has become part of a special effects group.

MARC HOLMES (*Stella Nova*) is a Calgary artist stuck between the dream of being an artist and the reality of his 2.5 year old son. Finishing his 3rd year at the Alberta College of Art (Graphics and Advertising), he will be showing his art at WorldCon in Winnipeg this fall.

MIKE JACKSON (*Making Ghosts*) is a Vancouver artist whose work appears regularly in the *Shadowrun* and *Battletech* games from FASA. He is currently doing artwork for a company that makes Nintendo games. He is lo-cal, and high in fiber.

PETER MacDOUGALL (*The Monk*) is a Halifax artist currently inking *Dragon's Star II*, a continuing graphic novel from Caliber Press. He also works on his own stories and private commissions in most media.

DORY A. RIKKONEN (*Too Clean to be Dead* and *Résumé*) works as the broadcast media coordinator for a Calgary retail store. A freelance designer working either by hand or in the Macintosh environment, she is old enough to "know better" but not old enough to creak.

CHERI STREIMIKES (*Lenses*) has worked for the last 20 years as an SF airbrush artist and painter. Currently working with computer art and effects on video, she also teaches art and media at the Spectrum Alternative High School in Kingston, Washington. ➤

GENERAL INFORMATION

ON SPEC is seeking original science fiction, fantasy, horror, ghost or fairy stories, magic realism, etc. Strong preference is given to submissions by Canadians. Send your short stories (max. 6000 words), short short stories (under 1000 words) or poetry (max. 100 lines) to the *ON SPEC* address below.

All submissions **must** include a Self Addressed Stamped Envelope (SASE) with sufficient return postage. **Do NOT send originals.**

Submissions must be in **competition format** (author's name should NOT appear on manuscript). Enclose separate cover page with your name, address, **phone number**, story title and word count.

Please send SASE for complete guidelines before submitting.

Deadlines are February 28/94 (for Fall/94), May 31/94 (for Winter/94), August 31/94 (Theme: "HORROR & DARK FANTASY," for Spring/95), and November 30/94 (for Summer/95).

Art guidelines and advertising information are available. Please send SASE.

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FEB 94

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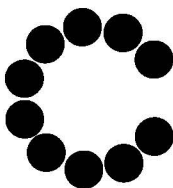
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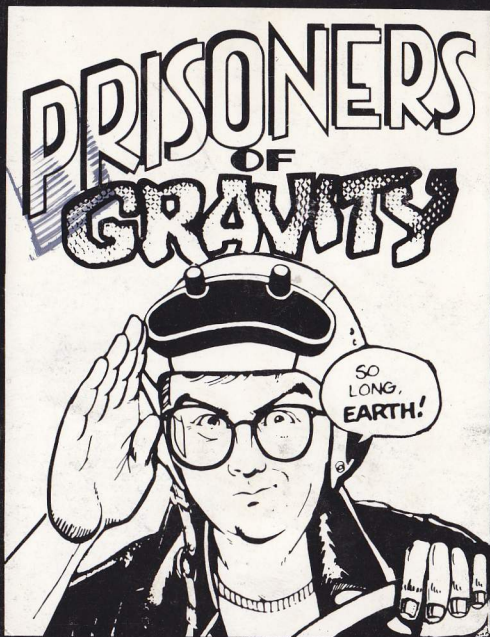
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