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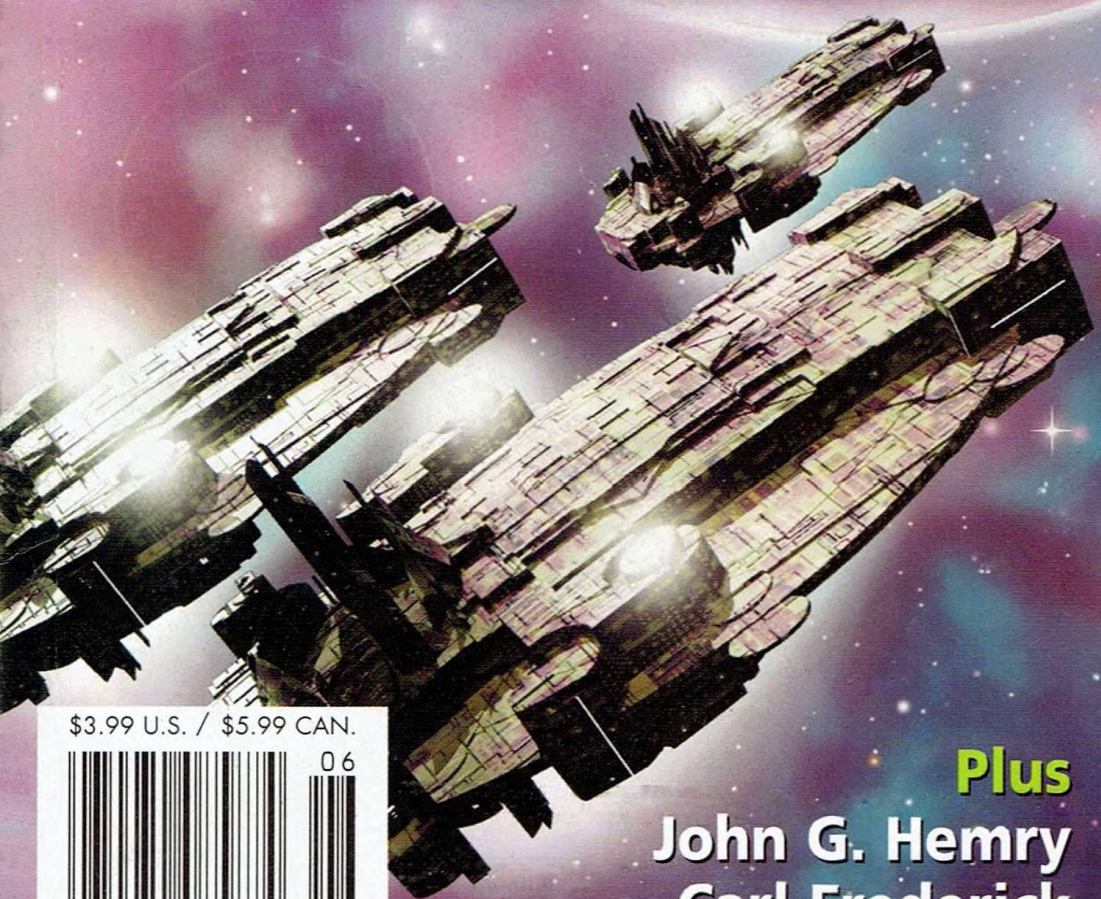

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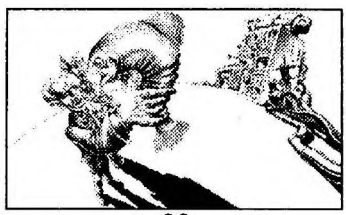

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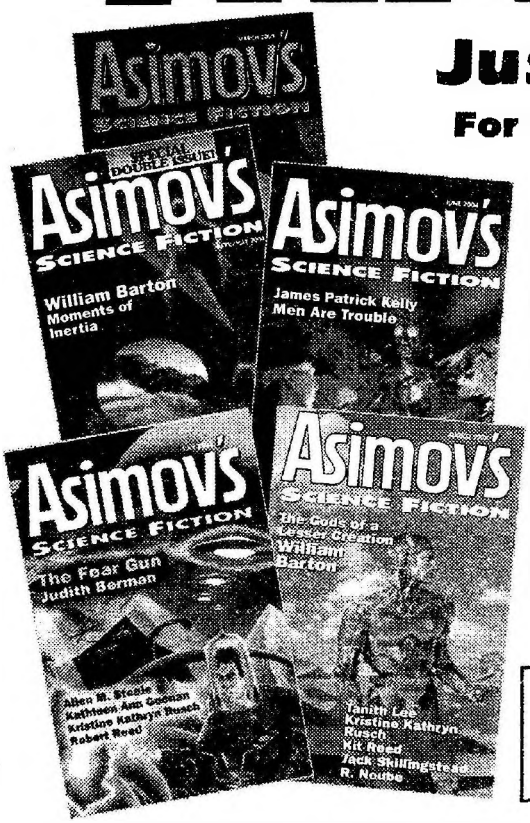

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EDITORIAL Stanley Schmidt

ZERO-POLLUTION SOLUTIONS

Despite the current prevalence of huge, gas-guzzling vehicles and store clerks who insist on using far more plastic bags than necessary, there are still people seeking ways to reduce the adverse impact of humans on their own environment. Recycling programs have become fairly widespread, though they're often not as consistently followed as they might be. Hybrid vehicles—cars, trucks, and buses that combine electrical and combustion propulsion for greatly increased fuel efficiency—seem to be catching on. They're still relatively scarce and expensive, but if demand continues to increase, those circumstances should improve.

From time to time, unsurprisingly, we hear someone getting all enthusiastic and evangelical about some device or process that they tout as "pollution-free." Sometimes they imply (or say outright) that if everybody adopted this or that, that would take care of all our problems in the relevant area. The implication is that such things do what we want, such as produce useful energy, with no harmful side effects on the environment. Surely this would be a very desirable state of affairs—but is it actually achievable?

Let's consider some examples of things that have received this sort of hype. Hydrogen-burning engines, we are told, emit no pollutants—just water vapor. Hydroelectric power burns nothing and therefore emits no combustion products like carbon monoxide (powerfully toxic) or carbon dioxide (a potent greenhouse-effect gas). Wind power is perhaps the best of all: you just stand a tower out in a windy field, the wind makes part of it spin, and that drives a generator, producing usable electricity with no environmental effects at all.

But are these claims really true? On the face of it, they all are; but "no environmental effects" is a bold claim that seldom holds up under scrutiny. As John W. Campbell, my predecessor once removed, liked to point out, "You can't do one thing." Anything you do with a particular purpose in mind will inevitably have other effects as well. Some of those may be fringe benefits; some may have no important consequences; and some may be what medical folk euphemistically call "side effects." Any time they involve extracting materials or energy from the environment, some of the side effects are likely to be environmental, too.

"Just water vapor," for instance. It's true that we don't normally think of water as a "pollutant," but that doesn't mean that adding or subtracting it has no environmental effect, or that whatever effect it may have is necessarily benign. Like me, you probably grew up hearing the truism, "It's not the heat, it's the humidity." I never fully grasped how true that was until I got on a plane on a stiflingly muggy day in Cincinnati, where it was 76 F and utterly miserable, and then got off in Phoenix, where it was 98 and much more comfortable. Just why humidity or the lack of it has

the effects it does is something I don't need to go into here. The important fact is simply that it does. Deserts have whole ecosystems evolved to cope with very little humidity; swamps and rain forests have whole different sets of plants and animals that need lots of it. The denizens of one environment cannot thrive in the other. Furthermore, increased humidity typically means more clouds, which increase the atmosphere's albedo (the fraction of sunlight that gets reflected back into space instead of coming down to the Earth's surface).

A few vehicles that put extra water into the atmosphere will not significantly change any of these variables, or the others I could have mentioned, for the planet as a whole. A whole world's worth of them might. This does not necessarily mean that their effect would be detrimental, or that we should assume that it would. It does mean that we need to think through all the consequences as thoroughly as we can, rather than just plunging ahead (as our ancestors did) while assuming we can do no harm.

How about hydroelectric power? True, a hydroelectric plant does its business without burning fuel or emitting combustion products. Some of those things will surely happen in the process of constructing the plant, but those effects are relatively small and temporary. What may be appreciably less so is the permanent disruption of ecosystems that occurs when such a plant is built. Constructing a large hydroelectric plant necessarily involves building a dam that floods a large valley, destroying the network of plant and animal life that lived there. Many humans are quick to shrug that off as inconsequential because it doesn't directly affect *them*; but they would do well to take a good, long, hard look at the *indirect* consequences.

This is not to say that the consequences are necessarily bad. When one ecosystem is destroyed, which happens routinely as a normal part of planetary evolution, another one typically evolves to replace it. But extinctions also happen routinely, and the extinction of one or two species may trigger that of many others. It's prudent, before making any sizable environmental change, to try to predict as well as you can what *all* the results will be, and whether they're all ones you want to live with. If not, you may want—need—to look for another approach.

The effects of a dam, of course, do not stop with the drowned valley upstream. The valley below the dam is deprived of most of the water and energy the stream used to bring there, which necessarily means big changes there, too. Plants and animals that depended on plentiful water can no longer live there, and will be replaced by others. Whether that's an improvement is not *a priori* obvious, and the answer may depend heavily on whom you ask. Anadro-

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mous fish like salmon may no longer be able to ascend their native streams to spawning grounds, resulting in the collapse of their populations, along with those of animal species that feed on them (including some human economies). In some cases such effects can be alleviated with technological aids like human-constructed salmon ladders, but sometimes even that option is cut off; some rivers no longer reach the ocean at all, but peter out in deserts. River deltas are often good for agriculture because of the fertile silt annually delivered by the stream, but if the stream is cut off, so is the periodic replenishment of fertile soil.

Even windmills are not exempt from such considerations. Even skipping over the practical problems of constructing them so that they work reliably, withstand wear and weather, and can compensate for the fluctuations in wind availability at any site, the simple fact remains that they extract *energy* from the atmosphere. That is the reason for their existence—but it necessarily implies that energy that would have been carried to points downwind no longer gets there. Since all atmospheric processes are driven by energy, this means that if the amount of energy the windmills extract is very large, weather patterns downwind *will* change.

It's much easier to be unaware of this fact (or to pretend it isn't happening) with windmills than with hydroelectric plants. Air, unlike water, is not directly visible; and enough of it still seeps into all available spaces so that even if it's moving more lethargically than it used to, nobody notices a conspicuous lack of it. But even if it's less obvious, I predict that any large-scale move to wind power will force a belated recognition that the removal of energy that drives weather systems cannot simply be ignored. I don't know just what the effects will be, but I do think somebody is going to have to work at figuring that out.

And I think that recognition will be slow in coming, partly because of the aforementioned invisibility, and partly because one windmill doesn't have much effect. That's the way we've been used to seeing them, until recently: widely scattered, quaintly bucolic structures running well pumps or generators on farms here and there. But shifting a major part of our energy production to windmills (or variations such as huge

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pipes connecting regions with different atmospheric pressure) would involve a very different kind of deployment. We can already see examples of it, like the huge "windmill farms" with hundreds of big, highly efficient windmills concentrated on mountainsides in parts of California. They have ecological effects in the purely biological sense: bird and bat mortality has been found to increase dramatically around such "farms," and the effects of that are quite likely to spread to other species, possibly including ours.

But what may be even more important is the direct effect on weather systems of removing significant amounts of the energy that drives them. I haven't heard much talk about this so far, but I fully expect to hear more if such farms become more widespread and bigger. Calculating their impact won't be easy, because atmospheres are very complex, frequently chaotic systems—but doing so will probably be an important and rewarding use of the large-scale computing systems we now have available.

Yet again, none of these cautionary comments is intended to suggest that a big shift to wind power is necessarily harmful. Done right, it may turn out to be a real and large improvement. Preventing tornados, for example, seems highly desirable. But I think we are due for a reminder that "zero-pollution" is a phrase better suited to a salesman than to a scientist. We need to remember that even if we can come up with energy technologies that produce little or no pollution in the narrow chemical sense, *anything* that diverts large amounts of energy from its appointed rounds will have significant effects beyond powering our necessities and luxuries. The more energy we divert, the bigger the effects.

The most direct and fundamental way to prevent them from getting out of hand, of course, is the one that few people want to consider seriously: reduce or at least slow the growth of human population. Since that pretty clearly isn't going to happen very fast or soon, at least voluntarily, we do need to seriously pursue the next best things: reducing per capita energy consumption by such means as increasing efficiencies and forgoing willful waste, and developing and adopting less disruptive ways of powering the technologies we do use. But we can't be too glib about believing any of them are truly pollution-free. Even the best of them will still have some side effects, and we need to proceed with a realistic understanding of what those are and how to deal with them. ■

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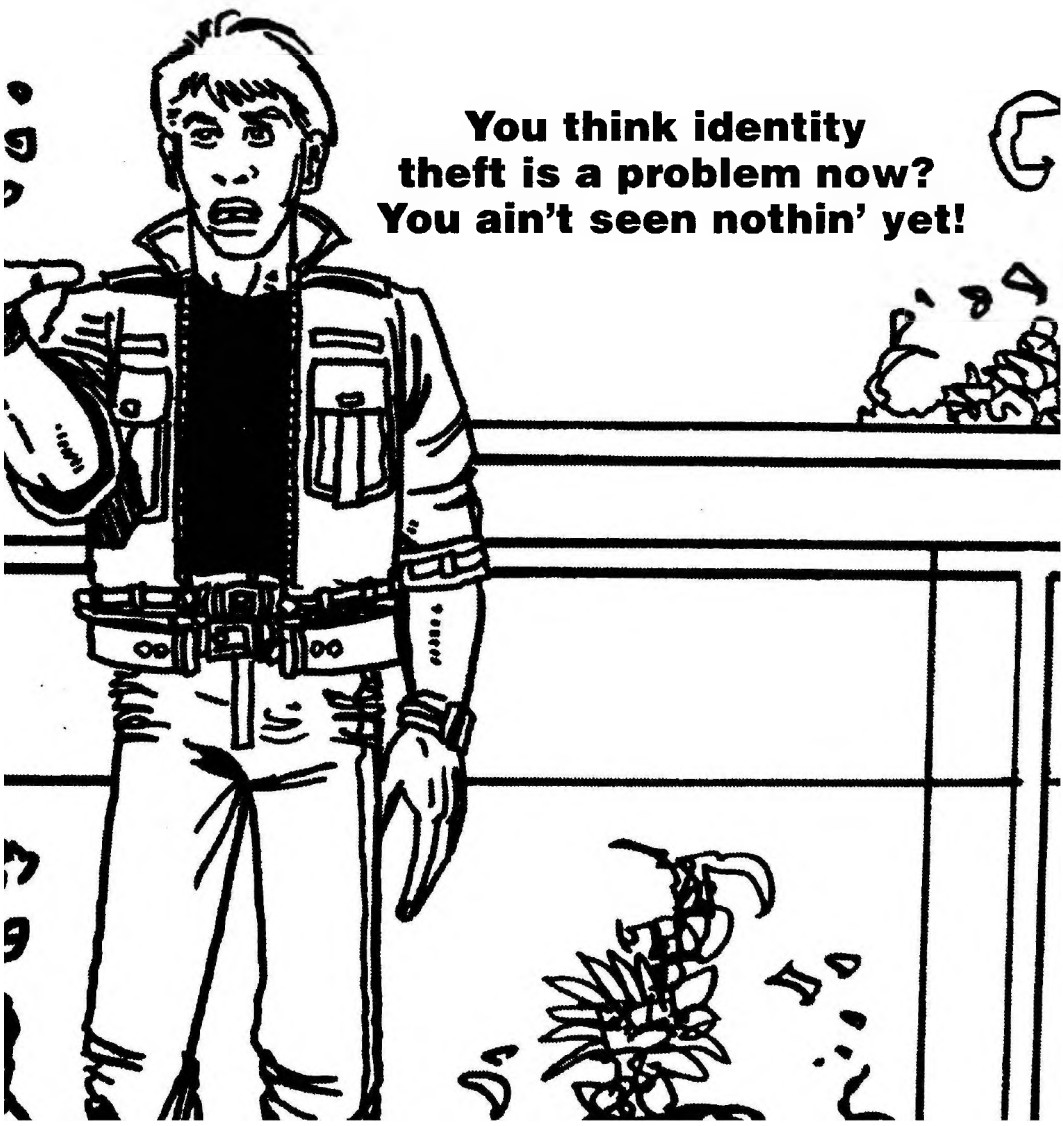
The Policeman's Daughter

By Wil McCarthy

Illustration by Rick McCollum



1.
Bourbon, Interrupted

The courier didn't come bearing packages, or letters marked *Carmine Strange Douglas, esq., Adjudicant, Juris Doctor and Attorney at Law.* He didn't need to. Instead, he came barreling down the hallway like a team of horses, shouting "Door!" at the wall of my office. When a rectangle of frosted glass appeared and swung inward, he jumped inside.

"Carmine. I have something for you," he panted.

"Did you run all the way over here?" I asked him. "There are quicker ways—"

But the courier didn't answer. Instead, he approached the fax machine—a vertical plate of gray material, vaguely shimmery in the wellstone light of my office—and said, "Reconverge." Then he threw himself at the plate and vanished with a faint blue sizzle.

Reconverge, hell. I'd sent two couriers out to question potential witnesses in the Szymanski divorce, and one had self-destructed rather than share his waste of time with me. The other, apparently, had come back with something both critical and hard to explain. Go figure.

Myself, I'd just finished researching the details on the case, poring over written documents and public records, mental notes and fax traces in an effort to figure out who, if anyone, had promised Albert the cabana boy permanent residence on that tiny estate. Certainly he'd made the claim in public several times, within the hearing of one or both Szymanskis, and neither had corrected him.

This by itself carried a certain legal weight, even if the original claim was baseless, so if the Szymanskis sold the property—and it looked like they were going to have to—Albert's claim might have to be bought out at his own named price, or sold along with the property as an easement in perpetuity. And in a world without death, perpetuity could be a long damned time! Oh, what a jolly old mess.

It was four-thirty in the afternoon, late enough to kill brain cells with a clear conscience, and I'd just cracked the seal on an opensource bourbon of excellent pedigree. Damn. Sitting open to the atmosphere would not improve it. Still, the courier's news sounded important in a pay-the-mortgage kind of way, and like most decent bourbons this cost almost nothing to print. And when you're immorbid, baby, there's always tomorrow.

Sighing, I got up from my desk, from my too-comfortable chair, and strode over to the fax's print plate. "Confirming reconvergence, all parameters normal." Then I followed the courier through.

Stepping into a fax machine is like falling face-first into a swimming pool. The sensation isn't cold, or liquid, or electric, but it's just as distinct. There is, of course, no sensation of being *inside* the fax machine, since the part of you that passes through the print plate is immediately whisked apart into component atoms. Technically speaking, there should be no consciousness at all as the head disappears, as the body is destroyed and rebuilt, sometimes in combination with other stored images. But consciousness is a funny thing, an illusion that struggles to preserve itself against any insult. The courier and I stepped out of the plate only a moment after I'd stepped into it. Facing *into* the room, now, not out of it.

The courier was, of course, myself. We were one and the same, briefly split and now rejoined in that seamless ball of wonderfulness that was Carmine Strange Douglas. Like any good investigative counsel, I did this five or six times a day. Hell, if not for plurality laws—three thousand copy-hours per month, rigidly enforced by the fax network itself—I'd do it more than that.

Anyway, now that I was one person again I knew details of my—of the courier's—meeting with Lillia Blair, *and* I knew all the details of my morning and afternoon research. Reconvergence: the collapsing of two waveforms into one. Like any scattered thoughts the pieces took a few seconds to come together in my mind, but when they did, the legal strategy was clear.

"Call Juniper," I said to the wall.

The wall considered this for a moment before answering, "I assume you mean Juniper Tall Szymanski."

I glared at the wall without answering, irritated because I'd already called June Szymanski twice this week, and the only other Juniper I knew—Juniper Pong—I hadn't spoken to in months. Taking the hint, the wall patched the message through, and created a hollie window beside the open doorway.

For two seconds it displayed nothing but gray; that deep, foggy, *three-dimensional* gray that some people—myself included—use for a null screen. But then, presently, June Szymanski's face appeared in the hollie, and behind it her living room. She might as well be standing right outside my office. She might as well be solid, physical, *here*. I've had some practice in distinguishing real windows from hollies, but it takes a microscope and some patience.

"Hi," June said, looking both anxious and pleased to hear from me. "What've you got?"

People are always glad to hear from Carmine while their case is unresolved, and especially when the strategy hadn't been figured out yet. At times like these, I'm everybody's best friend. If the issue came to trial, I figured June and I would be friends for another week, week and a half. But in light of what I'd just figured out, a trial seemed rather unlikely.

"According to Lillia," I said, "Albert's exact words were 'I can stay until I decide to leave.'"

"So?" she asked, absorbing that without really getting it.

"So, that's a very different thing from 'I can stay forever,' or even 'I can stay as long as I want.' Because 'decide to leave' is a distinct event in time and space. It can be measured, logged, and read into the court records. And we can make a case—a strong one—that simply setting foot outside that cabana will bring the implied contract to an end."

"Huh. Meaning what? I can evict him?"

Can anyone evict anyone these days? "No," I told her. "Not now, and not without a lot of work. But you can inform him that leaving the pool house is *grounds* for eviction."

Juniper's face relaxed. "Oh, my God. Thank you so much. I do want to be civil about this, but I can't have that . . . I can't face this . . . well, this makes everything a lot easier. You're a genius, Carmine."

And that was true. I *was* a genius. I am, but so are all the other lawyers in town. These days it's impossible practice law—to practice much of anything—if you aren't unimaginably good at it. Because if you're not, someone who *is* will simply print an extra copy of him—or herself, and take over another chunk of your market.

False modesty is bad for business: I'm not ashamed to say I aced my bar exam, went to the best schools and did well in them. I reckon I'd make a good generalist, not only in the practice of law but also in a range of other fields. I was 100 years old, immorbid, and absorbed knowledge voraciously.

But even that wasn't enough to hold a job in Denver anymore. You had to be generalist *and* a specialist. You had to be broad and brilliant, but lensed down to a unique pinpoint. You had to get your name associated with some particular little quirk or gimmick of the business so that people, when they ran afoul of it, would know whom to call

Even "interpersonal disputes" cut too broad a swath for a viable legal practice. And anyway it was boring: the same disputes over and over again, with only the names and faces changing. And the faces—sculpted by faxware to beauty and perfection—weren't so different anymore either.

But I've always had a flair for the dramatic and a nose for the bizarre. My directory ad said it all: "If you've been wronged, call a lawyer. If you've been *stranged*, call Carmine Strange Douglas."

"This could still turn ugly," I warned June. "That's a wellstone cabana, right? Fully programmable, no restrictions? And he's got his own fax machine in there. Crème brulée and ostrich bisque, anytime he likes. If he decides to make a siege of it, he could hold out for a long time."

"Can't we just shut off the electricity?"

"Ahem! No. And even if you could, he's got the right to generate his own. Wind, sun, and rain—the Free Three, as they say. Albert has taken sides, Mrs. Szymanski. Specifically he's taken your husband's, and he's not going to vacate just because you ask him nicely. He wants this to be difficult.

"I'll write a threatening letter if you want, give him something to think about, but my advice to you as a friend is to talk things over with your husband. It's all right to get bored with each other—if we're going to live forever, it's almost inevitable. But somebody's got make a gesture, here. This is no way for two people to behave, who ever loved each other."

At this, Juniper Szymanski's face closed down. "You don't know anything about it, Carmine. Beyond the bare facts. I'm guessing it's a long time since you've been hurt."

And then she cut the connection, and her hollie window winked out.

What a small-minded thing for her to say! I'd been hurt plenty, and bad. In the broken-heart shuffle that began the moment people stopped dying, everyone got hurt. Or maybe they always had, and always would. This was just one of those facts of life, which you could put out of mind if you didn't happen to be an interpersonal lawyer. Divorces were far and away the worst part of the job, and if I didn't get the strange ones—the ones snarled hopelessly in unique legal challenges—I don't know what I would've done. Soldiered on, probably; an eternity of less-than-happy labors.

"Close door," I said to the wall, and it obliged me by swinging shut that rectangle of white frosted glass and, with a slight crackle of programmable matter, merging it back with my yellow marble decor again.

Too late, I realized there was someone out there in the corridor. There came a polite rapping on the wall outside, and a muffled voice murmuring, "Door. Door."

With a whispered command, I could make the wall perfectly soundproof. I even did it sometimes, but only when I was really busy and wanted the world to go away. Generally, I liked to feel I was part of the world.

Anyway the office would, of course, not obey the commands of a stranger, so I said, "Door." And like some crayon rubbing on a bas relief, the door magically reappeared, then clicked and swung open with a phony creak of phony hinges. A man stood on the other side with his hat pulled down and his shoulders hunched, glancing furtively to his left and then his right. He stepped inside, and then quite rudely pushed the door until it swung closed again, engaging with a click of imaginary latches. "Carmine Douglas," the stranger said, "I hear you solve people problems."

"I help people *with* problems," I answered guardedly.

"That's fine," the man said. "That's close enough. It's good to see you,

Carmine. You're looking well."

The lighting in my office—yellow spotlights and venetian-blinded daylight—created pools of atmospheric shadow, and the man had gravitated into one of these, denying me a clear view. But suddenly there was something very familiar about his face, his voice, the way he moved. "Double apparent brightness," I told the room, though I hated the way that washed things out. "And whiten it up a bit. Kill these shadows."

The windows and ceiling did as I commanded, and there, plain as day, like a ghost from the past, was the face of Theodore Great Kaffner, my old roommate from my last three years at North Am. U. He hadn't aged a bit, which shouldn't surprise me at all, since I'd never known anyone who did. But still, the sight of my old friend was a shock, a discontinuity. How many decades did that image leap across?

"Theddy?"

"Hey, Carbo. It's been a long time."

"You look terrible," I said, because that was true as well. "What sort of problem are you having?"

Theddy seemed to cringe at the question. He pointed to the windows on the office's other wall. "Can we darken those? D'you have some sort of privacy mode, here? A really strong one?"

I did, though I rarely used it. Speaking the commands, I watched my prized yellow marble and peach plaster melt away, turn cold. Within moments the whole room—floor and walls and ceiling alike—was seamless, featureless gray steel, and would obey only my commands, and only from within.

"All right?" I asked, waving my hands at the new decor.

"No," Theddy said. "Conductive surfaces block EMI, but lend themselves to transmissive tampering. We need an insulating layer on top."

Did we, now? How interesting. "Glass?"

"Glass will do."

I gave the appropriate commands, then gave my old friend an annoyed "Well?" sort of look.

And when Theddy shrugged his shoulders noncommittally, I advised him, "Nothing you say will leave this office, or be recorded in anything but my own brain, and yours. But be advised, with a proper warrant the court can search those. They can also take this room apart electron by electron, recording the quantum traces. Nothing is ever truly secret."

"It isn't secrecy I'm concerned about," Theddy said, eyeing the walls warily, "it's security. Someone very clever is trying to kill me."

Naturally this statement brought me up short, because it was virtually impossible to kill a person in the Queendom of Sol. Oh sure, you could kill their body, could destroy whatever memory they'd built up since the last time they stepped through a fax machine, or stored their atomically perfect image in an archive somewhere. But the archives themselves were unassailable. People had died in the chaos of the Fall, 80 years before, and since that time a lot of precautions had been put in place. A *lot* of precautions.

Fearing some sort of transient mental illness in Theddy—a delusional paranoia?—I chose my next words carefully. "Thed, that sounds like a matter for the police. If what you say is true, they can have a team on it before you draw your next breath. We can make the call from here."

But Theddy was shaking his head "I'm not an idiot, Carbo. This isn't a criminal matter. It's civil, or maybe administrative, or something which if I knew what it was, I wouldn't need *you*."

"Slow down, Theddy," I tried "You're stringing words together, but you're not making sense. Administrative murder? What's that? Who exactly is trying to kill you?"

And here, Theddy fixed his old roommate with a level, half-panicked gaze. "I am. And I'm doing a good job of it, too."

2.
Xerography, Complicated

Generally speaking, keeping old copies of yourself was like keeping anything else. Found objects, hobby collections, treasured letters or artifacts from childhood—whatever. You could only fit so many on a shelf or in a cabinet, so at some point you boxed them up and stuck them in the attic, or fed them into the fax to be stored as data. And once that happened, chances were you wouldn't see those things again, nor ever miss them.

Archive copies were exactly the same way: there were people who kept only one, the latest and greatest incarnation of their perfect selves. There were even those who, for financial or aesthetic reasons, stored only the differences between themselves and some idealized manikin of human perfection.

But with either strategy it was possible to make a mistake, to internalize and record some experience that weakened or cheapened or traumatized the soul. And you couldn't always know that this had happened, and if you'd overwritten your earlier backups then you were pretty much stuck with the results for eternity. You could also, in the same way, lose track of what you were supposed to look like, lose track of your God-given body, which had been really good at baseball or algebra, which had just *felt right* somehow. Most people had a bit of this disconnection in their lives—it was pain of an ordinary sort—and admittedly the real horror stories were rare.

But they happened, and in fact I'd encountered enough victims in my practice—their circumstances ranging from tragic to absurd—that for more than half my life I'd been following the costlier and more restrictive change control regimen favored by the various mental health councils. This involved archiving my entire self every five to ten years, and storing each copy, with annotations, alongside the previous ones in a facility that was guaranteed to remain uncorrupted by natural forces for a minimum of 10 million years. Effective infinity, in other words, because even if I somehow lived that long, I reasoned that I'd be unlikely to care what I'd thought or felt or looked like as a mere centenarian.

Theddy had apparently followed a similar practice, though in some dangerous and backward-looking way. "Being unhappy with your life doesn't mean you necessarily want to scrap the whole decade and start over. We all have our troubles. I *like* the wisdom I've accumulated, but along the way I seem to have lost the spirit I had as a younger man. Some of it—enough of it. And shouldn't we, as immorbid beings, have both? I guess I was mixing and matching."

"You guess?"

"Listen, *I* was attending a matter programming conference on Mars. The rest of me were all back home, taking care of personal and professional minutia. Or so I presume. So I infer from the circumstances, as an outsider. As for what I was thinking, what exactly I was doing, I can only speculate."

I thought that over. People had different viewpoints on plurality; some even claimed that every copy of them had its own unique soul. Fortunately, the law rarely ruled in their favor with a legal twinning, or the world would quickly overpopulate with nearly identical people. Xeropollution: the arrogant assumption that the world needed more and more and more of your precious, perfect self. And *that* question had been settled—with fire and blood—in the Dallas of the Late Modern era, and I doubted very much

whether society wanted to repeat the experiment.

I personally liked to keep my copies close together in both time and space. I didn't send myself on vacation while the rest of me worked. I didn't cover multiple long-term assignments in parallel, and then reconverge afterward. It just gets confusing, when the experiences of your copies have diverged that much. My sense of self was, I suppose, a small thing: capable of encompassing only a handful of very similar instantiations. But while Theddy Kaffner had his fair share of faults, timidity was not among them.

Nor, tellingly, was malice. The Theddy of old was an irate fellow, but never a hurtful one. If he pushed someone down the stairs every now and then, he did it in the spirit of horseplay, knowing that no permanent harm could possibly result. Broken bones were just a fax plate away from their old glory, right? And Theddy, the programmer, was far more likely to just hack your shirt's wellcloth with a smear of ink or something, or throw *himself* down the stairs for a laugh. He'd been full of rages and frustrations, but he'd channeled them into useful hobbies, which included running and acting and the building of wooden models. The idea of his committing a *murder*, or even threatening one was . . . strange.

"What do you mean by mixing and matching?"

Theddy's stressed-up expression relaxed for a moment, into a smile as wistful as I had lately seen. "You're the food freak, Carbo. You know how it is: a pinch of this, a dash of that . . . a soupçon of my angry young self, to spice up my flavor a bit. I suppose I overdid it. Angry Young Theddy was a force to be reckoned with; did even I, myself, underestimate him? Did 10 percent of him overwhelm 90 percent of the canonical me? Or maybe it just felt good. Maybe I kept turning the knob, adding more and more of him until it was too late."

I spread my hands, unsure what to say. "More than anything, Thed, this sounds like a communication problem. Have you tried talking to yourself?"

"Yeah, briefly," Theddy said, the stress snapping back down over his features like a new matter program. "Until I kidnapped myself, with a force of three Theddies. These guys, who said they were me, they lifted me right off the floor. They were going to throw me through the print plate of my own goddamn fax machine in my own goddamn living room. Can you imagine? 'You're the last one,' they said, 'and it's one too many.' The way they were laughing, the way they were—I don't know, *handling* me. It went beyond contempt, Carbo. This was hatred. 'How could I turn into a fuck like you?' That was what Angry Young Theddy said to me.

"But *he* underestimated the power of fear. They meant to kill me, erase me—there was no question about that. They weren't fighting for their lives, and I was, so in the end they couldn't hold me. I felt their bones breaking. I felt an eyeball pop. As long as I live, I never want to feel a thing like that."

Okay, yeah, this was complicated. If there was a right place for Theddy to come to with this problem, my office was probably it. But where to begin?

"I'll need a full power of attorney," I said for starters, "and since you appear to have valid concerns for your physical safety, it may be best to store you here, in my office fax, under a seal of attorney-client privilege. The state can open that—the state can open anything—but *you* can't. The pattern that comprises you right now, right here, will be preserved no matter what Angry Young Theddy thinks or does."

"He's cleverer than you suppose," Theddy warned.

But I just laughed. "Nobody's cleverer than I suppose."

There was a bit more to it than that, but Theddy wanted help, and wasn't in a mood to argue. His agreement was not difficult to secure, and neither, as a result, was his physical person. It didn't take three guys to push him through the plate, and truthfully, I wasn't sure three guys could have stopped him if they'd been here to try. It was a safer place, and he wanted in.

3.
A Pedestrian Encounter

When you traveled by fax machine—and who didn't?—no place in the solar system was more than a few hours away, and if you were the one being transmitted, not the one waiting around at the other end, then from your point of view the journey was instantaneous. With a handful of steps, I could have found myself on the landing outside any home or apartment, anywhere. It was a funny thing, though: Theddy had lived less than a mile from my office for almost 20 years. How strange, that we should live so close for so long without realizing it! But living forever can be like that: it's easy to put things off, to assign them to the infinite and amorphous future. Even important things; even close friends.

Anyway, Denver was a historical preservation zone where walking was actively encouraged. In the eight square kilometers of the downtown district, faxing was actually illegal for anything but official business or the direst emergencies, and the city was adorned for tens of kilometers all around with roads and sidewalks, trails and quaint little bridges arching across the streams and rivers. This classic look was a large part of the city's appeal, and I wasn't about to abuse it by teleporting six blocks. The walk might take me 20 minutes, and might represent more exercise than most people got in a year, but my body, rendered eternally youthful by the fax filters, was surely up to the job. Whose wasn't? People who don't like walking, who don't like mountain views and fresh air and strangers on the street, well . . . they should live someplace else. Denver was not made for indoor souls.

Still, once outside I felt a twinge of regret for my decision, as the November afternoon rolled over me with shocking, unseasonable heat. "Mild winter" didn't begin to describe the weather we were having that year, but I kept forgetting. I kept dressing for wind and fog and the possibility of snow. My jacket did its best to fight off the heat (blasting it behind me in a stream of warm air), but in the shade of downtown's towers it had no ready power source, so there wasn't a lot it could actually do.

There's an irony for you: on a hot day it's cooler in the sun than the shade! But the shirt underneath was having a hard time as well, and I couldn't remove the jacket without revealing the sweat stains it was failing to disperse from under my arms. Life can be so unfair.

Anyway, Theddy's case was heavy on my mind, and June Szymanski's still hadn't left it, and the two were filling up very different pieces of my brain. So I was deeper than usual in thought, and found the bustle and jangle of the crowds annoying. Some street wisdom I heard that day:

"Hollywood is a *plant*, Gabriel. The city, they were calling it that way before they started making hollies there."

"There's nothing noble about boredom, aye? Are there people you could be helping? Societies you could enrich? Don't you give me that look, you vegetable."

"Oh, of course you have the right to design a new life form. Everyone does. But for criminy's sake, John, that doesn't mean you have the right to instantiate it in the real world."

Yeah. Real pearls, those. The streets of this city had always been crowded,

or nearly always, but even I, a mere centenarian, could remember a time when the crowds all had someplace to go, some purpose in their steps. As often as not it was someplace they were *forced* to go, to stave off economic ruin in a scarcity-based economy, but still. The city's loitering laws had never been repealed, and ought at least occasionally to be enforced.

With its bright colors and piled-high fashions, its buskers and mimes, its living sculptures "dancing to the din of a dozen decades," the city resembled a carnival that day as much as a center of business or residence or learning. And for some reason I found this deeply irritating.

On the other hand, it wasn't like anyone was holding a sword to my neck, forcing me to interact, to be here at all. I was a champion of strangeness, and these, for better or worse, were my people. And anyway it *was* a short walk before I found myself in front of Theddy's apartment building, a retro-opensource brownstone in the twenty-second-century style.

"How may I help you, sir?" The building asked, in what was surely its politest voice.

"I'm here to see Theddy Kaffner."

"I'm afraid Mr. Kaffner isn't in at the moment," the building clucked, with quite a good semblance of regret.

"It's a serious matter," I told the building. "A *legal* matter, I'm afraid. If you have a buffer copy of Mr. Kaffner on hand, and I imagine you do, then I must request you print him and allow me to speak with him at once."

The building's intelligence didn't like that one bit, and sounded cross. "On what grounds? You're not a police officer." (And this was true, although I knew a lot of police, and had once loved a policeman's daughter.) "Nor do you bear the carrier signal of a government official. By studying your face I can make a guess as to your identity, but I would prefer that you simply explain yourself."

Fair enough. "My name is Carmine Strange Douglas. Mr. Kaffner's attorney. The rest I'll say to him, if you don't mind."

"I have no record of this association," the house said skeptically, "although your face and pheromone signature match that name, and the social network archives indicate you have fraternized with Mr. Kaffner in the past. Do you have any proof that this arrangement exists?"

I held up a bonded, self-notarizing copy of the power of attorney, and the building opened instantly, curling aside a broad doorway of gold and pearl and other substances I couldn't identify. "Please come in, sir, and excuse my rudeness in detaining you. One can't be too careful these days, and in any case my security settings are at legal maximum."

"No offense taken," I assured it, since the thing was only doing its job, following its program, and had no actual feelings. Or so the law declared. Inside, among furnishings assembled from white puffy pillow-cubes, I found Theddy in deep conference with the wall.

Presumably, he was receiving a briefing on this turn of events—my arrival and such—since from his own perspective he had just moments before stepped through the fax machine on his way to somewhere quite different. This was a buffer copy, probably not more than a few hours old, and he had no way of knowing why I was here.

When Theddy saw me, he looked up with an expression of wonder. "Carbo? My God, man, what're you doing here? It's great to see you! But when exactly did you become my lawyer?"

"About half an hour ago," I said, extending a warm handshake. "There's a copy of you in my office who claims he was assaulted. By *you*, or rather, by several instances of you. I was hoping you could shed some light on the subject."

Theddy's hand withdrew from mine, and his face grew cautious, and right away I could see there was something different about him. He was less like the Theddy in my office, and more like the one I'd remember if I really thought back. The angry prankster. A composite sketch of New Theddy would be all broad lines and shallow curves, but while Young Theddy looked the same, he wore it differently. Here was a fellow of edges and points and sharp, staccato movements.

"There was an altercation," Theddy admitted, "but he started it. All I did was defend myself."

"Against what?"

Theddy's answering look was not quite a sneer. "That copy must have got some bad poison along the way, Carbo. He was irrational, and slow. It would have taken a lot of patience to get any sense out of him, and who's got the time?"

Well, *that* sounded believable enough.

"Did you try to push him into the fax?"

"It was the only way I could think of to, you know, figure out what his problem was. Merge a little bit of him with a lot of myself, and see what was on his mind."

I'd never been one to beat around the bush, so I came right out with it: "Theddy, have you been mingling your image with archive copies of yourself? Would a personality scan reveal sudden, dramatic changes in your character?"

"Yes," Theddy said, as if it were the most normal thing the world.

"Hmm. Well, listen, this allegedly deviant copy of yourself is the contemporary version. It's who all his friends and neighbors and colleagues are used to seeing. If he were in fact stored in your personal fax machine, per your plans, would you ever print him out again?"

"Hell no," Theddy answered, with that same matter-of-fact, self-righteous conviction. As if people did that sort of thing every day. Oh boy. Oh boy, oh boy. Some dangerous cocktail of thoughts and experiences had come together in this copy's brain. Theddy—the *real* Theddy—was right to be afraid: this man was not only capable of self-murder, but felt it was, in some way, his legal right. And I wondered: where was the case law to prove otherwise?

And to think I'd thought the Szymanski divorce was a mess! "What we have here," I said cautiously, "is a case of disputed identity. Two divergent copies of the same individual, laying claim to editorial rights over each other. That being the case, I personally have a conflict of interest, and must make no further contact with you, except if necessary in court. If you intend to prosecute your rights in this matter—and I find it difficult to imagine otherwise—you'll need to retain your own counsel. I cannot advise you in this."

Theddy scowled. "Oh you can't, can't you? Maybe the years have eroded your memory, dear friend, but you and I have an agreement, which predates any contract you may have with . . . that other bloke. That failed experiment. That shriveled old creature who does not deserve to wear Theddy Kaffner's skin."

Though it might be a breach of ethics, I took the bait. "What agreement is that?"

"I'll find it."

Theddy stepped to the wall and began whispering to it. A hollie window appeared there, displaying lists of text with little thumbnail images beside them. Theddy poked at the display several times, muttering, and finally said, "Ha! Found it."

A beer-stained cocktail napkin tumbled out of the fax machine, into Theddy's waiting hands. He scanned it briefly, nodding, then handed it to me. It said, in appallingly familiar handwriting,

I, Carmine Douglas, through the power vested in me by the state of inebriation, do solemnly swear that I will never lose my faith or spirit, and that I will look out for my friend Theddy come what may, for all eternity and throughout the universe.

It was signed and even—though the hologram was hard to make out—notarized.

"You can't be serious," I said, waving the thing as if to dry it. "This isn't legally binding." But even as the words were out of my mouth, I realized it might not be so. There were times in the historical past when what was legal and what was right were two different things, when valid arguments could be crafted to excuse almost anything, but the Queendom of Sol took a dim view indeed of broken promises. Theddy saw it in my face, too; he was a hard man to hide things from. I sighed and asked, "What do you want? What does it take to make this thing go away?"

Theddy sneered in youthful triumph. "If you want to go legal on me, old friend, I can only respond in kind. I *do* want my own counsel, as promised to me in this old contract. I want *you*. Not this stuffy alien creature you've become, but the young, angry, lovesick Carbo I went to school with. Well, I suppose you'd have to add a couple of years to that, or he wouldn't be a lawyer yet, but you see what I mean. I want my old roommate to defend me."

With a sinking feeling I realized that might just stick. Theddy might just have a point, which the law, in its finite wisdom and limited experience, had never yet addressed. The right of archive copies to be revived? To seek the company of their peers? To repudiate their future lives?

"Call my office," I said, sighing uneasily. "I'll authorize it to set something up. Not because I have to—and certainly not because I want to—but because you've raised an interesting point, and it needs to be properly explored. Even a younger me, a green me fresh out of school, is better qualified than most attorneys to wrestle this particular alligator. In fact, if I didn't buy into it voluntarily, the court might well assign it. In which case they'd offer you a disposable copy of me, which would self-destruct once the dispute was resolved. And that, my friend, is an involuntary servitude I would not wish on my younger self, who was an innocent and charming lad."

All of which was true, insofar as it went. Unlike Theddy, and with a single and quite excusable exception, my own younger self could be *trusted*. So why, in my heart just then, did the prospect of unleashing him bring nothing but dread?

4.
Passions, Revived

Rummaging through the archives took a lot longer than I expected. The storage companies are happy to take your money to capture the backup, but when it comes time for the free restore they're a lot less helpful. Wading through the layers of bureaucracy and "technical assistance" proved so difficult and involved that in the end I had to print out a dedicated copy of my recent self, who spent several days working on the problem exclusively.

Of the fifteen images I'd stored at one point or another in my life, the best fit for young Theddy seemed to be a Carmine two years out of law school, working at a big firm in Milan and flush, for the first time in his short life, with the income and respectability of gainful employment.

Memories washed over me. Those had been good years, but turbulent ones, too. Money and power and youth were a potent combination, and bred the sort of arrogance that led to personal troubles. And if there was a god of Love—and Strife, for they were bound together as a single entity in

Queendom mythology—then poor Eros had spent some busy seasons that year, looking after the torrid romance between myself and Pamela Red. Even now, more than 70 years after the fact, the memory brought a poignant flutter of excitement and pain. I'd had a number of lovers before her, and quite a bit more after—I'd even been married twice—but when I looked back over the conquests and treaties, surrenders and defeats of my immorbid love life, Pamela's shadow seemed to loom over all of it. She was the standard against which all others were measured.

This was of course no great novelty in the Queendom, where the phenomenon was common enough to have its own name: the guidepost affair. And rumor had it that if you lived long enough, if you loved well enough, your guidepost would fade, would be replaced, or even—strange thought—subsumed entirely by the one true love of your life, who would stay with you forever. A guidepost affair was, by definition, buried deep in your past—something that didn't or couldn't or wouldn't work out. Something painful. But ah, we still believed in a higher sort of love than that, else how could we face eternity?

Not that there wasn't other strife in that era, as well. Like any human being, the Carmine of that day had had a sackload of mundane troubles, which to him seemed very serious and immediate, though today I could scarcely remember them. But I did my best to align myself with that mental space, in the hours and minutes—and finally the seconds—before Angry Young Carmine stepped out of the fax.

"Welcome," I said to myself, for I remembered this young man with great fondness and admiration. Angry Young Carmine, looking me up and down, recognized me at once, but the first thing he said was, "Hello, Carmine. You look . . . different. Considering the fact that I've *just this second* archived myself, for the benefit of my future self, I can only assume that some years have passed."

"Correct," I said, beaming at this lad's quick mind.

"Something has gone wrong, then. Ah, Carmine, have you been poisoned? Traumatized? Worn down or worn out with the passage of years?"

"There is a problem," I agreed with gentle amusement, "but not with me. It's Theddy."

"Theddy needs an archived copy of *me*? That sounds damned peculiar, and complicated. Brief me on the specifics, if you would."

And here I felt the first tingle of irritation, for I was clearly the senior partner in this endeavor, and this young man had no right to give me orders. But without noticing or without caring, Young Carmine pressed on: "I also need to orient myself. I'll need news highlights for each of the intervening years, and if you don't mind, a sampling of the clothing and music fashions as well. And the *food*."

"Ahem. Young man, you might find it helpful to let others get a word in now and then. The time capsules you describe are in the fax's buffer memory right now, awaiting your attention."

"Ah. What year is it, anyway?"

I told him, and watched his expression tense briefly and then relax.

"That's a long time, old man. I assume it's a short-term assignment you've woken me for?"

"It is."

Young Carmine's smile was pained. "Reconverging our experiences could be problematic when this is finished. You should probably check with a doctor, or maybe a quantum physicist, but I'm not sure consciousness can bridge a gap that large."

I adopted what I hoped was a look of patience. "My plan is to filter you in as a percentage, to reintegrate a tincture of you with my current self. Carefully, of course, but everything admirable

about you will be preserved and magnified, and with luck our flaws will mask one another."

"Oh really. I see." Young Carmine's tone was skeptical, poised on the cusp of anger. "And what percentage, exactly, did you plan on granting me? Twenty-five percent?"

At this, I was afraid to answer truthfully, because the actual figure I had in mind was .25 percent, or possibly .5 percent. But to this living, breathing young man, that would sound like murder. I had the legal right to do exactly that, to print disposable copies of myself and then, you know, dispose of them. But I'd never done it when there were major life experiences at stake. Why would I? I wouldn't want to *be* the disposable copy whose memories died, and I wouldn't want to be the one who lived on without those memories, either. A no-win scenario.

But this was different, right? Everything important about Young Carmine was preserved in me. I was a superset of him, and in that sense his erasure would mean nothing, cost nothing, hurt nothing. Except from his point of view. And to enforce the right of erasure against his will . . . To enforce the right, I might have to print extra copies of my current self, and overpower Young Carmine, and hurl him forcibly into the fax. Or contact a lawyer of my own, and let the courts decide. And didn't ***that*** put Theddy's case in an interesting light?

Afterward, I was never sure what my younger self read in my face at that moment, but whatever it was, he answered with an obscene gesture and a barked command at the office wall, which, recognizing the voice of its owner, opened a door and let him out.

"Ah, hell," I said, following behind, trying to put a hand on his shoulder to reassure him. To reassure myself. But Young Carmine was having none of that, and in fact took the gesture as a hostile one. Which might not be too far from the truth. Young Me jerked his shoulder away, then ducked and ran down the hallway.

I said, "You're going to want—you'll need—hey!" But the lines of communication had broken down entirely, and the next comments I received from Young Carmine would, I realized, have a letterhead at the top. Damn. My body hadn't aged a day in all this time, and I supposed I could simply run after myself, tackle myself, fight it out physically and force myself to listen. But I'd be hard pressed to win against so equal an opponent, and if the concept of "youth" meant anything at all in this day and age, would it really be so equal?

What I actually did, like a useless old man, was race down the hallway and scream down the stairwell at myself: "You stay away from Pamela Red, do you hear me? You caused her enough trouble when you were . . . back when you were . . ." Real.

5.
The Daughter's Policeman

The next morning found me on the far side of the Moon, in a scenic dome at the pit of Jules Verne crater, with the sharp-toothed hills of the crater lip rising up all around. Here it wasn't morning at all, but early evening by the Greenwich Mean shift clock and somewhere close to midnight by the actual position of the Sun. Given the full Moon in Denver last night—always a peak time for strangeness—it made sense that the Moon's sulking farside, faced always away from Earth, should be bathed in darkness.

Any school child of the early Queendom knew that on that big, pre-terraformed Moon, the Sun rose and set every 28 days. But unless you'd spent time on Luna yourself, it was hard to appreciate just how irrelevant the daylight really was. Aside from the anachronism of gravity tourism, Luna

didn't really offer anything the rest of the Queendom particularly needed, and as a result the great dome cities at Tranquility and Grimaldi were money pits, gone to seed in a state of not-quite completion. The Moon's million permanent residents were mostly scattered in small, economically depressed communities, and the great bulk of its housing was underground. You lived there because you loved it, basically. Because you'd bought into the romance of it: a wild frontier on Earth's very doorstep.

And on that frontier, for some historical reason I'd never bothered to learn, the clocks were set, planetwide and regardless of longitude, to British time. Not that it really mattered to me—the hour or the darkness. Such transitions—day to night, winter to summer to hard vacuum—were common to the point of dullness in a faxwise society. That's just the way things were.

In any case, Verne was a small town inhabited mainly by astronomers and small-time trelium prospectors, who had taste enough to keep the dome lights low and green. Night lights, so that the stars could shine down in all their glory through the near-invisible wellglass of the dome. I'd seen this place in the daytime once—on a sadly similar errand—and the dome had been frosted a translucent blue-white which didn't mimic an Earthly sky so much as pay homage to it. Good for the soul, I reckoned at the time. Better for the plants and animals than the searing unfiltered light of Sol herself.

Also tasteful was the way Verne's visitors were encouraged, through transit fee structures and hierarchical addressing, to enter through the fax ports in the park level immediately beneath the dome. It wasn't a big park as such things go, but its colored brick pathways folded back on themselves many times, with the view of grassy meadows blocked here and there by stands of dwarf bamboo and twisty, lunar-tall apple trees. So it felt bigger than it really was, and the walk from fax to elevator took a good three minutes. An actual elevator, yes; to get to any particular home, office or storefront in Verne you had to find the right color-coded shaft, and ride the elevator down to the appropriate subsurface level.

As a longtime resident of Denver—a city similarly trapped in the romantic past—I could only approve. Beauty was so much finer a thing than convenience! Even (or perhaps especially) when you were in a hurry.

Too bad it was guilt, not beauty, which brought me there that day. But hey, even that guilt, that shame and worry, could ultimately be blamed on beauty. On one particular beauty, in fact, which I had sought above all others. Nearly to my ruin, yes, and I might spend the rest of eternity shaking off the consequences, but in this sense I regretted nothing, and would do it all again if I could.

By blue starlight and the green glow of the dome's perimeter, I trod a path of yellow bricks in platinum-white mortar. My bootheels clopped and rang. I'd come here expecting to ask directions, from a wellstone pillar if not a live human, but I found to my surprise that my feet still knew the way. Through the gloom of an orchard and back out into starlight again, I came to a low pink cottage with the words GOVERNMENT AND UTILITIES carved into its lintel and glowing that same soft green, with modestly animated crests on either side to emphasize the point.

I entered the building, and found myself in a traditional lobby complete not only with elevators but with a human security guard seated behind a desk. This might seem laughable in an age where superweapons had nearly obliterated the Sun, but the man's gray uniform—bearing the five-pointed star of the Verne Crater Sheriff's Office—was thicker than ordinary wellcloth, and lent him a formidable air. In time of

trouble, the suit would no doubt extend to cover his face, his head, his hairy-knuckled hands, and the thing's capacitors and hypercomputers would be prepared to amplify his strength, to shoot all manner of energy beams from his fists, from his eyes, from the edges of any wound an attacker might somehow manage to inflict.

This, too, was nothing special—most cops dressed this way most of the time—and anyway a pair of gleaming, hulking Law Enforcers lurked robotically in the corners behind him, just in case anyone still had any thoughts about getting cute.

"Carmine Douglas, Attorney at Law," I said, although by now the guard must already know this. Like all professionals everywhere, he'd be unemployed if he weren't uncannily competent. "I'm here to see Waldo Red."

"Yeah?" The cop looked me over with a bored expression. "What for?"

"Personal business."

The guard thought that one over. "I don't have you on my visitors list. Is he expecting you?"

"No. Well, possibly." Depending on what Angry Young Carmine had or hadn't done, Waldo might well be drafting a warrant for my arrest. Or tying a hangman's noose. "But he knows me."

"So he does," the cop said, glancing down at some social network display on his desktop. He tapped the surface several times in quick succession, like a harp player working the strings. "He . . . will see you. But—whoa. According to my stats, there's a 90 percent chance of verbal confrontation and an 8 percent chance of violence. On *his* part; *you're* down in the noise, an innocent victim of potential attack. My goodness. Do . . . you want an armed escort?"

"No," I said. "Thank you. I'm here to make peace."

"Huh. Well, go on ahead. Level nineteen, end of the hallway and turn right."

"Thanks."

The guard shuffled uncomfortably in his chair. "Hey, buddy? Uh, you don't have to answer this or anything, but. I mean . . . Deputy Waldo isn't exactly a thug. What does a guy have to do to burn him off like that?"

"Sleep with his daughter." I said, and turned for the elevator.

6.
The Law

The first thing Waldo said to me when I walked into his office was, "Hmmph. So now you're stalking *me*."

And there was a lot of evidence coded in this statement: it meant that Young Carmine had gone to see Pamela, and that the visit had been less than welcome. It meant that she'd called her father afterward, and that he considered the incident, at least in his heart, to be a criminal offense. Which was silly, because that old restraining order had expired forty years ago, and I had no history, either before or since, of criminally rude behavior. But then again, there was no telling what Young Carmine might've said. Or done. Truthfully, I had forgotten how forceful and intense I'd really been as a young man. And pointlessly so, for it had only gotten me in trouble.

I held up my hands in mock surrender. "Hi, Waldo. I'm sure you're angry—and not without reason!—but it's not what you think. There's an old, old copy of me running around."

Waldo studied me, thinking that one over. Whatever he'd expected me to say, that wasn't it. Waldo was seated on his desk, which had gone soft beneath him in response. His arms were crossed, and his single, heavy eyebrow was pulled down in an almost comical frown. In his harrumphy way he said, "Rogue or authorized?"

"A little of both," I answered, unsure what else to say about it.

Waldo digested that, and finally nodded. "Hmm. Humph. Yeah. One of those."

A bit of the tension went out of the room. The details must surely be unique, but Waldo had been a cop for a hundred years longer than I'd even been alive. He'd seen his share of weirdness, and understood that the law was gray. What cop didn't know that? The law was designed for assaults and robberies, angry neighbors fighting over the pruning of a tree or the disposition of its fruits. By definition, you couldn't legislate the unanticipated, and existing laws—sensible laws—sometimes yielded perverse or even contradictory results. *Do we divide the child in two?*

And in this age of plenty there just wasn't all that much thuggery. The sorts of things that had value anymore were not sorts of things you could steal a gunpoint, and anyway such obvious crimes were always solved, always punished. With enough decades behind them, even the most hardened criminals eventually got the message.

So what did that leave? Juvenile mischief, and the weirdness at the margins of the grown-up world. The need for cops and courtrooms would never go away.

"Why are you here?" Waldo asked with less hostility.

I tried on a half smile. "It seemed . . . more polite than going directly to Pamela. I figured he'd go and see her. I knew he would. He's an archive copy from when that . . . issue was relatively fresh."

"So why'd you print him?"

"Contractual obligation, I guess you'd say. I'll spare you the insipid details."

"Hmmph. Thanks. Are you going to get rid of him?"

I could only shrug. "I'm not sure I can, Waldo. He's defending another person's archive copy against exactly that procedure. Removing him would be a form of pre-trial tampering, and if his case prevails—which it very well might—then it's anyone's guess what *my* legal rights are. Pray for a wise judge."

Waldo didn't like that answer. "Really. How convenient. There's a little Carmine running around from the period of the restraining order—and believe me, you where nitwit back then—and he's got all the rights of being you and none of the responsibilities of being himself. He can bug my daughter all he likes, unless I file an updated order against *you*. Which I guess I'll just have to do."

And that made me angry, because the revival of a seventy-year old restraining order would look bad on my record. It would hurt my image, hurt my business, hurt my *pride*. And for what? "You know, Waldo, your darling Pamela wasn't exactly an innocent in all this. If there were courts of law for faithless lovers . . ."

"You were a nitwit, and your friends were nitwits, and you made her sad. The only surprise is that it took her two years to realize the fact. And like a shit, you refused to crawl back under your block. You just couldn't leave it alone. You wanted to own her. You tried buy her like a doll."

At that, in a wildly uncharacteristic gesture, I slammed the wall sideways with my fist, hard. "I wanted nothing of the kind, *Deputy*. Even now, you refuse to acknowledge my point. It was simple enough for a small town cop and his daughter to understand, if they put their minds to it. For years I licked the wounds she inflicted so casually. For *years*. Like an old tree, I got whole again only by growing around the scar. Burying it inside me, surrounded it with strong, healthy tissue. But the defect itself is permanent."

"Love always is," Waldo lectured, as if to a child. "We all have our little scars. It doesn't give you any special rights. And just for your education,

punk, you fix a tree by printing an undamaged copy. If that 'wound' of yours is so terrible, why do you keep it?"

"You've been in love, Waldo. You know why."

The old cop sighed and harrumphed. "I don't know where you crawled out from, pal, and I don't care, but understand: we keep the peace here in Jules Verne. You know how many arrests I've made this year? Six, and three of them were the same guy. You know how many times I've called the Constabulary in the past decade, to solve some capital crime of Queendom-wide importance? Zero."

"Congratulations."

Waldo answered with a mocking expression, and then a more seriously threatening one. "I may not have jurisdiction outside this crater, Mr. Douglas, but you've got five minutes to get your ass out of here before I throw it in jail. Don't let me catch you here again, ever."

And this was a strong statement indeed, because Waldo Red would never die, never grow old and retire. Never forgive a young man's trespasses.

Well, I had my own rights to worry about, and said so: "If you do that, or file an injunction of any kind, I'll sue for defamation. I'll make it stick, too."

And with that I stomped out, feeling in spite of everything that the visit had gone better than expected.

7.
Pamela, Read

Pamela herself, whom I visited next, surprised me by being a lot more understanding.

"Daddy called," she said by way of introduction. "I heard about your little . . . technical difficulties."

Her house was one of nine at the summit of Mt. Terror, on Antarctica's Ross Island overlooking both the volcano's active caldera and the Ross Sea coast, aglow in the lights of McMurdo City and, across the water, of Glacia and Victoria Land. It was nighttime here as well, in a place where night was winter, or in this case early spring. And Pamela's foyer, like many in cold climates, was poorly insulated on purpose, to discourage surprise visitors.

My wellcloth suit did the best it could, but it had been out of the sun for hours now, and its power reserves were getting low. It settled for swathing me in black velvet, lined with some crinkly, unbreathable super-reflector that left my skin feeling hot and suffocated, even as my body heat bled away through my uncovered hands and head.

"You look cold," Pamela said, ushering me in through her open doorway. "You want some coffee? Soup?"

"Spiced almond chowder," I answered gratefully, following her inside. There was no such thing as a poorly furnished home in the Queendom of Sol, but there were copyrighted patterns available only to those with money, and there were expert decorators and geomancers who could customize a space to its owners with striking—and strikingly expensive—skill. And everyone had access to a fax machine, if not in their own houses and apartments then, by law, within forty paces of their door. But to *fill* a house with fax machines—I counted five in my first quick look around, including the one in the foyer—took resources. And the view, also not free, was spectacular.

"Looks like you're doing all right here," I said, while she stepped up to her dining room fax to fetch my soup. "I hope you don't mind my saying so."

"Not a bit," she laughed. "But I'll be the first to admit, I got lucky. Matter programming is funny that way: sometimes you hit the right combination, and this substance you've just invented is gorgeous, and it's waterproof, and it's diamagnetic, and some construction outfit on Pluto is offering you cash up front and a 10 percent share of their

leasing profits."

"Sounds nice," I told her, fighting to keep any deeper feelings at bay. For the moment, I was succeeding; it *had* been a long time, and seeing her now was more nostalgic than painful. "Theddy became a programmer, too, you know, but he doesn't live like this."

She smiled. "Theddy. My goodness, how is he?"

"In trouble," I said.

"Well, that figures. I suppose you're representing him?"

"Yeah."

"That figures, too. As for my alleged wealth, don't be too jealous. It won't last. Unless I get lucky again, I'll have to sell this place in a few centuries. Maybe move back to farside, although they're still talking about evacuating the entire Moon, and crushing it to boost the surface gravity. You can't go home again, isn't that what they say?"

Thinking about that, I looked her over, studying my feelings as they unfolded. Things weren't the same as they had been long ago, that much was definite. Her mere presence no longer panicked me, made me stupid or impulsive. Which was probably just as well, although there was a part of me that would always miss feeling that way. You can't go home, indeed.

"That would be a shame," I said, "destroying the Moon like that. Where would all the shady people go?"

She could easily have taken that the wrong way, but she chose not to, and chuckled instead as she pulled my mug of steaming soup from the fax. "The shady people always find a place, Carbo. Isn't that what keeps you in business?"

"Well," I admitted, "sort of. It's the *rich* shady people that can afford my services. The poor ones get their legal help from software, which is worth every penny of the nothing they pay for it."

"Their matter programming, too," she said. And suddenly we were laughing together, just like old times. It felt good. Cleansing. If all our times had been like this . . .

"Look," I told her, "I want to apologize for inflicting Young Me on you like that. I hope he didn't scare you."

"Not in the least. Actually, he was quite charming." She handed me the soup, and I tasted it. It was *good*, and here too I sensed some vague tincture of money, some subtle designer flavor to which I myself had never been privy. And I was not exactly a poor man, nor a gustatorial simpleton.

"What did he do? What did he want?"

"The usual," she laughed. "A bit of me for his collection."

Suddenly I found myself fighting down anger again, for the second time in a single morning. Because it wasn't funny, damn it. Not to me it wasn't. The request had seemed simple enough at the time. Pamela and I had archived ourselves at the height of our passion, wanting—literally—to preserve that glorious feeling for all eternity. Later, when things had soured, when we started fighting and she finally turned me out, I had asked her to revive that feeling. Not even in her own skin, necessarily. Couldn't she print out an alternate copy, an older, younger version who was still in love with Carmine Douglas? Wasn't that the whole point of the backup?

But apparently it wasn't, at least in her mind, and apparently I had pressed the point too firmly. Well, no "apparently" about it; love could make a man do stupid things, and no force in heaven or Earth could make him regret them afterward. In love especially, we behave as we must.

In any case, my defense had taken me all way to the Solar Court itself, where my stalking and harassment convictions were narrowly upheld. I was clever enough not to lose my license over it, but the court forbade me to have any contact with Pamela Red, or

her friends and family, for three long decades. The mark would be on my record forever: Carmine Douglas, sexual deviant. What was funny about that?

"Look," she said, catching my expression, "We were young. We applied our passion to each other, and when it didn't work out we applied our passion against each other. It's the oldest story in the world. I'm assuming we both got over this a long time ago, like good little grown-ups, so let's not start fighting now. Okay? I'm genuinely sorry, about all of it."

That stung too, its own way. "About *all* of it? You're sorry it even happened?"

And to my surprise, her face melted in a strange mix of amusement and dismay. "*Sorry it happened*? What . . . What are you even talking about? We were fresh, we were new, we were ***burning*** with passion for the first time in our tiny little lives. What's the point of living forever if you only get to feel that way once? Carmine, Carbo, baby doll, it was the hottest fling of my life."

What came next made perfect sense, because if I'd ever had any willpower in the Pamela Red department, we wouldn't be standing there talking about it. And if she hadn't loved me—truly loved me with all her heart, at least for a while—I wouldn't have had anything to press her about, to get in trouble about. An explosion could not occur without heat. But it was one more bit of strangeness, and I honestly didn't know if there were any law or rule or ethical guideline being broken. Would society prevent me from hurling myself on this additional complication?

It hardly mattered. Yes, I tumbled into bed with her, and she with me. Heedless of the consequences, we remained there for three days, refusing all calls. And it was worth any price.

8.
Orders

When I finally got home, my head was clearer somehow. It was one thing to stir up ghosts from the past, but quite another to have them walking around spouting threats. But making peace with Pamela—making more than that!—put a different face on things. Anyway, I did what I should've done in the first place, which was to file a motion for Division of Self for Theodore Kaffner, and another for Carmine Douglas.

Divisions of Self—so-called twinnings—had a sparse but readily traceable case history, and seemed the most appropriate vehicle for dealing with this mess. True, no one had ever and attempted an *involuntary* twinning before. Generally, they were granted to individuals who had lost a genuine twin somewhere along the way, or who could, for whatever reason, prove some tangible need to divide themselves into two legally distinct individuals. Because they'd grown in different ways, and no longer believed they were compatible.

Angry Young Theddy's argument was quite different: that he should have the right to delete his later self and try his whole adult life over again. But if the older and younger Theddies were two different people, then this desire would be nonsense from a legal standpoint, and acting on it would be murder. Which, to my thinking, sounded about right.

And Young Carmine's position was different still: having been granted the flesh and breath of life, he simply wanted to continue. He didn't want to be erased, and truthfully neither would I, if our circumstances were reversed. And the law was supposed to mean what was *right*, right?

The next step was to file a temporary restraining order—actually four restraining orders—prohibiting the various Theddies and Carmines from harming one another, or having any sort of contact at all outside a courtroom setting. We could send legal commu-

niques to one another through the proper channels, and that was all. Sadly, this would be another mark on my own record, another opportunity for me to look like some sort of mad stalker, but since my name was on the order as both plaintiff and defendant, it would seem more strange than incriminating. And anyone researching my background that deeply would know, *should* know, that Strange is my middle name.

Then I did another thing I should've done right away, which was to call my parents and let them know what was happening. "Aren't you a bit old for shenanigans like this?" my father wanted to know.

"I'm beginning to think so," I answered.

For good measure, I called Theddy's parents as well, and found to my mild surprise that Angry Young Theddy was actually staying there with them, having vacated his apartments in Denver. This of course forced me to cut the conversation short, but that was all right. The Kaffners were drunks and dreamers, with never all that much to say to me, or I to them.

And since these orders were of the sort that could easily be handled by hypercomputer—the so-called Telejudges—I had a stack of bonded approvals in hand within a few minutes. The Telejudges of course demanded a flesh hearing, ten days hence, so a human judge could review the facts of the case and decide the long-term disposition of the orders, and of the humans tied up in them.

And that wasn't so hard, really. Strangeness is nothing more than the shock of the new: a thing never seen before, never felt or tasted or lived through. But strangeness by itself it didn't make this thing intractable, nor guarantee in any way that the future—the Theddies and Carmines and Pamelas of centuries hence, indeed all of society—would find them unusual. Indeed, to the extent that society took any notice of this case at all, it would be as one more precedent in the legal definition of identity. No big deal of all. Or so I reasoned at the time.

And so, somewhat anticlimactically, I found that my job was complete. With those orders posted, there wasn't a fax machine in the Queendom that would reconverge the older and younger Theddies, or a door that would open for them, if the opening might place the two in the same room. My client was safe, and so was I. And I found, also to my surprise, that I was shaking with relief. How about that! This was another thing my job had going for it: no matter how long I did it, there was still this aura of excitement and danger and fresh discovery. Most especially when it was about me.

After that there was only one thing left to do: call my office fax machine and retrieve Theddy—the real, contemporary Theddy—from storage.

9.
Wine, Interrupted

My apartment at the time was a pseudo-penthouse—its large balcony was roofed over but otherwise genuine, and the rooms themselves were on the 13th floor of a hundred-story building. But the balcony's overhang was programmed to look like sky—an illusion so good that I myself sometimes forgot—while the apartment ceiling was a fiction of dormer vaults and skylights looking up at the other tall buildings as though the higher stories of my own did not exist. This was not an extravagance; the patterns had to be customized by experts and hypercomputers, but it only took an afternoon. A team from Sears-Roebuck had done it for less money than I made in a week. Why, hundreds of people in Denver alone had the exact same decor, probably an even dozen in that very building. But low-cost and cheapness were not

the same thing, and most visitors found the effect both striking and laudable.

In this, Theddy Kaffner was no exception. He leaped from the fax all stiff with anxiety, but once I'd explained the situation to him, and handed him a glass of wine, the first thing he did was look around and say, "Jesus Christ. Nice place."

The fireplace was also an illusion—you couldn't jab it with the ornamental poker or wave your hand through the flames—but it looked perfect, and crackled *just so*, and gave off exactly the right amount of heat for a November evening that was suddenly, finally beginning to feel like fall. I faxed up some throw pillows, and the two of us sprawled in the firelight, chugging our drinks and laughing like we had in the good old days.

The purveyors of copyright bourbon tended to regard their products as perfect, and thus subsisted mainly on royalties, reinvesting little or none of it back into research and development. Which was a losing strategy in the long run, because the opensource and public domain recipes got a little bit better every year. Not the same as the copyright brews, obviously, but just as good in their own way. This meant that spending real money on bourbon didn't make sense, except as a way of flaunting one's wealth. Since I rarely had enough to flaunt, I tended to stick with the cheap stuff.

But the wine industry, long accustomed to change and adaptation, had seen the writing on the early Queendom's walls, and rolled with the times. They still grew their grapes the old-fashioned way, with robot labor and nano-optimized soil conditioners, and while they copyrighted every vintage, they actually copied and sold only the best of the best. But except in rare cases, they revoked the old recipes at the end of every market year, replacing them with new ones from the latest crop. If you really liked a particular vintage, you were obliged to buy as many bottles as your cellar would hold, because its like would never come again. So you either had to fill a cellar with the stuff, or pay the aftermarket prices on the collectors' market. Ouch.

I, however, belonged to the Wine Resistance movement. If you knew a bit, and were a good researcher of long-dormant archives, you could dig up the pattern of some ancient vintage whose creators had died heirless and alone. The public domain wines were mostly swill, but I had personally discovered two of these grayware vintages, which could be freely duplicated to my heart's content, and I'd bartered them for a dozen more on the semisecret Resistance exchange.

They were always the same, alas, but so were the "perfect" bourbons. This particular bottle was an atomically exact Delle Venezie Pinot Grigio, from 2203 at the tail end of Late Modernity. Possibly the oldest surviving Pinot Grigio, as delicate and fruity as the day it was archived. And it was *excellent*, even when chugged.

"You'll never guess who I saw this week," I said to Theddy as I uncorked our second bottle.

"Pamela Red," Theddy answered immediately. Was I that transparent? A lawyer really did need a better poker face than this, because Theddy read even more from my expression. "Oh, you *saw* her, did you? In the biblical sense? Did you *run into* her as well? Come across her, so to speak? Good for you, old boy."

I suffered some more teasing of an even less gentlemanly sort, until Theddy finally asked, "How's she doing, anyway?"

"Well. Very well. She's got a gorgeous house down in AntiLand, on the top of Mount Terror. You should see it sometime."

"She got that on a programmer's salary?"

"Well, she calls it a fluke, and I be-

lieve her. But yes, she's a programmer. Specializing in materials design."

"Mmm," Theddy said around a heavy swallow of dirt-cheap Pinot. "That would explain it. That's where all the glory is, where all the money is these days. If you ask me, my job is harder: making sure the materials actually work. However wonderful your brick may be, if it's wellstone you've still got to run power and data from point A to point B. You've got to manage waste heat, and if there's gas and fluid transport involved, the plumbing has to go somewhere. Also, a lot of materials aren't structural without an impervium mesh woven through them, and if you ever want the brick to be anything else, to be *programmable* like the rest of the world, then you'd better have some computing elements listening for commands. These things don't happen by themselves."

"I thought hypercomputers did all that."

"Everybody thinks that. That's why the job doesn't pay well. But hypercomputers don't *feel*, Carmine, not like we do. You can load them with algorithms for aesthetics and common sense, but it doesn't make them human. It's a human world we want, right? Computers are always seeking pathological solutions—you know, kill the cockroaches by roasting the whole apartment and then faxing fresh people. That actually happened! And if nothing else it takes a human to add those boo-boos to the common-sense database. No do, you stupid machine.

"But we do a lot more than just that. There are copyright issues, security and permissions issues. Hypercomputers will follow the letter of the law every time—they have to—and they're practically paralyzed as a result. To no one's benefit. And there are always profiteers exploiting loopholes, sneaking adware materials onto private property and then wrapping themselves up in the law. Sanctimonious jerks. Half my house calls are to defeat some security system or other, because the wellwood stopped working or the window glass is suddenly demanding back royalties."

"So it's an art," I said, "like everything else that matters."

"Yeah."

"Speaking of which, are you still involved with the theater?"

"Indeed I am," Theddy said. "In fact, that's where my troubles began. I was going to so many plays, and posting so many opinions about what I saw, that one of the news services finally signed me on as part of their appreciators pool."

I knew about those, yeah: appended to the remarks of professional reviewers were the Aficionados' and People's Choice scores, along with occasional snippets of commentary from their discussion boards. I'd even considered, at one point, quitting law to become a poverty-stricken food appreciator. But I didn't see a connection to Theddy's case, and said so.

Theddy's glass was empty again, and he waved it for a refill, which I provided. "See, the other appreciators were getting really burned off with me. 'You've already got a job,' they said. 'Why're you hogging an aficionado slot as well? You're taking a livelihood away from someone on Basic Assistance. Someone who loves the theater as much as you do.'"

"Now that's pathetic," I said.

But Theddy's take on it was more forgiving: "There are a lot of people who have nothing else to contribute, Carbo. They make good spectators, and where would the arts be without good spectators? But they can be really pushy about it. Really defensive. Some of these people, it means a lot more to them than it should. They started getting ugly, making threats."

"Ah. And you thought Angry Young Theddy could help."

"Well, yeah. A bit of him, anyway.

The fire of youth to temper the iron of wisdom. But fire is tricky."

Those were Theddy's last words, and for the record, when the Constabulary had reconstructed the events that followed, I was fully exonerated of any negligence or inaction. The tampering with my home and office records had occurred during the moments while Theddy's image was in transit, and had triggered no firewall alerts or quantum decoherence flags. The camera that appeared in my ceiling was a mesh of microscopic sensors, which my eyes could not possibly have discerned, even if I'd known where to look.

And although I was in fact looking right at Theddy—pouring the last of the Pinot Grigio into his glass, in fact—when the wellcloth of the pillows beneath him crackled and turned to metal, when the floor became a grid of high-voltage lines . . . I'll feel terrible about it for the rest of my life—forever, in other words—but I didn't know what was happening, or why, and even if I did there was really nothing I could have done about it.

When the corners of Theddy's lips drew backward and upward, exposing his teeth, I thought at first that he was smiling. But then his body began to jerk and smoke, and his eyes grew milky, and I hope to God that the brain damage happened early, because if it didn't, then Theddy, paralyzed and twitching, felt his own hair catch fire, his own skin blacken and peel away. Was the general alarm the last thing he heard?

These were not only my speculations, but also those of an entire Queendom of voyeurs, for there hadn't been a lurid murder in twenty years, or an electrocution in over a hundred. And such events—even before they'd become rare—had always been strange.

10.
Judgments, Final

The trial was only two hours long, and very nearly a formality. Theodore Great Kaffner, Sr.'s only physical body had been murdered, and the only recent copies of him—in the fax buffers of my home and office—had been expertly deleted. Angry Young Theddy did not deny his involvement in these acts, and even if he'd tried, he wouldn't have gotten very far in light of the Constabulary's overwhelming evidence.

On the face of it, he was guilty as sin, but Young Carmine, true to his beer-soaked promises, had mounted a spirited defense. Theddy was guilty, yes, but of what, exactly? Young Carmine consistently used the term "voluntary file maintenance" to describe the incident, and insisted that at the time of said maintenance, Young Theddy had had no way of knowing he'd been legally partitioned into a pair of twins. Thus, he was incapable of criminal intent in the commission of these acts, and if any loss or suffering resulted, it was—to Theddy's mind—of a self-inflicted sort which the law could frown on but not actually forbid.

It was, I thought, quite a savvy maneuver for a counselor so young. It made sense, and if justice were a purely logical affair, or an attempt to move forward with the minimum social damage, it might possibly have prevailed. But the other function of law is to frighten, to make examples, to discourage further thoughts of wrongdoing in the hearts of human beings. And the facts of the case remained incontrovertible: one legal individual was killed through the deliberate and premeditated actions of another. In the end, Young Carmine did about as well for Theddy as anyone could expect: malicious negligence resulting in death.

Tragically, of the durable archives Theddy had stored over the course of his life, the most recent was nearly twenty years out of date, and when it was printed and briefed and placed on the stand to provide commentary for

the sentencing, all it could do was hang its head and weep. There was just too much missing from its life. It couldn't make sense of the actions of older *or* younger Theddy, nor of the circumstances it found itself awakened to. When the court asked if it wished to be marked disposable, and thus erased, the copy nodded slowly and was led away by the bailiffs.

As for Young Theddy, he was sentenced to 100 years' hard labor, without the possibility of parole, and since he was barely twenty-five years in subjective age, this was about as close to a death sentence as a person could get, without murdering thousands or attempting to destroy the Sun. A century of subjugation, of cheek-to-jowl contact with humanity's hardest customers. When that was over, nothing would remain of the Theddy I went to college with. Theodore Great Kaffner had managed to destroy himself, and this date was one I would always remember as the true time and place of his death.

There have always been tragedies, and perhaps there always will be: sad events with a momentum of their own, which benefit no one and which make the world a poorer place. And yet, in a way, this was a fitting end for a prankster like Theddy. Hoisted on his own petard, indeed. What a lark! I sobbed off and on throughout the trial, dabbing at my tears with a wellcloth handkerchief, but even so I could not avoid the occasional giggle or snort. Even Theddy's younger self, doomed to ruin, seemed on some level to appreciate the irony. He smiled and waved as they led him away, and would no doubt make friends in prison by throwing himself down the stairs.

Ever mindful of the convenience of its patrons, the court had scheduled my own case next on the docket. And this one really *was* a formality, for I had sent an offer to myself the night before, and accepted it gratefully. I, the older Carmine, would cede that portion of my wealth that the younger Carmine had rightfully earned, and Young Carmine would cede the name, changing his own to Ralph Faxborn Douglas. He would also move to a different city, seek new acquaintances, and change his face and hairstyle in minor but telling ways. As for Ralph's ongoing maintenance, I offered a generous five-year stipend, to give him a chance to get on his feet, to find a job or found a business somewhere. But Ralph, awash in notoriety, had no shortage of job offers, and had already licensed his story—*our* story—for a tidy sum that I agreed not to dispute or attach in any way. No further settlement was needed.

On the stand I was asked by the judge to confirm that yes, these were the terms I had agreed to. And I felt a momentary pang before answering, for letting go of my youth was a hard thing to do. But I spoke clearly for the record: "Yes, Your Honor. Ralph Douglas and I are in full agreement."

It was a sad affair all the way around, made all the more stressful and surreal for me by the presence of Pamela Red in the audience. What was *she* doing here? The question plagued me throughout both trials, only to be answered at the end, when I watched her fall happily into the arms of Ralph Faxborn. This was not *my* Pamela at all, the Antarctican matter programmer, but rather the archived student, still burning with passion, over whom I had pined for a decade and more, risking nearly everything. I watched the two of them, warm and happy together, and wondered if I'd ever feel a thing like that again. Was youth a necessary component?

Against my better judgment, I went over to talk to them. "You two look . . . happy together."

"Thank you for everything," Ralph said. "For life itself. I apologize for not trusting you."

And I answered him sternly: "Never apologize for being cautious. The world is full of nasty surprises, and lawyers, at least, must stand prepared. Until I'd thought about it, I *was* going to erase you." I paused a moment and then added, "Look, I've learned a lot over the years, about being you. We should sit down. Have a chat."

"And turn me into yourself?" Ralph laughed at that. "Another generous offer, sir, but I'll have to decline. Is my own future not bright? If you survived our trials and tribulations, I reckon I won't do any worse. And time will tell, sir, but I reckon I have a certain advantage as well, coming to this world as a traveler from its past. It gives a certain outsider's perspective, which ought, I think, to be useful. So if it's all the same to you, I will ignore you as I would my own father. Fair enough?"

"You're a clever boy," I said, and it wasn't entirely a compliment.

All the while, young Pamela had been looking me over with great curiosity. And if this was painful, why, returning her gaze was like leaping into a furnace. "And you, young lady," I said as evenly as I could manage. "I'm quite flabbergasted to see you here."

"I imagine you are," she said, with a sympathy that was agonizingly genuine, and equally condescending. "I don't know your history, and I don't care to. But it upsets me to think I've caused you pain."

And *that* one really knocked the stuffing out of me. Young Pamela had always had a knack for that, for hitting me where I was weakest while trying, in some vague way, to be nice. And suddenly I was able to forgive her for that, for all of it. Because she was just some kid, and didn't know any better. How could she?

I nodded slowly. "Yes. Well. The intent behind your words is appreciated. Have you spoken with . . . yourself?"

"I have," she said, "and it's her you should be talking to, not me. I felt her letting go of a lot of anger. If you want to . . . you know, pounce in a moment of weakness . . . well, now would be time."

"Thanks for the tip," I said, laughing in spite of myself. And then, more thoughtfully: "She and I fought such battles over you. It's ironic, and rather sad, that she didn't surrender you sooner."

Pamela just looked at me then, with a wise sort of weariness, and said, "Love isn't a surrender, but a gift. Sometimes we return it unopened, but we never fail to appreciate it. If you're going to talk about me like a thing, at least have the right sort of thing in mind, all right? The real question to ask yourself is why she suddenly feels like giving."

God, she sounded so good. So lovely, so perfect. And Ralph, too, was everything a mutant, sexually deviant father could hope for. Surely *here* was a young man who could do no wrong, no matter what the provocation.

"I wish you both the very best of luck," I said with conviction.

And the two of them smiled at me as they might a distant relative, and then turned, arm-in-arm, and walked away. The perfect couple, yes. This was no longer the world they'd been copied from, and they were not those people. Not quite. Maybe things would be different this time.

The smart thing for me to do then would have been to go back home and get to work. There was plenty of work for me, always. But life was too short for that, yes? Even if it lasted forever. I had a flair for the dramatic and a nose for the strange; it was time to take a risk.

Still, it took all my strength to keep from shouting after them, "Fool! She's *five months* from dumping you!" ■

Science Fact

Gene Doping and Other Olympic Scandals of the (Not-So Distant) Future

Richard A. Lovett

Several years ago, Larry Niven and Steven Barnes wrote a novel called *Achilles' Choice,* in which Olympians of the future have to decide whether to use a performance enhancer called "the boost" or compete without it. Without the boost, they can't win. But the boost is deadly. Winners get the antidote; losers die. It's a slightly forced premise, but it perfectly articulates the dilemma of modern sports. What do you do if the only way to win is by doing things to your body that might damage your health later on?

Other than the Niven and Barnes story, science fiction has generally addressed sports and human performance from the standpoint of genetic engineering, focusing principally on how the enhanced athletes are accepted by the society that created them. In 1982, for example, Isaac Asimov wrote a story called "The Super Runner" for *Runner's World* magazine. In it, he postulated the athlete of the future: gene modified to have lungs like bellows, bulging muscles, and an immensely jacked up metabolism that allows him to perform amazing feats of strength, speed, and endurance. It's a gentle tale, centering on a young boy's wide-eyed encounter with such an athlete and his discovery that "different" is still human. But to its *Runner's World* audience, the story had an unmistakable subtext: someday, the ordinary athlete will be obsolete.[1]

Genetically enhanced athletes are still far in the future. Nobody really knows how to do it except by the time-honored approach of marrying each other, and that's a bit hit-and-miss. Besides, most would-be cheaters are young people seeking glory for themselves, not their children.

[1] *Runner's World*, October 1982, pp. 62-67. According to *www.asimovonline.com*, this story was never placed in any of Asimov's books. Many libraries, however, retain old copies of *Runner's World*.

But the lure of that glory is immense. A few years ago, the sports community was abuzz with tales of a study in which top-level collegians were asked whether they would use an illicit substance that was undetectable and guaranteed to give them Olympic gold—but which would kill them a year later. It's the Niven and Barnes story, without hope of a cure. According to the poll, one-half said they'd do it.[2]

The study, however, appears to be the sports equivalent of urban legend. When it was mentioned in a scientific symposium in early 2004, most of the audience had heard of it. But then one scientist raised his hand. Could anyone actually give him the original citation? He'd looked, and not been able to find it.[3]

But that doesn't mean the "study" is meaningless. Urban legends acquire their power because we believe it's possible for alligators to lurk in sewers or nefarious people to stalk hotel bars, hoping to steal our kidneys. This legend tells us that athletes, coaches, and scientists truly believe that a great many people would sell their futures for Olympic glory.

It's not as though it's not happening in real life. In 2003 and 2004, the sports world was rocked by the Balco scandal, in which Balco (the Bay Area Laboratory Co-Operative) was charged with making designer steroids for a *Who's Who* of famous athletes. In an interview with *Runner's World*, Suzy Favor Hamilton, a 1,500-meter runner with a squeaky-clean reputation, voiced a very Niven-and-Barnes-like frustration at having to compete in the post-Balco world. "People keep trying to cheat," said Hamilton, who has lost several races to an archrival whose name appeared on the Balco list. "It's so discouraging. Look at THG. If something like that is out there, and people think they won't get caught, they'll take it. We need to stop them. . . . I'll never in my life have a chance to get those titles and those races back."[4]

Thomas Murray, president of The Hastings Center, a leading bioethics think tank, puts it more succinctly: "It's a kind of arms race in global sport."

That race is proceeding at an amazing pace. We'll get to THG in a moment, but Hamilton's concerns about steroids will soon be passé. The up-and-coming threat is a technique called gene doping.

Gene doping isn't the creation of Asimov's super-athletes by bioengineering them from birth for superstar height, strength, speed, or bulk. Rather, it's a method of altering the genes of adults so that their cells do things differently from the way they were initially programmed.

As far as anyone knows, gene doping has yet to hit the athletic world. But in 2002, Richard Pound, president of the World Anti-Doping Agency, received his first inquiry from a concerned coach. And Theodore Friedmann, a medical professor at the University of California, San Diego, notes that the necessary techniques are within the reach of the average graduate student in molecular biology.

If a well-funded national sports program made a concerted effort at a gene-doping program, as the East Germans did with steroids during the Cold War, gene-doped athletes could be a threat in the 2008 Beijing Olympics. Otherwise, most experts believe it won't become prevalent until 2012.

Personally, I doubt that we'll have that much time. Gene doping is possible

[2] If this sounds utterly crazy, consider how much risk the average science fiction fan would be willing to accept for a trip to Mars.

[3] The symposium was part of the 2004 annual meeting of the American Association for the Advancement of Science, Feb. 12-16 in Seattle, WA. The symposium and an associated press conference were major sources for this article.

[4] "Pretty Fast," by Gretchen Reynolds, *Runner's World*, August 2004, pp. 66-69.

now. Scientists have already proven this by creating gene-doped rats and mice. But before we get to that, let's take a look at existing methods of cheating, some of which are already quite innovative.

A Brief History of Cheating

Cheating is undoubtedly as old as sport—or at least as sport with rules more complex than "first one to the water hole wins." But until recently, cheaters were limited to crude methods. In the 1900 Olympics, for example, the marathon followed a convoluted route through the streets of Paris, not all of which were paved. It had rained the night before the race, and when the winner, a Frenchman, reached the finish with clean legs, the mud-spattered American who found himself in second place argued that his competitor must have taken a shortcut. The Frenchman kept his medal, but the controversy lingers.

Or consider the 1980 Boston Marathon, which proved that if athletic immortality is your goal, sometimes really blatant cheating might be better than winning honestly. In that race, Rosie Ruiz was the first woman across the finish, looking amazingly fresh for someone who'd just run 26.2 miles. It turned out that she hadn't. Early in the race, she'd slipped off the course, caught a commuter train, and then sneaked back onto the course (merging into the pack of speedy men) in time to win by three minutes. By the time race officials figured this out, the actual winner, Jacqueline Gareau, had already gone home to Canada, wondering how on *Earth* that woman had managed to get ahead of her. To this day, "doing a Rosie Ruiz" is runner-slang for taking a shortcut.[5]

Cheating of this type is easy to defeat. Once you realize it's possible, you simply watch to make sure nobody's doing it. End of story. The same applied to the first types of drug use, which in sport is referred to as "doping."

These early scandals involved stimulants, which perk you up on race day so that you can do things you ordinarily couldn't. Not all stimulants are illegal. Caffeine is an effective stimulant, but you won't get in trouble for drinking your morning java. The issues are safety, availability, and ensuring the proverbial "level playing field"—and on these scales, coffee is pretty benign.[6]

More dangerous are amphetamines, which work by shutting off the sensation of fatigue. Timothy Noakes, a professor of exercise physiology at South Africa's Cape Town University, once told me that these drugs are so potent that professional cyclists say that any middle-of-the-pack competitor could win a stage of the Tour de France by taking them. But fatigue serves a purpose. One of the ways amphetamine use came to light in bicycle racing was when cyclists started dropped dead from heatstroke and overwork.

In other sports, cheaters want drugs that will calm them down. In target shooting and archery, for example, your aim is affected by the fact that your fingers twitch slightly with each beat of your heart. Top-level competitors know this and shoot between heartbeats. Beta-blockers are drugs that make this easier to do by slowing your heart rate, but they are banned because of potentially dangerous side effects.

Stimulants, beta-blockers, and other such drugs must be taken during the event or they won't do any good. That makes them easy to detect because they or their metabolites will show up in blood or urine samples taken immedi-

[5] This and many other stories of Boston Marathon fame and infamy can be found in *26 Miles to Boston*, by Michael Connelly (Lyons Press, 2003.)

[6] Mega doses of caffeine, equivalent to about eight cups of coffee in a single jolt, are banned, however.

ately afterward. In theory, this makes them a dead issue, because users are guaranteed to be caught. In practice, cases still surface. Typically, they involve athletes who didn't pay attention to what's in their prescription medications, or who were stupid (or naïve) enough to buy an over-the-counter cold remedy or "all natural" dietary supplement in a foreign country, only to discover, when they flunk a drug test, that it contained something naughty.

Vampire Fantasies

The easy detectablity of stimulants has led athletes to seek another type of illicit aid, which we'll call "training enhancers." These are drugs that make your training more effective, but which, having done their job, vanish from your body by race day. There are two basic types: endurance enhancers, and muscle builders.

Endurance is a complex process comprising at least three physiological elements: the rate at which oxygen can get to your muscles, the ability of your muscles to process that oxygen to burn fuel, and the body's stores of readily accessible fuel. Superimposed on these is the brain, which subconsciously monitors what's going on in the heart, lungs, bloodstream, and muscles to determine how hard it will allow you to work. The subconscious also takes into account the task at hand, allowing you to work harder, for example, in the final lap of a 10,000-meter race than you can during the bulk of the event. (The conscious brain also plays a role, by designing your race strategy and tactics.)[7]

All of these can be improved by training. But doping primarily targets one factor: the number of red blood cells available to carry oxygen to the muscles. It does this via a substance called erythropoietin (EPO), a hormone made by the kidneys when the body needs to make more red blood corpuscles.

Because red blood cells last only about 120 days, the body makes EPO naturally, as it is needed. Non-doping athletes engage in numerous (perfectly legal) training methods that encourage the body to make more of it. These include:

- Training really, really hard.
- Living at high altitude. The building of extra red blood cells is a minor aspect of altitude acclimatization, but it's one that helps you at sea level, when you come down out of the mountains to race.
- Sleeping in an "altitude tent" in which the concentration of oxygen is reduced to mimic the effect of sleeping at high altitude, without having to leave the comfort (and training facilities) of home.[8]

These, however, are slow, uncertain ways to boost your red blood count.

One way of cheating is via a tech-

[7] This paragraph expounds the "central governor theory," recently propounded by Noakes. Prior theory minimized the role of the subconscious brain. See "Running on Empty," *New Scientist*, 20 March 2004, pp. 42-45. Exercise physiologists are deeply (and vehemently) split over which theory is accurate, but for present purposes, the differences are minor.

[8] These tents change the oxygen/nitrogen mix of the air, using a technology employed, in reverse, for oxygen enrichment in high-elevation workplaces. See Richard A. Lovett, "Subsisting on Oxygen Lite: Altitude Research, Himalayan Mountaineering, and Their Applications to Alien Worlds," *Analog*, June 2002. At least two 2004 Olympians, marathoner Dan Browne and 10,000-meter runner Mike Donnelly, lived in an "altitude house" in Portland, OR, before going to Athens. See Richard A. Lovett, "Runner's High," *New Scientist*, 2 November 2002, pp. 50-53. The high-tech training methods of Brown and Donnelly's coach, Alberto Salazar, were also the subject of a 2002 cover story in *Wired*.

nique called blood doping, which involves drawing blood well before a race, waiting for your body to replace it naturally, and then reinjecting it when desired. But blood doping is difficult to control. Overdoing it may make the blood too thick, preventing it from reaching the capillaries that supply the muscles. In addition, blood doping gives you extra blood only for a short period of time, until the body adjusts and returns to normal. For optimum benefit, cheaters want the extra blood not only during the race, but also during training, so they can train harder and be stronger on race day.

EPO makes all of that much easier. It's one of the world's largest selling pharmaceuticals—a miracle in the treatment of anemia and certain types of kidney disease. That means that it's extremely easy to get from unscrupulous doctors. Worse, it's currently undetectable.

Nobody knows how many athletes are using EPO. But if you're a distance runner on the verge of cheating, the rationale for using it is frighteningly easy. It goes something like this: *Nobody in the world can keep up with the Kenyans (and Ethiopians). When it comes to distance running, they seem to have some kind of natural advantage—maybe from all those generations of living at altitude. Maybe they just naturally make a lot of EPO, and I'll never be able to match them without help.*

We may soon find out how many people are thinking this way. In early 2004, scientists announced that a promising test for EPO was under development, although it still has some hurdles to overcome before it could stand up to legal scrutiny. But once that test becomes available, we may find out which of the people chasing the Kenyans are also naturally good—and who aren't. As I write this, the Balco scandal is widely described as the biggest doping scandal ever to ever hit sports. But someday soon, EPO may give it a run for its money.

Bulking Up

Some sports don't call for endurance. Sprint races, for example, are over before the need arises, and other sports, like shot put, discus, and power lifting, are similar. What these athletes need is sheer, raw power. For them, bodybuilding steroids are the drugs of choice.

Steroids come in three basic types: exogenous, endogenous, and designer.

Exogenous steroids are chemicals the body doesn't make by itself. There is a plethora of them, created as legitimate pharmaceutical agents, but also of value to the cheating athlete. Their undoing lies in the fact that they aren't natural. Once you know what to look for, they're

One of the standard laboratory measures of red blood cells is the hematocrit, which simply measures the fraction of the blood comprised by these cells. Another measure is a hemoglobin test, which reveals the density of this oxygen-carrying protein in the blood. Neither of these tells scientists and athletes what they really need to know, which is the total quantity of hemoglobin in the body. For that, you need to know how much blood is in the body—hard to measure for a living person. Recently, however, Loren Myhre, a scientist at Nike's research lab in Beaverton, OR, found an ingenious way to finesse that problem by having his test subjects breathe small, carefully measured doses of carbon monoxide—about the amount you'd get from smoking a single cigarette or running a few miles in smog. After waiting long enough for the tainted blood to mix evenly through the body, he drew a sample and measured how much carbon monoxide it contained. Comparing that to the amount he'd administered told him what fraction of the total blood supply was in the sample, allowing him to calculate the total volume of blood, and thus the total amount of hemoglobin.

easy to test for, and will show up on the random drug screens that have become a large part of athletes' lives, even during training.[10] The fact that athletes continue to be caught using these things is testimony not only to the degree to which they have infiltrated sports, but also to the power of the tests. "This is more or less a finished issue," says Donald Catlin, a professor of molecular and medical pharmacology at UCLA, whose career has made him a chemical Sherlock Holmes, hot on the trail of drug cheaters. "We know how to test for them and their metabolites."

More difficult are endogenous steroids: chemicals like testosterone, which the body makes on its own (even women's bodies make testosterone), but which are also available as pharmaceuticals. Because normal levels vary, it's difficult to separate cheaters from noncheaters simply by measuring the amounts in their bodies. The levels would have to be sky-high before you'd truly be convinced they were cheating. Therefore, tests for these chemicals are based on steroid profiles and ratios, rather than single compounds. The standard test for testosterone, for example, looks at the proportion of testosterone to epitestosterone, which shoots up if you start taking testosterone. Most people have T/E ratios of 1:1 or less. If the ratio hits 6:1, it's presumed that you're doping.

Unfortunately, that leaves a lot of room for subtle cheating. Athletes who know how the test works can monitor their T/E ratios and make sure they never exceed the 6:1 threshold. "We have to pay increased attention to that," admits Catlin.

Worse, Balco's chemists devised a product called "the cream" which contained both testosterone and epitestosterone at levels that assured that the ratio stayed below the cutoff.

But the drug testers may soon have the last laugh. A new test is under development, which uses carbon isotope ratios to distinguish natural from synthetic testosterone. The test works because carbon has two stable isotopes, carbon-12 and carbon-13. Biological processes tend to favor the lighter one by enough that the isotope ratio should make it possible to identify people using even small amounts of synthetic testosterone.

Designer steroids are a different matter. These are chemicals with no legitimate pharmaceutical usage. They first came into the limelight in the summer of 2003, when an anonymous coach mailed a syringe of an unknown fluid to officials at the U.S. Anti-Doping Agency. A flurry of tests followed, revealing that the syringe contained a previously unknown steroid called tetrahydrogestrinone (THG), eventually linked to Balco.[11]

THG is an extremely sophisticated compound. It contains an extra double bond, which makes it more planar, so that it will fit better into cells' steroid receptors. A better fit is also produced by trimming off a methyl group, and the addition of a novel ethyl group promotes absorption from the stomach, for those who choose to take it in pill form. The upshot is that the chemical is designed to be unnaturally potent. "Whoever designed it knew something," Catlin says.

In addition, THG was undetectable on

[10] In her *Runner's World* interview, Hamilton said she is frequently rousted out of bed by drug testers, who stop by her home (or hotel) first thing in the morning. All told, about 100,000 drug tests are administered throughout the world, each year. Cheating may be big business, but so too is drug testing.

[11] THG was actually the second designer steroid to be detected. Another had been found in March 2002, but it was a research chemical that somehow escaped the laboratory. Anti-doping authorities knew it existed and were already on the lookout for it. THG was the first designer steroid to come to light *after* it was already in use

conventional drug tests. By luck or design, its metabolites are unstable in urine and don't show up on the normal steroid assay.

Nevertheless, the moment THG was identified, Catlin says, it went from designer-drug-of-choice to "a dinosaur." The same is likely to be the case for each new designer steroid that appears. The moment it comes to light, anti-doping authorities are going to go into high gear looking for a way to test for it. Thus, while designer steroids are likely to haunt athletics for years to come, this is a fight the anti-doping agencies will eventually win, as dopers run out of drugs that not only work, but also evade an ever-more-sophisticated set of tests.

Eventually, cheating athletes will need a new, undetectable technology. Gene doping is their best bet.

Mars, Muscular Dystrophy, and Age

Medically, gene doping is the same thing as gene therapy. Both use a "vector," such as a genetically engineered virus, to insert a gene into the DNA of mature cells.[12] The difference is that gene therapy is intended to cure disease. Gene doping will produce athletes who heal quickly, are resistant to age, and are unnaturally strong or fast.[13]

Some of the most likely forms of gene doping are based on techniques currently under development for the treatment of muscular dystrophy.

Muscular dystrophy is a devastating condition that involves the gradual degradation of muscles, usually due to their inability to manufacture a crucial protein. Unfortunately, the missing gene is too large to package into the preferred vector, adeno-associated virus, which readily infects muscle and has no known harmful effects.

Muscular dystrophy researchers hope to circumvent that limitation by using a different gene, which makes a hormone called insulin-like growth factor-1 (IGF-1). Administered carefully, adeno-associated virus can insert the IGF-1 gene into any desired muscle or group of muscles, without unnecessarily infecting the rest of the body.

IGF-1 encourages the proliferation of "satellite cells," a type of stem cell found in muscles. These cells can fuse with normal muscle fibers, repairing injury or simply helping the muscle bulk up—potentially beneficial both for repairing the damage of muscular dystrophy and for offsetting the atrophy of old age.

But the same research is a "road map" for gene dopers, says Lee Sweeney, chair of the Department of Physiology at the University of Pennsylvania. In one experiment, the scientists inserted the IGF-1 gene into one leg of middle-aged mice but not the others. By the time the mice had aged to the equivalent of octogenarian people, their uninjected legs had lost 25 percent of their strength—but the injected ones were as strong as ever. In another test, the same treatment was given to younger mice, equivalent to humans in their athletic prime. Even in sedentary mice, there was a 15 to 20 percent increase in muscle strength. "It's the couch potato's dream," Sweeney says.

[12] See Catherine H. Shaffer, "You Can Change Your Genes," *Analog*, September 2003.

[13] For additional information, see H. Lee Sweeney, "Gene Doping," *Scientific American*, July 2004, pp. 63-69; Sukho Lee et al, "Viral Expression of Insulin-like Growth Factror-1 Enhances Muscle Hypertrophy in Resistance-Trained Rats," *Journal of Applied Physiology*, March 2004, pp. 1097-1104; and Elisabeth R. Barton-Davis et al, "Viral Mediated Expression of Insulin-like Growth Factor 1 Blocks the Aging-related Loss of Skeletal Muscle Function, *Proceedings of the National Academy of Sciences*, December 22, 1998, pp. 15,603-15,607.

For baby boomers hoping to avoid having to use walkers in their old age, these are wonderful findings—although it will take years of testing to determine whether they are free of nasty side effects (such as cancer). Beginning in their thirties, most people start losing muscle mass. This atrophy most strongly affects "fast-twitch" muscle fibers, which provide strength and speed. Ultimately, some people wind up losing their entire supply of fast-twitch fibers.[14] Exercising religiously, especially with weights, can slow this process, but not halt it. IGF-1 gene therapy offers the hope of staying fit and strong into old age (in the process, avoiding the hip-breaking falls that cripple so many senior citizens). It also offers the hope of preventing muscle atrophy during enforced inactivity, such as when a limb is in a cast, or on a trip to Mars. Needless to say, there is a great deal of interest in the legitimate uses of IGF-1.

All of these early experiments used sedentary animals. Thus, they didn't answer the critical question for gene doping, which is whether IGF-1 gives you anything you can't get by ordinary training. Athletes, even cheaters, aren't lazy. They're not going to take the risk of using an experimental drug (let alone the risk of getting caught doing so) if it doesn't give them anything they can't get by conventional methods.

To determine whether IGF-1 gene doping actually poses a risk to sport, Sweeney repeated his experiment, this time with rats, forcing the animals to climb ladders with weights tied to their tails in an effort to simulate human workouts.

The findings were dramatic. In control animals that were not subjected to the ladder-climbing workouts, the gene-doped legs again got 15% stronger. But in animals that received both the injection and the exercise, the doped legs grew 30% stronger. By comparison, the equally well-exercised, non-doped legs gained only 14% in strength. In other words, gene doping more than doubled the effectiveness of the athletic rats' training.

IGF-1 is merely one possible form of gene doping. Another would be to boost the muscles' metabolism by increasing their component of mitochondria, the cellular powerhouses that burn fat and carbohydrates to produce fuel for exercise. More mitochondria mean more energy, and presumably greater speed and endurance, without the need to bulk up. Endurance training does this naturally. If you go for a long swim, run, hike, or bike ride—long enough to tax your stamina—the body notices, and decides that you would fare better with more mitochondria. That's part of why exercise gets easier with training. Gene doping would attempt to supercharge your muscles by identifying the hormone that leads to the production of new mitochondria and inserting a gene for it into the cells.

Another form of gene doping would be to tinker with a hormone called myostatin, which has the opposite effect as IGF-1. Its purpose is to keep you from growing larger muscles than you actually need—important to our distant ancestors, who would have had to forage for

[14]The opposite of fast-twitch fibers are slow-twitch fibers, which provide greater endurance, but lesser strength and speed. Because they're crammed with dark-colored subcellular structures called mitochondria, slow-twitch fibers are the color of the "dark meat" of turkeys and chickens. In fact, these birds pack slow-twitch fibers into their legs and wings, but not into the white meat of their breasts. In people, fast- and slow-twitch fibers are mixed throughout the body, but the proportions vary widely from person to person. People with a lot of fast twitch tend to gravitate into sports such as weightlifting, sprinting, and football, where the top performers' muscles can be comprised of up to two-thirds fast-twitch fibers. Endurance athletes such as marathoners can be ninety percent slow-twitch.

extra food if their bodies bulked up too strongly.

There is a breed of cattle called Belgian Blues, which have unusually large, lean muscles because they produce lower-than-normal amounts of myostatin. Myostatin-inhibiting drugs are already under development for use in treating muscular dystrophy, and Sweeney's team has experimented with gene-doping techniques to inject a myostatin-inhibiting gene into the livers of mice, causing all of the muscles of their bodies to grow like those of Belgian Blue cattle.

Nobody has a clue what side effects this would have in humans—but if it makes stronger mice, it's likely to be tempting to the next generation of Balcos. Sweeney predicts that myostatin-inhibitors will be the next designer drug on the cheating athlete's shopping list.

Creative gene doping has the prospect of turning any organ of the body into a chemical supply house, providing the body with a slew of performance-enhancing substances, including not only myostatin inhibitors and IGF-1, but also such tried-and-true doping agents as steroids, EPO, and human growth hormone. The advantage to cheating athletes is that it's a one-shot treatment. Other than a few follow-up tests to make sure the treatment worked, there's no need for risky contact between athletes and suppliers.

Some gene-doping methods will be easier to detect than others. Right now, for example, there's no obvious blood or urine test for IGF-1 doping because the IGF-1 would remain in the muscles, rather than circulating in the blood. The most likely test would be to take a biopsy of the muscle and look for the inserted gene—a painful and inconvenient procedure that even non-cheating athletes are likely to resist. The same would apply to any form of gene doping in which the hormone stays in a single organ, rather than circulating through the body.

Chemicals such as myostatin inhibitors, on the other hand, move through the bloodstream, where they are vulnerable to detection by blood tests. But don't count on carbon-isotope tests to differentiate them from the body's natural complement of the same hormones. Gene doping means that these chemicals are made by biological methods, rather than in a laboratory, which will probably give them carbon isotope ratios similar to their natural counterparts.

Eye of the Beholder

So what does the future hold? One prospect is that the cheaters will eventually find something truly undetectable, and we'll be in a world where the choices are very simple: cheat, quit the sport, or resign yourself to losing.

Personally, I think that's an unlikely future. Cheaters are bright and persistent, but so are analytical chemists. Consider the case of human growth hormone (HGH), a banned substance we didn't talk about earlier. In childhood, it plays a role in determining how tall you will become, but our bodies continue to make small amounts later in life, where it probably plays a role in muscle growth and repair. Nobody knows whether it actually works as a performance booster, but a lot of athletes believe it does, and illicit use is thought to be rampant.

For years, HGH use was undetectable. You could measure the hormone, but couldn't distinguish doping from the body's natural supply. But the analytical chemists didn't give up, and in February 2004, Catlin announced that a decade of research was on the verge of bearing fruit. The chemists still couldn't distinguish supplemental HGH from the natural thing, but they had identified another hormone that spikes to unnatural levels in many HGH users. The lesson is simple: today's undetectable chemical is tomorrow's detectable one, and cheaters can't expect to hide forever.

But does society really want to ban everything that can improve sports per-

formance? To some degree, we already live in the world of Asimov's super-runner. "Records are made to be broken," we say, and sports of all kinds draw huge crowds whenever we think it might happen. Often, that's done using training techniques and equipment that would have been the stuff of science fiction only a few generations earlier.

This isn't happening merely in equipment-dominated sports such as bicycling and sailing. Only a half-century ago, Roger Bannister became famous as the first person to run a four-minute mile. Today, the mile record hovers somewhere in the vicinity of 3:42, and lots of people can run below 4:00. Are today's runners better athletes than Bannister? Not likely. They do train harder. Bannister was a medical student at the time he set his record—inconceivable today, when athletics is itself a full-time job. But other things have changed as well. Bannister ran his record on a cinder track—significantly slower than today's perfectly cushioned tracks made out of a substance with the consistency of rubberized asphalt.[15] If we were serious about preserving the "purity" of the sport, we'd still be racing on cinders. Similarly, Bannister's shoes were made of leather. Today's are made of composite materials that absorb shock, then rebound with perfect balance and minimal energy loss.

The quest for records, and the tremendous amounts of money at stake for athletes, coaches, agents, race promoters, and sponsors, means that the future may be willing to accept enhancements that make us squeamish today—even such dramatic ones as gene doping. After all, Murray points out, athletes are accustomed to manipulating their bodies in all kinds of ways to achieve maximum performance. Dietary supplements, minutely planned diets, altitude tents, high-tech equipment—all of these are an accepted part of sports. Why not gene doping, if it proves to be safe?

Sweeney suggests that the answer will depend on how often similar techniques are used by non-athletes. If a treatment is used only rarely, to cure a disease such as muscular dystrophy, athletes will most likely be prohibited from using it. But if the population at large is using something like IGF-1 to slow the normal effects of aging, it may become an accepted method of boosting athletic performance, no different from high-tech shoes, space-age tracks, and those low-resistance body suits that have long been part of swimming, running, and cycling.

He also notes that genetic profiling of elite athletes will probably demonstrate that they already carry unusual genes. For example, weightlifters may be like Belgian Blue cattle: with naturally low levels of myostatin that make it easier for them to bulk up. Once such factors are identified, he asks, is it fair to insist that other athletes not be allowed to give themselves the same advantage?

One solution is to create separate divisions in each sport—something that's already been done in power lifting. There are many different power-lifting associations, Murray says, some of which are explicitly drug free, and some in which anything goes.

Such an approach would resolve the problem raised by both the Niven and Barnes story and Asimov's super-runner. Ordinary athletes wouldn't be obsolete because they wouldn't be competing directly against the super-enhanced gladiators. But it's not likely that this will completely resolve the doping problem. Just because there are leagues in which everything is fair doesn't mean that enhanced athletes won't try to compete in

[15] Once a year, I get a chance to race on one of these, and it's a joy to run on. And I'd swear I'm a second a lap faster on it than on the conventional asphalt track—itself fast by the standards of Bannister's era—on which I train.

the ones in which they're not welcome.

This would be especially true if purists see the anything-goes leagues as freak shows or pseudo-sports akin to professional wrestling. "I don't want my children to have to become chemical stockpiles in order to play the game," says Pound. "I want gold medals given to athletes, not to their pharmacists or gene engineers. I want athletes, not gladiators—human beings, not mutants."

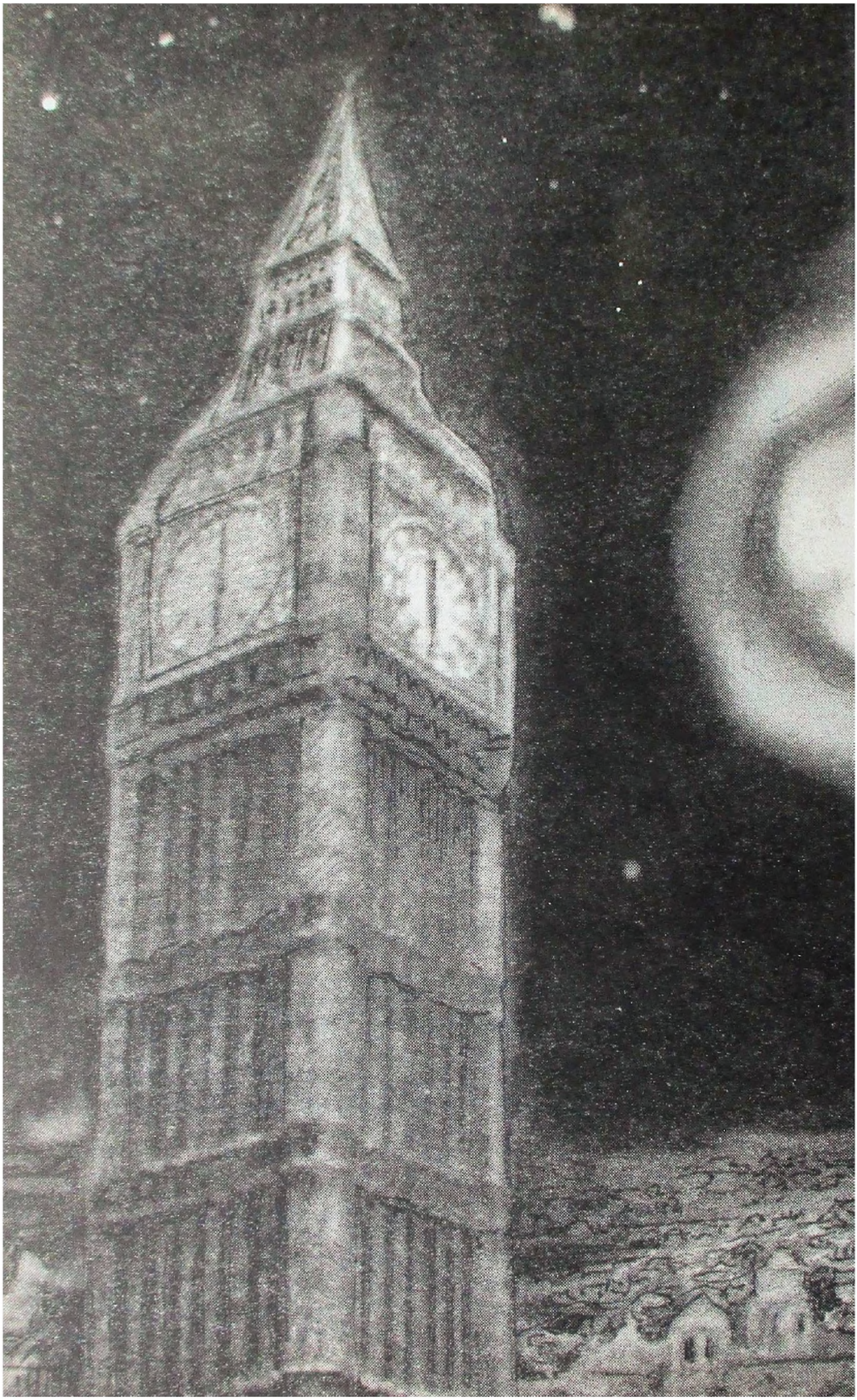
At the same time, shoes, tracks, clothing, equipment, and training methods will continue to get better. Athletes will continue to be rewarded for finding any legal means to feed the insatiable desire for new records—and there will be plenty of incentive for cheaters to look for new ways to get that subtle, extra edge.

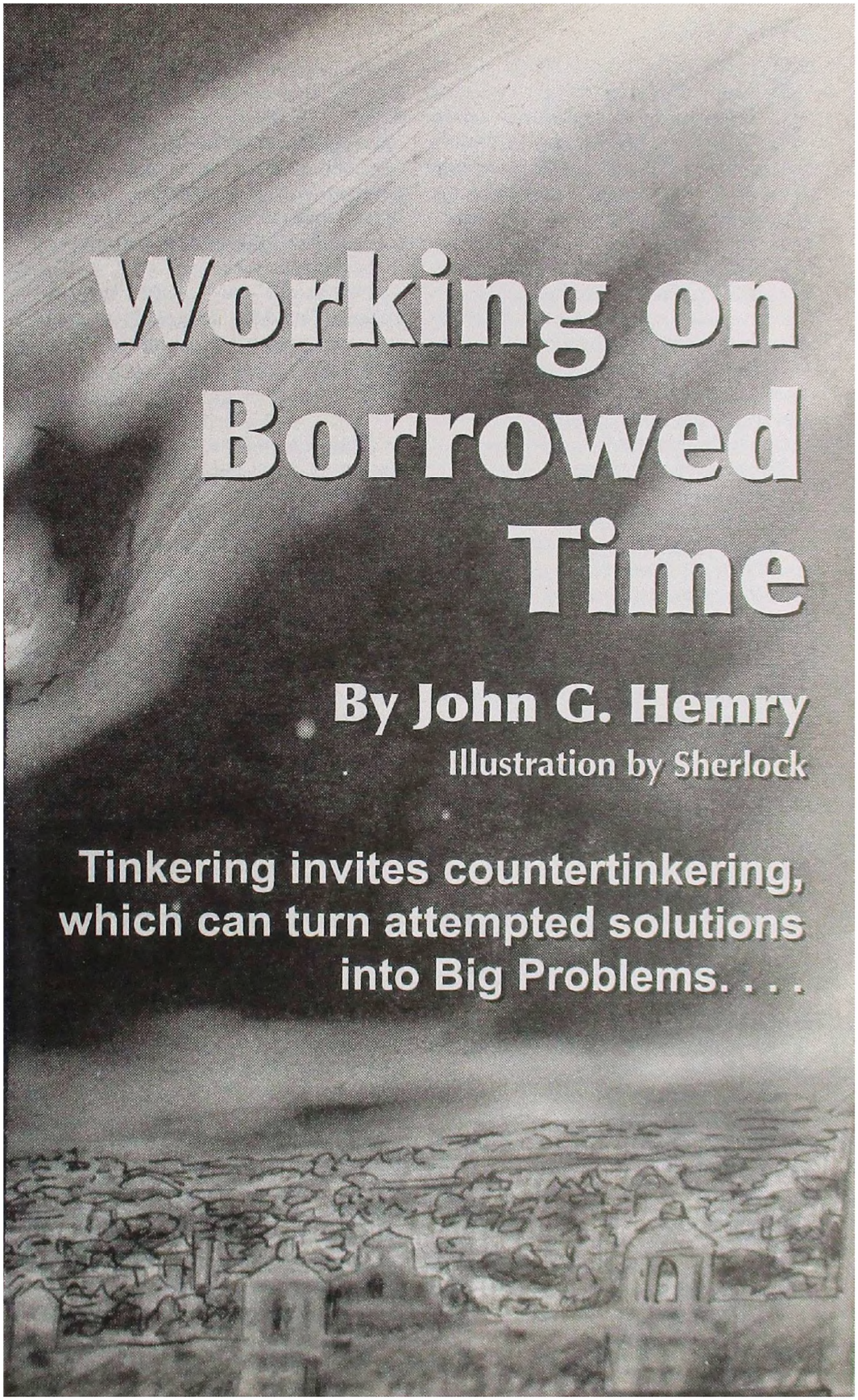
It certainly sounds like an interesting future to me. ■

IN TIMES TO COME

Our July/August double issue offers an extra-large and varied assortment of stories and articles. Bob Eggleton's spectacular cover illustrates Rajnar Vajra's novelette "Of Kings, Queens, and Angels," which will transport you into a most peculiar world where games are played for extraordinarily high stakes—and the laws of chance are themselves variables. Bud Sparhawk is back with a new novella, "Chandra's Pup," shedding new light on a mystery whose surface was just scratched (no pun intended) in last year's "Clay's Pride." Stephen Baxter has a new tale in another uncommonly strange world, the one you first saw (if you read that issue) in "PeriAndry's Quest." (But the earlier story, as in all such cases, is *not* a prerequisite!) And Michael A. Burstein, who made a big splash ten years ago with his first story, "TeleAbsence," celebrates the anniversary with "TelePresence," a new novelette in which a grown-up Tony faces greatly expanded consequences of the system he first cracked in his (and its) childhood.

We'll also have new stories by such writers as Robert R. Chase, Brian Plante, Gregory Benford, and Carl Frederick. The fact article is big and unusual: "Mission to Utah: A Science Fiction Writer's Adventures at the Mars Society Desert Research Station," wherein Wil McCarthy chronicles his own experience as part of a simulated Martian expedition—and his emergence with a new perspective on Earth.




Working on Borrowed Time
By John G. Hemry
Illustration by Sherlock
Tinkering invites countertinkering, which can turn attempted solutions into Big Problems. . . .

The Here and Now which I call home has a number of advantages compared to most earlier There and Thens, one of which is air conditioning. I was still wiping sweat from my forehead and contemplating the fairly recent dust of now-ancient Egypt on my sandals when Jeannie interrupted my work. "You have a call from Mr. Farrow."

I automatically looked up, even though my implanted assistant couldn't be seen, and fastened an annoyed glare on the nearest wall. "Tell him I just got home and ask him to call me back in a few hours."

"He says it's very urgent."

I smothered an exasperated reply. Whenever I got together with other temporal interventionists we usually ended up discussing one of the still-unsolved mysteries of the universe; why we had access to all of human history but never seemed to have any time to spare. "Okay. Put him on."

An image of Bill Farrow appeared before me, his usually cheerful face looking worried. I started talking before he could. "Look, I'm sure this is really important, but I just got back from dodging homicidal priests through the City of the Dead so I could stop someone from looting a tomb a few millennia before it was supposed to be looted. In other words, I had a really long night last night a long time ago. Can't this wait?"

Bill frowned. "You guys always talk funny."

"T.I.'s, you mean? It comes from living in circles. Can this wait?"

"No."

I smothered another exasperated expression and tried to look halfway accommodating. "What's up?"

"Tom, we've been friends since college, right?"

"Right."

"Have I ever remembered stuff that wasn't true?"

I started to give a flippant reply, then thought better of it. "No." Not more so than anyone else, that is. But I didn't want to get into Quantum Memory Effect at the moment.

"Then why . . ." He looked bewildered now. "I was preparing a lecture for my classes, and went to check some of the information, and, and . . ."

"Something didn't match?"

"Not at all! How could I have forgotten London, England was destroyed by an asteroid in 1908 Common Era?"

"It was?"

"Yes!"

"Jeannie, please check Bill's last statement for accuracy."

Her voice sounded as calm and confident as always. "Historical databases all agree that London, England was destroyed in 1908 CE. I am unable to check the accuracy of Mr. Farrow's alleged forgetfulness."

"Thanks." I shook my head. "That's not what I remember, either, Bill."

Bill spread his hands in a helpless gesture. "But that's what happened! Every history I've consulted says so. How could we misremember something like that? How could *I* misremember it? Imperial England is my specialty."

I rubbed my forehead to fight off the first twinges of a headache. It looked like this conversation would take a while whether I wanted it to or not. "Have you ever heard of Quantum Memory Effect?"

"Uh, no."

"Human brains work partly on a quantum level. That's how we accomplish creative work, and it's why our minds can accept apparent multiple realities simultaneously. You know, like fiction. But it also has an effect when there's been a temporal intervention that causes changes to ripple up through history. Thanks to QME, you remember something being a certain way, and it's not, even though you're positive you couldn't be mistaken.

That's because part of you is still remembering a reality that has been altered, a reality that no longer actually happened. Usually, it's just something small and insignificant. But if a really big change happens downtime, it can cause really big changes uptime."

Bill didn't look reassured. "But your assistant—"

"Jeannie—and every other artificial intelligence—doesn't work the same way as our brains do. Not yet. They can only accept one reality at a time, even though they can shuffle through alternatives very quickly."

"You're saying London *wasn't* destroyed in Edwardian times?"

"Well, no. I mean, it obviously was. But it apparently wasn't before. Maybe. Now it was."

"I don't understand. You're talking in circles again."

Despite everything, I laughed briefly. "Because that's how I have to think. *You* can think in linear terms of before and after. But I have to deal with causality loops brought into existence when someone uptime goes downtime and changes something. The cause of the action takes place after the action, you see. It's a causality loop through time, not a straight line."

Bill didn't look reassured, then he looked puzzled. "What does that all mean? Look, what're we arguing about, anyway?"

"You wanted me to explain why you didn't remember London being destroyed."

"London? You mean the 1908 CE event? Of course I remember that. I wrote my thesis on it."

I looked away for a moment, startled by the rapid progress of the QME. When I looked back, Bill's image was gone. "Jeannie, did Mr. Farrow terminate that call or did something else happen?"

"I require further information to answer your question."

I pointed, unnecessarily, at the spot where the image had been. "Mr. William Farrow. The call he made to me just now. How did it terminate?"

"You were not engaged in a call. Your last call was made seven minutes ago to notify your employers of your successful completion of your mission."

"I see." Or, at least, I was afraid I did. "Please put through a call to Mr. Farrow."

"I have no data for a Mr. Farrow in your personal contact file. Please provide more identifying information."

I stared at the spot where Bill's image had been, rubbing my chin this time. He wasn't there anymore, and he wasn't in the contact list I maintained for friends. Someone had made an intervention downtime, something that might've made William Farrow disappear completely from existence, like that man who'd famously walked around the horses, or maybe he'd just shifted to a new reality where he and I weren't friends. I don't like interventions that mess with my friends. "Jeannie, how many names are in my personal contact file?"

"Eighty six."

There should've been an even one hundred, a number I'd stuck to so I could keep the file from bloating into uselessness. I was certain of that, even though doubt nagged at me in a way I recognized. "Confirm. Eighty six?"

"No. Eighty five."

Damn. I'd lost another in that second of time. It'd been a big intervention, then. Not just ripples causing localized effects that dampened out as they ran up through the inertia of history, but a big wave crashing through time and rearranging what had been. Big wave, big intervention. London, 1908.

And I had to assume I was just experiencing the front of that wave. As a T.I., I'd developed some extra resistance to changes working their way through time. No one knows for sure

why that is, but even with that resistance, if I was still here when the crest hit . . . maybe I'd change enough not to remember what had been, either. I didn't know what that new reality would be like, but I had a feeling anyone willing to destroy a city to bring it about wasn't interested in building a better tomorrow in any way I'd approve of.

"Jeannie, I need to do a jump."

"Your credit reflects payment for your intervention in Egypt."

For what that was worth. Museums hated losing objects from their collections, but couldn't budget much to get them back, especially since they often couldn't prove they'd ever had them. Also unfortunately, T.I.'s are prohibited from soliciting work, even in what I assumed was a good cause. "Will my current credit line cover a jump downtime to 1908 CE?"

"Yes. It will be close to maximized, however. I am required to counsel against making a jump on borrowed funds with no specific client."

"Thank you. Counsel noted." I glanced around the room, noticing a blank space where I was sure a picture ought to be. A picture of what? The memory was already blurring. "When exactly was London destroyed? And what does history say did it?"

"Old London was destroyed just before dawn on 30 June, 1908 CE by an atmospheric explosion attributed to a meteor impact with the Earth."

A meteor? There must be another explanation, even though I now had memories of a New London crowding into my head. I waited a very long second while Jeannie set up the jump.

"The period immediately prior to the destruction is inaccessible," she reported.

"Inaccessible? How can it be inaccessible?"

"I cannot determine the reason. I can jump you in four months prior."

Too long. "That's the closest you can get?"

Another long second passed. "I can access 28 June, 1908. There's a very narrow window available."

I needed to change out of my outfit and get into clothes at least halfway appropriate for the period. "How long can you hold that window?"

"I do not know. It appeared on my third access scan and may disappear just as quickly."

"Then let's go. Right now."

A moment later, I dodged into an alley while the locals were still trying to figure out if they'd really seen a man dressed like an ancient Egyptian court functionary standing in the middle of a street in very early twentieth-century London.

"Jeannie, I'd appreciate suggestions on how to get Here and Now clothing."

"You should acquire such clothing prior to a jump."

"You're supposed to tell me things I don't already know." I spent a moment becoming aware of my surroundings. Something scuttled through a pile of trash not far from me. The tang of horse manure and assorted less pleasant scents filled the air. Downtime cities stink. Downtime people usually do, too. I coughed, glancing up at the soot-laden sky. "They burn coal for heat Here and Now, don't they?"

"Yes. I can describe the effects of the coal burning residues on health if you desire."

"No, thanks."

The sky seemed darker than it should be, though, even through the smog. I got a glance of a sunbeam spearing through the sky and realized the Sun was setting. Jeannie's narrow window must have been late in the day, leaving me that much less time to discover what had destroyed London and whether I could stop it.

I studied the nearest pile of trash,

kicked it a few times, waited for various unseen somethings to scurry out of it, then reached down and pulled out a broken wooden chair leg about the length of my forearm. Then I waited for the sky to get darker.

As I'd expected, the street lighting of the period wasn't up to the task. It never is. I reached out through the gloom, grabbed a passing stranger who seemed about my size, yanked him into the alley, then menaced him with my club. A few minutes later, my victim was trussed up in strips torn from my Egyptian get-up, and I was wearing somewhat ill-fitting but appropriate clothing and striding rapidly down the street. As rapidly, that is, as my Here and Now footwear permitted. My feet, accustomed most recently to sandals, sent out pain messages with almost every step in the heavy, stiff shoes I'd appropriated. Just my luck that in this Here and Now feet were supposed to accommodate themselves to shoes rather than the other way around.

When I'd put a good deal of distance between me and my mugging victim, I found a bench and sat down to think. I was here. The day after tomorrow, something really bad was going to happen to London. I needed a lead. Fortunately, whoever was carrying out this intervention had to have left footprints of some kind. All I had to do was spot those footprints within less than two days in a very large and primitive city. I watched the foot and vehicle traffic going by, coughed some more, and wished I had more time to work with and more ideas.

A boy's voice was yelling out something. I looked that way, and saw he was selling newspapers. I slapped my forehead, drawing an alarmed look from a passerby. Maybe it was some lingering effect of the intervention wave, but I'd failed to immediately focus on the obvious and best search method.

My new clothes proved to have some coins in one pocket, with which I purchased copies of every newspaper I could find being sold. Then I returned to the bench, opened the first newspaper to its personal advertisements, and started reading. Hours later, the street lights were turned down and passing police officers began giving me long looks, so I found a hotel cheap enough to pay for with my ill-gotten gains but not cheap enough to run too high a risk of picking up parasites. Soon after that I fell asleep despite my best intentions, waking only after the Sun was well up the next morning.

As a result, it was mid-morning before I finally found what I was looking for. A personal ad. *Mister Meyer Kampf wishes to inquire as to the whereabouts of Miss Leni Riefenstahl with whom he attended the Triumph of the Will lectures in Nuremberg. Anyone with information on Miss Riefenstahl please contact Mister Kampf at* . . . The combination of names teased at my memory. "Jeannie, I need a fact check. Leni Riefenstahl. Triumph of the Will. Nuremberg. Identify any connections."

"Leni Riefenstahl was the producer of a primitive video depiction of Nazi political rallies in the German city of Nuremberg. It was entitled *Triumph of the Will*."

"Primitive? When was it made?"

"1934 CE."

"Great." The most common method of making contact or just advertising your presence in a downtime Here and Now was to literally place a personal advertisement containing anachronistic references. No one from downtime would realize the anachronism, but to someone from uptime, it would stand out like a sore thumb. As a result, temporal interventionists were masters of historical trivia. Occasionally the anachronistic contact data got into permanent, widely distrib-

uted form, like when Swift got his hands on an accurate description of the moons of Mars and put it in *Gulliver's Travels* quite a while before the moons were actually discovered. That particular blunder wasn't my fault, though.

In this case, the ad confirmed that someone from uptime was operating in London. Moreover, I knew Germany and England had been at each other's throats twice in the next few decades, so anyone citing Nazi trivia probably didn't have London's best interests in heart and might well be involved in the upcoming disaster. If they weren't involved, they should be a potential ally for me. "Jeannie, how far away is this address from here?"

"About three kilometers."

"Then let's take a walk."

Jeannie's database is a wonderful thing. I don't know what I'd do without her maps. She provided directions to "Kampf's" address, and I set off, trying to walk in the same fashion as those men around me dressed like I now was. Not too arrogant, but not very servile. I'd apparently mugged a solid member of the Here and Now middle class.

The weather wasn't bad, though the Sun shone a bit weakly through the haze of coal dust, smoke and other unhealthy substances suspended in the air. And the people didn't smell too bad for downtimers, all in all considered. I enjoyed the walk for a while. Then my feet started to hurt again in the heavy, ill-fitting downtime footwear and I started coughing again and my stomach wondered what had happened to last night's dinner and this morning's breakfast.

"How much further, Jeannie?"

"About one-half kilometer straight ahead."

I looked in that direction, and saw something that didn't belong. A woman, not mincing along in confining clothing, but striding along rapidly, wearing something slightly loose and functional. Her bright blonde hair glowed like a beacon because she wasn't wearing a hat. That fashion error alone would've made her stand out on that downtime street, even if she wasn't shoving through the crowds like a lioness ignoring a herd of hyenas. People on the street were stopping to stare, either at her clothes, her behavior, or at her strikingly beautiful face. Beautiful, but also disturbing. Even from a distance there was something about her that somehow made me think of my one look at Caligula. Then those eyes rested on me, her face instantly lit with fury, and one hand swung upward holding something that looked disturbingly like a weapon.

I'm no hero, which has probably kept me alive in Here and Nows where heroes wouldn't last long. My mind was still registering what my eyes had seen when my legs propelled me sideways into the doorway of the shop I was passing. The impact of my shoulder against the door was muffled by the crash of a weapon discharging, and then a chunk of the doorframe blew apart. I scrambled the rest of the way inside and ran for the back of the shop as more shots ripped up parts of the structure and the merchandise. The gape-mouthed storekeeper didn't have time to yell as I rushed past and hit the rear exit, finding myself in another noxious alley.

"We are being pursued," Jeannie announced as I dashed past mounds of refuse.

"I'd noticed. Did you recognize her?"

"No."

Not likely someone I'd ever met, then. A cross-alley entrance loomed and I swung around into it as another shot ripped through the space where I'd been and exploded downrange. Whoever psycho-blonde was and wherever she came from, she wasn't

worried at all about blowing her temporal cover, and she really wanted me dead.

The cross-alley was short, coming out on another street. As I slid out into the thoroughfare, barely missing a horse-drawn cab making its way through the crowds, I remembered my old Temporal Survival instructor's advice. Do the unexpected. In this case, the expected would be for me to run down a street filled with other people who were walking.

I cupped my hands and yelled as loud as I could. "They're on to you! Run for your life!"

At least half a dozen men and one woman began running as people stared at them. I yelled again. "For God's sake, run!"

Most of the crowd did what crowds usually do. They panicked. In a moment, the street was full of people pushing and stampeding in all directions. I ignored them, heading instead for the nearby cab.

The cabby fought his wild-eyed horse to a standstill and began shoving his cab forward through the mess. I yanked open the door, hopped inside and smiled at the two women staring back at me. "Lovely day, isn't it?"

The older woman eyed me warily. "Yes. You are...?"

I dredged up a period name from memory. "Alfie. You remember me."

Barely visible through the edge of one of the cab's windows, my pursuer came out of the alley like death incarnate, her hand weapon jerking back and forth as she scanned the crowd. I tried to keep smiling at the two women despite the sweat I could feel forming on my skin, desperately hoping they wouldn't scream and draw psycho-blonde's attention.

"Alfie?" The younger one suddenly smiled. "Oh, yes. Ascot!"

"Yes! Ascot!"

"How did that work out, Alfie?"

"Uh . . . fine."

"Fancy you being here." More shots boomed down the street. I couldn't be sure, but they seemed to be going away from me and the cab. "What do you suppose is happening out there?"

The older woman gave her a stern glance. "Don't look. It's not our affair. But if this gentleman would be so kind?"

I kept my smile fixed in place even though my cheeks were beginning to ache. "Of course." I cautiously looked out. Amid the Victorian hats streaming away from us, a head of blonde hair was visible fighting its way along. Then the cab turned a corner and cut off the view. I started breathing again.

"What is it?"

"I couldn't tell. Odd, eh? Nice seeing you again." I was out of the cab and back on the street before they could say anything else.

One street away, the panic I'd started was already being swallowed into the inertia of the city. The entire incident, crazed blonde shooter included, might merit a couple of sentences in the next day's papers. "Jeannie, how far are we now from Kampf's place?"

"Two hundred meters."

I found the street and the address, a four-storied rooming house of some sort. Kampf's room was on the third floor, so I headed up the narrow stairs.

The man who answered my knock peered suspiciously at me. "Yes?"

"Mr. Kampf?"

"Yes?"

"I know something about Miss Riefenstahl."

"Then you know when I met her."

"That was in 1934, right?"

His eyebrows rose, then he squinted at me. "I'm not expecting *you*."

"Something came up. Please. We don't want anything to go wrong."

Kampf pulled me partway into his room. "Why? What's happened?"

It'd worked once. "They know

They're on to you."

"What? How?"

"I don't know."

"What are my orders?"

"Abort."

"Abort!" He shrilled the word, his face disbelieving. "No. Impossible. They'd never order an abort at this point. Who are you?"

I had one hand on Kampf's coat to keep him from pulling away. "The orders are to abort."

Kampf barred his teeth at me. "I need verification. I won't abort without verification, even if you threaten to kill me."

I tried to look menacing, which was the best I could do. My old survival instructor had drilled into me that you should never carry a gun. It made you too confident, too careless, so you missed warning signs. It also meant I didn't have anything to shove in Kampf's face.

But old Professor Matson had been right. There was a tiny sound to my left, just the barest rustle of fabric, which I only noticed because my senses were hyped up with fear. I dropped to the floor while Kampf spun about partway. His coat came off in my hand at the same moment his chest exploded. The door swung wider and I got a glimpse of a newly familiar face. Psycho-blonde had her gun out and was staring at what was left of Kampf with an expression that went from horrified to enraged. Then her eyes locked on me without any hint of recognition, but with a very Caligula-like promise of death.

I didn't waste time trying to get up, but rolled out of the doorway and right down the stairs, banging myself up painfully. Moments later I was once again running frantically through alleys and streets to lose my pursuer.

An hour and considerable distance later, I chose a small garden and finally sat down to catch my breath. In one hand I still held the late Mr. Kampf's coat. But at least I appeared to be safe for the moment from psycho-blonde.

The late Mr. Kampf's coat didn't match my own outfit, so I had to get rid of it as soon as possible. I went carefully through the pockets, then felt along all the seams, examined the buttons, then carefully pressed my hands along every square centimeter of fabric. Finished, I examined the meager results. A few more coins to add to my small supply of local money. A handkerchief that seemed to have no other hidden use. A big key with a number embossed on it, which matched that of the room Kampf had been using. And a cancelled train ticket to Greenwich.

I pocketed the money, returned the key and handkerchief to the coat, then took a long look at the ticket. It was apparently no more or less than what it appeared to be. Why had Kampf gone to Greenwich? The Royal Observatory was there, so maybe he'd snuck a peak at the rock, which was scheduled to arrive in less than twenty-four hours. No, that was ridiculous. The rock was probably too small to be seen by the optics available Here and Now, even if Kampf knew the exact place to look.

I had a lot of questions for Mr. Kampf, but he wouldn't be answering any of them for me. My stomach took that moment to once again protest. It was past noon, and the last time I'd eaten was in ancient Egypt.

Jeannie directed me to a pub with an outdoor dining area, as I wanted to be able to keep an eye out for dangerous blondes coming my way. The early twentieth-century English food wasn't very tasty, but then I didn't expect it to be and it did a decent job of filling me up. The English beer, though, was a positive joy. I ordered a second pint after polishing off my meal, then leaned back to ponder my next move.

Something hard pushed against the base of my neck as a female voice

whispered, "Don't move." I sat as still as I could, wondering why psycho-blonde wasn't shooting me right off the bat. Perhaps this run-in with me was coming for her before either of her earlier meetings with me. The pressure eased and I heard someone moving around to my left.

The woman who came into view didn't look familiar, and she was dressed like a Victorian. But her movements betrayed the casual grace of someone trained in gymnastics or martial arts, and didn't appear hindered by the horribly confining undergarments required of women Here and Now. Not a local, I was certain. She sat down opposite me and gave me a long, searching look before speaking. "Who are you?"

I put my best confused and innocent look on my face. "I'm from out of town—"

"That's obvious, since you have an implanted jump mechanism."

Definitely not one of the locals. "Do you mind telling me who you are, first?"

"Yes, I do. Obviously I'm not someone you were expecting to see."

I hoped my smile looked sincere though I feared it was still a bit shaky. "There's a woman who's tried to kill me a few times. You're not her."

"I could be," she advised dryly. "Now, tell me who you are. I don't want to ask again. My weapon still has you covered, so you'd be advised to take my requests seriously."

I noticed one of her hands was inside her purse, and nodded in what I hoped was a non-threatening fashion. "I'm a T.I."

"Private work, then."

"Sort of."

"Why are you Here and Now?"

I briefly considered possible responses as I examined her. Whatever her motives, she didn't have any trace of Caligula or even Mussolini in her eyes. So I opted for truth, and explained how I'd happened to be Here and Now.

Her expression didn't change even after I'd finished. "This woman you say you encountered—"

"The psycho-blonde."

My nickname for my would-be killer finally brought a brief smile to one corner of her mouth. "Why does she want to kill you?"

"Apparently, she tried to kill me the first time we met because the second time we met she accidentally blew away a friend of hers while she was taking a shot at me."

"She back-jumped and tried to intercept you before the accident happened."

"I'm sure of it."

"And why was she trying to shoot you the second time you met her?"

"I'm not certain. I'd cornered someone who I'm sure was an ally of hers, but I don't know why she responded by trying to blow a hole in me instead of taking some less extreme step." I paused and frowned. "Though from what I've seen of her, psycho-blonde doesn't seem to think of killing people as being all that extreme a step."

My questioner nodded. "If she's with whoever caused the destruction of London tomorrow, that's entirely too likely."

"Then the asteroid *is* an intervention?"

"Absolutely." I finally saw tension leaving her posture, though her hand stayed inside that purse. "I know because I was here when it hit. Not in this spot, needless to say. I was a ways out of town working a job, saw the object streaking in, and knew immediately it had to be an intervention because my background studies hadn't mentioned even seeing such an aerial display. Then it blew. I had my assistant jump me back before the shock wave hit so I'd have a chance of doing a counter-intervention." She eyed me closely, and then relaxed for real.

though her eyes kept roaming around in precaution against us being surprised as she'd caught me. I hoped she was better at spotting danger than I was. "I had to make sure you weren't one of the people trying to carry off the intervention. Did you catch any of the change wave before you jumped in?"

"The first parts. Not the crest, I'm sure."

"My assistant's history files haven't been exposed to the change wave. If we compare them with yours, we should be able to figure out who will profit from what happened to London tomorrow."

I didn't reply directly, instead having Jeannie call up her information so I could summarize it. "Starting with tomorrow, the short story is that the British Empire responded to the tragedy by vowing to rebuild London in even more glory than before. Huge sums and resources were sunk into the effort. The rebuilding effort was well along when World War One took off."

She leaned forward, eyes narrowed. "Who won that war?"

"The Allies." I saw her relax, puzzlement plain to see. "At tremendous cost. Russia's monarchy was overthrown—" she nodded, "and replaced eventually by a communist dictatorship—" another nod, "the French were bled white—" nod again, "the United States came out relatively unscathed, and the British Empire sank what was left of its wealth into finishing the job of rebuilding London." Another frown. "The combination of the loss of London, the war, and the rebuilding effort bankrupted the empire, so it started falling apart in the 1920s CE—"

"What? The British Empire started coming apart in the 1920s?"

"Yes. By the 1930s, there were just a few rump possessions left. Then when resurgent Germany invaded and conquered France in short order, the British had no choice but to sue for peace on the Germans' terms—"

"Damn!"

I checked some more of Jeannie's data and flinched inwardly. "The Nazi Third Reich lasted for one hundred fifty-two years." I didn't elaborate on what the Reich had done with that length of time, but I had a feeling I didn't need to.

I was right. Her eyes and voice reflected horror. "They're supposed to lose. The Third Reich dies in 1945 CE."

"Not after tomorrow." I shook my head. "I have to give them credit, the ones who pulled this off. The years, even the decades, right before and during World War Two are packed with T.I.'s trying to stage interventions for or against the Nazis. They're always running into each other and countering attempted interventions. But these guys went way downtime, far enough down to avoid the crowds, yet close enough that their intervention played out in the outcome of World War Two."

She grimaced. "Very clever, in more ways than one. If Germany hadn't lost the First World War, then the Nazis wouldn't have come to power. Our opponents had to take out London early enough before World War One to ensure the Empire would commit to the rebuilding, but not too early to allow the Empire to recover from the double blow before 1939. I never thought I'd describe destroying a major city as a surgical intervention, but they did it." My fellow T.I. (for that was what I was sure she was by now) reached for my beer, pulled it toward her and took a drink. "I hope you don't mind."

"Am I still covered?"

"Of course."

"Then be my guest." She flashed a grin that quickly faded as I asked a question. "What exactly happens tomorrow?"

She took another drink and made a

face I knew had nothing to do with the taste of the beer. "You tell me. I saw the object flaring across the sky, then the flash of detonation."

I checked with Jeannie again. "Best estimates are that an object entered earth's atmosphere and detonated over London. The city was totally destroyed by an explosion of at least ten megatons equivalent." I glanced at my companion. "So what really destroyed the city?"

"A meteor."

"That's what my history says—"

"That's what happened. My assistant picked up enough information from the object's entry to confirm it as an asteroid."

I sat digesting that for a moment. "Do you have any idea how they managed to use a meteor as an intervention?"

"There's only one way they could've. They jumped a spacecraft through and shoved the rock this way."

"A spacecraft? In a jump?" My expression must have revealed what I was thinking. The cost and energy requirements for jumps go up exponentially as mass increases.

"I know it's hard to believe. Whoever did this must have expended a large world's gross planetary product's worth of wealth on the project." She finally relaxed completely and took her hand out of her purse. "I'm Pam."

"Tom. You're also a T.I.?"

"That's right."

"And you really haven't met psycho-blonde yet?"

"No." Pam's eyes went distant for a moment in the way they do when someone's thinking deeply. "She's blonde, you say. Tall."

"Yes."

"Blue eyes?"

I hesitated, but Jeannie had automatically saved a file on my brief looks at psycho-blonde. "Yes."

"She's someone's idea of the perfect Aryan killer, I guess. Just the sort of thing a hundred-and-fifty-year-old Reich would produce."

"Kampf looked nothing like that," I objected.

"No? And this, uh, psycho-blonde was apparently waiting in Kampf's apartment when you got there?"

"Yes, I . . . hell. How stupid can I be? I'd waylaid Kampf, someone in the intervention-created future realized it in time to do something, and they sent her to stop me from getting to him."

Pam nodded and drank again. "Countering your attempt to counter them. Wheels within wheels. But being a blood thirsty assassin, she bungled her rescue of Kampf in her eagerness to kill you."

We fell silent for a while. I ordered another beer, since Pam didn't show any signs of returning what was left of my first, and wondered what about this whole picture was bothering me. "Why does it matter?" I finally asked her.

She looked astonished. "Are you serious? Why does the destruction of Here-and-Now London and a Nazi victory—"

"No, no, no. Not that. *That* matters. What I mean is, if someone shoved a rock at London from out in space, why does it matter if I got Kampf? Or anyone else? How can we stop a rock? Spacecraft are hideously expensive to jump, but imagine trying to jump downtime a Space Object Destruction or Diversion System. If we can't get a SODDS, why does Kampf matter, and if we can get a SODDS, why do we need Kampf enough for them to worry about it?"

Pam frowned thoughtfully. "Very good question." Her expression shifted. "And why is Kampf even Here and Now for that matter?"

"*Was* Here and Now."

"Was Here and Now. He must have had some role in what happens to-

morrow."

When in doubt, bounce information off your assistant. Jeannie pondered the question briefly before replying. I stared at Pam as I relayed the answer. "Terminal guidance. A rock hurled at the planet wouldn't be that accurate a weapon. They need to hit London square on. The only way to ensure that is to have a maneuvering system on the rock so they can bring it down at the right place. Kampf must have been involved with that."

"But how does the rock know where its target is? They didn't jump through constellations of navigational satellites. Even aside from the cost, there'd be too big a chance of them being spotted by Here and Now astronomy, or their signals being inadvertently interfered with by primitive electronic experiments—"

"Then they need a surface locator or homing beacon . . ." Here and Now astronomy. Of course. I laughed, earning a questioning look from Pam as I reached into my pocket. "Kampf had this." I told her, holding out the train ticket.

"Greenwich?"

"The Royal Observatory. High ground, near London."

"Yes! The perfect site! They must've installed something there already. Maybe Kampf was just hanging around in case it malfunctioned and needed repairs."

I grinned. "I think we can arrange for a serious malfunction beyond the possibility of repair. Interested?"

"Absolutely. Want to take a train ride?"

"I thought you'd never ask."

It took us a while to reach Victoria Station, then we had a wait for the next train to Greenwich, and then we had the journey itself. The day was drawing to a close, and another day wouldn't dawn over London unless we found what we hoped for at Greenwich. At some point, I realized that even if we diverted the rock, we'd still have a very dangerous object heading for someplace on Earth with potentially horrible consequences. I couldn't think of any consequences worse than a century and a half of Nazi rule over Europe and a good chunk of Russia, but I wasn't happy thinking of the people who might catch that rock instead.

Everything considered, I enjoyed the ride. Pam had an easy smile and a good face. It's usually impossible for me or other T.I.'s to get emotionally involved with locals in downtime because there's no way to shake the knowledge that those people have all been dead since before you were born. They're alive, walking and talking and feeling, but it seems like stepping into an old movie where the characters are playing parts you learned about in ancient history lessons. Pam being from uptime, like me, made it possible to connect with her. Pam being Pam made it easy to connect with her.

But all good things come to an end.

The walk from the platform where the train dropped us to the observatory wasn't too far. It'd gotten very late and plenty dark, however.

A long grassy slope led upward toward the observatory. Aside from a few trees dotting the landscape, it was all distressingly open. We began sauntering up the path, trying to look casual, unconcerned and inconspicuous.

It didn't work. Either psycho-blonde recognized my clothing or she was in a kill-just-in-case mode. I noticed something move against an opening near the top of the observatory and shoved Pam to one side moments before a shot dug a very large divot out of the grass.

We scrambled to one of the trees, which fortunately wasn't too far away and had a trunk big enough to hide behind as long as Pam and I huddled

real close together. Under other circumstances, I would've really enjoyed that, but occasional shots blew chunks out of the tree trunk and kept my mind on business.

"Now what?" I asked Pam.

She grimaced. "There's only one option. One of us has to jump downtime far enough to try to get into the observatory before your blonde girlfriend gets to it."

"Please don't call her that. And I had trouble getting into this Here and Now, by the way."

"Nice time to mention it." Pam fell silent, communing with her assistant, then frowned at me. "My assistant can't set up a jump within weeks of this date. The period's blocked."

"I came in on a narrow window on the 28th."

"It's not there anymore. Nothing within four months."

"How are they blocking jumps?" We both knew it could be done. No one could jump uptime past a certain year because whoever lived Then had set up barriers to jumps for reasons that remained unknown. But no one downtime of that was supposed to have such capability.

Pam shook her head angrily. "I'd guess one of the results of this intervention was the discovery of a means to block jumps farther downtime of when it should've happened. They must've opened that window to jump one of their own people in. Maybe Kampf. You just got lucky and saw it during that brief gap."

I winced as another shot sent wood splinters flying. "How much ammo does that homicidal maniac have?"

"Too much. Do you think we have a chance if we split up and try to rush from two different directions?"

I looked around, judging the terrain and what I knew of psycho-blonde's accuracy, then shook my head. "She'd nail us for sure. We'd be out in the open too long."

Pam looked unhappy, but nodded. "I have to agree. There's no sense getting ourselves killed without a reasonable chance of success. Too bad we can't call on reinforcements."

"You, there!" Pam and I looked at each other, wondering who'd spoken. "What's all this?"

I rolled slightly and bent my head to see ten men in uniform standing a ways downslope on the walkway. They looked magnificent in what must have been full dress or mess dress, their insignia and medals flashing even in the dim illumination of the night. British military officers, obviously, probably returning late from the sort of social function which made up a large part of Victorian and Edwardian military life. Just what we needed to balance the odds. "There's a foreign agent in the observatory! Here to kill the . . ." Exactly when had Victoria died?

"King," Pam whispered.

". . . King!"

A shocked pause followed, then rasps of metal and more glints of moonlight revealed the Brits were drawing the swords hanging at their sides, swords I'd automatically and incorrectly assumed to be simply ceremonial. "Unthinkable," the most heavily bemedalled officer stated. "We shall put a stop to this."

"Good. If we split up and work our way around—"

The apparent commander raised his sword. "Forward, men."

Pam and I stared at each other. "Wait," I yelled. "The agent has a gun!"

The Brits didn't hesitate. They stepped out, walking upslope at a brisk pace, their swords held at ready, the senior officer slightly in the lead and the others in line abreast behind him. It made for a glorious sight, if you happen to think that watching brave people do stupid things is glorious.

"What are they doing?" Pam demanded, both her face and her voice

revealing her disbelief.

I shook my head, feeling sick inside. As I noted earlier, part of a T.I. knows the people he or she is seeing died a long time ago. Maybe so long ago that even memory of what they believed worth dying for had gone to dust along with their bodies. But another part of a T.I. sees living humans who aren't fundamentally different from those of us uptime from them and hates to actually see them die in the Here and Now. "World War One hasn't happened, yet. They still think war's a grand and glorious game. They haven't seen tens of thousands die on barbed wire while struggling through Belgian mud, or watched battlecruisers exploding, or seen poison gas drifting across the landscape."

"Fools. They're throwing away our only chance to get to that building."

"No, they're not. They're providing a diversion and absorbing shots that psycho-blonde could be aiming at us. Come on. Let's take advantage of it."

As Pam and I raced up the slope at an angle, shots started booming from the observatory and gaps began appearing in the ranks of the soldiers. The officers didn't hesitate as their companions fell, stubbornly, valiantly, and brainlessly continuing their attack. I was off to one side and just coming even with the forwardmost Brit, the most senior of the officers, still plodding forward with head held high, when his forward progress jerked to an abrupt halt as a large hole appeared in his chest. The officer, his face seeming to reflect just a small degree of surprise and puzzlement, toppled backward slowly, his body hitting the grass and rolling a few times down the slope.

And I was still too far from the building.

I dodged and ran and heard the boom of a shot and prayed. Then I realized the shot I'd heard had come from the side, not ahead, and that Pam had snapped off a round to keep psycho-blonde's head down so she couldn't nail me. I was rapidly falling in love with Pam. I gained the side of the observatory building just as psycho-blonde's next shot cracked by perilously close behind me.

Pam was a few meters down, flattened like me against the side of the building, and like me gasping for breath after our dash. I eased her way as Pam checked her weapon with a grim expression, then looked at me. "You do realize that if she'd taken time to shoot us first, she could've still nailed all those Brits before their frontal attack reached her."

"Yes. I hoped she wouldn't be able to resist going first for the easy targets and sure kills. It seemed to match what I knew of her."

"The more I learn about her the more I can't wait to meet this woman."

"I can wait. She's really dangerous, Pam."

"So am I when I want to be." Pam held her weapon ready as she eased inside. No shots went off, so I followed. We crept through the dimly lit rooms, heading for stairs leading up.

It was night and this was an observatory, but there seemed to be a disturbing lack of astronomers. Then we spotted the first body.

Pam covered me while I crouched down to check. "He's not dead."

"He's not?" Pam seemed to be as surprised as I was.

"No. It seems like some sort of heavy sedation. I don't see any signs of a struggle, though."

Pam nodded. "An area-incapacitating weapon. Gas, or maybe a short-ranged neural suppressor. Something to get these people out of the way for a few hours without raising any alarm outside or creating too many risks for that blonde to be able to operate here right afterwards."

That made sense, though I could

imagine psycho-blonde had been disappointed at not being able to engage in mass murder. "I guess once she spotted us, she stopped worrying about keeping things quiet."

We reached the stairs and stopped. Pam waved me forward again while she kept her weapon at ready. I knelt near the stairs, wondering if Pam's reflexes were faster than psycho-blonde's. "Jeannie, can you detect anything here?"

"There is a sensor of some sort placed nearby. It appears to be focused on the first few stairs."

I informed Pam, who nodded. "My assistant says she can jam the sensor for about four seconds. Do you think you can cover those stairs that fast without making a lot of noise?"

"I can try."

We both made it without setting off the alarm, and then we crept upward as silently as possible. We made our way past some more sleeping astronomers, assistants, and others who'd been unfortunate enough to be in the observatory tonight.

The door into the big domed area holding the telescope was closed and locked. I pantomimed slapping my head in exasperation and Pam grinned tensely. Then she brought out a small gadget and rested it against the lock. After a moment I heard a very faint click. Pam winced at the tiny noise, and then pocketed the device. She held her weapon up, gesturing me to the right. I nodded.

Pam's hand on the doorknob moved smoothly and quickly, then she was pushing the door open and dodging inside and to the left. I was right behind her, catching only a quick impression of the big telescope and the Victorian-vintage architecture around it as I searched for danger.

And there she was, her blonde hair standing out like a beacon in the dim light. The barrel of her gun was already swinging my way. A big piece of girder nearby rang with the impact of a shot aimed at me as I dove for cover. Pam hit the deck, too, as psycho-blonde snapped a second shot her way. I couldn't see Pam where she'd dropped, and hoped she hadn't been hit.

This was bad. Very bad. Even if Pam was still in good shape, the best we could do was to try rushing psycho-blonde and hope she only dropped one of us before the other one reached her. Given what I'd seen of psycho-blonde's aim and reflexes, I wasn't at all sure even one of us would make it. "Jeannie, can you contact Pam's assistant?"

"Yes."

"Is Pam okay?"

"Pam is uninjured except for a bruise developing on her—"

"Does she have any ideas?"

There was a brief pause before Jeannie answered this time. "She wants you to distract your opponent for a few seconds."

"Does she have any helpful suggestions for how I should do that?"

Another pause as Jeannie relayed the question and response. "She suggests you give your opponent something to shoot at."

"Great suggestion." I didn't have any personal appendages to spare, nor did I see any lifelike mannequins lying nearby. I had one tranquilizer-crystal shooter imbedded in my right forefinger, but that was a point-blank weapon with little accuracy beyond a meter or so. Even if I fired my single crystal, it'd only distract psycho-blonde for a second. I shifted position slightly, wincing as psycho-blonde snapped off a shot toward the sound I made and then wincing again as a new blister rubbed against the heavy, uncomfortable shoe on my left foot.

Maybe I did have some more weapons handy. I reached back cautiously, working both shoes loose, then braced myself, one shoe in each

hand. "Jeannie, tell Pam I'm preparing the diversion."

"She is awaiting your action."

"Pass her this countdown. Three, two, one, now!"

I rose up at a slight angle to hopefully complicate psycho-blonde's aim and hurled one shoe without bothering to aim. The big object flying her way must have worried her—for all she knew it contained a grenade—because she caught it with a direct hit that blew leather in all directions. The second shoe, better aimed, met a similar fate well short of psycho-blonde, then I started to bring my forefinger to bear, realizing as I did so that she was going to be able to hit me with a third shot before I could duck back down.

Fortunately, Pam was better armed than I and also a good shot. Psycho-blonde's wrist snapped back at an odd angle and her weapon flew away as Pam's shot hit. I jumped up to run forward as Pam pumped out a couple of more shots, but psycho-blonde evaded both by a stunning display of speed as she leaped at Pam. Pam's gun also flew away as the two women grappled. Despite psycho-blonde's bleeding and apparently broken wrist, Pam barely held her own while I watched for an opening.

Pam finally got in a good slam at psycho-blonde's wrist, generating pain even the Aryan berserker couldn't shake off. In the momentary lull, I shoved my finger against psycho-blonde's back and fired the tranq crystal into her.

After that it was only a matter of keeping her from killing Pam and me until the tranq knocked her out. That was easier said than done, but eventually we found ourselves looking down at our unconscious foe, breathing heavily and trying to ignore all the places where we'd been battered.

"Based on how she killed all those soldiers," Pam gasped, "I guessed she'd be so focused on killing you that she'd ignore me for long enough."

"You don't know how glad I am that you were right," I wheezed back.

"Why don't you carry a more effective tranq weapon?"

"It's effective enough to drop a mammoth within seconds!"

Pam shook her head, looking down at the blonde. "But it took a few minutes to take *her* down. I wonder what her genetic profile looks like."

"I don't want to know." Nazi genetic engineering wasn't a scenario I liked contemplating.

"We need rope in case she comes to."

"Rope, hell. There's some chain back where I was hiding."

The chain wouldn't have sufficed to hold a battleship at anchor, but we wrapped it around psycho-blonde as many times as we could, interweaving the wraps so she wouldn't be able to just shrug it off.

Fortunately, it wasn't too hard to find the device psycho-blonde had been guarding. Outside, it looked like a small Here and Now trunk. But the energy it was giving off led our assistants to it easily. We checked for booby-traps, then cautiously opened the lid and saw a control panel far too sophisticated to be local work. "Jeannie, what is this thing?"

"The device before you is transmitting a continuous encrypted signal."

"Can you break the encryption?"

"No. Not with available resources."

I turned to Pam. "My assistant can't break the signal."

Pam nodded and smiled. "Mine can."

So Pam's assistant was more capable than mine. I hadn't really had time to think about When she was from, but it was now apparent she lived uptime from me. Not too far uptime, I hoped. "Should we shut it off?" I asked.

"No. If we just did that, the asteroid would probably continue on its last

heading and still cause a lot of damage even it didn't hit the city. My assistant thinks she can alter the homing signal parameters, though, and . . . ah! She's found the atmospheric entry command sequence."

"Has it activated?"

"Not yet."

"If we can cancel the maneuver—"

"No! The rock will still reenter and we'll have no idea where it'd impact." Pam stared at me. "Trust me."

"But . . . okay." It sounded like Pam was going to try to make the object enter earlier than planned. It'd come from the east, Pam had told me, so that meant the new trajectory would bring it down somewhere east of England. What was east of London in 1908? Europe. Heavily populated even then. Then Russia. Or the Russian Empire, rather, in 1908 CE.

Pam seemed to be sweating as her assistant worked silently to alter the space object's destination. Jeannie and I waited. I watched Pam's face for any sign of how her attempt to alter the asteroid's path was working, but couldn't see any clues there. I found myself looking outward, wondering if I'd see the incandescent path of the space object heading for London.

A light blinked off on the device. Then another. Pam drew a long, deep breath. "It's coming down early."

"Where?"

"Somewhere in a region called Siberia." She shot me an aggrieved look even though I hadn't said anything. "I couldn't stop it and I can't achieve a precise target area without a homing device like this there, so I aimed it for the emptiest place I could. Siberia seems the best chance we have to minimize the death and destruction this intervention will cause."

I nodded, realized it'd been a while since I'd breathed, and inhaled deeply. "Siberia is one of the least populated regions on Earth right Now."

"Yes." Pam sagged with reaction as the tension fell out of her. "When we get back to our own Here and Nows, there'll no doubt be mention of a big explosion in Siberia on," she paused to check the date, "30 June, 1908 CE. Hopefully in the middle of nowhere."

I grinned. "I wonder to what they'll attribute the good fortune of it hitting in the middle of nowhere?"

"The usual, I'm sure. Accident or chance or luck. The standard way of explaining something when they don't really know the answer."

"If they didn't explain things away like that, our job would be a lot harder."

"True." We heard a strangled sound, and both looked toward where we'd left psycho-blonde. The killer was snarling soundlessly at us, having recovered from the tranq with amazing speed. "What should we do with her?" Pam wondered.

"If they don't manage another counter-intervention, she should loop out any time now when the future that created her ceases to exist."

"Yeah, but how long will that take?" Metal clanked on the heels of Pam's question, and as we watched, the loops of chain that had been wrapped about psycho-blonde collapsed into the vacant space she'd once occupied. "I think the fat lady just sang. How's it feel to know you've saved London?"

"Right now it still hurts. Too bad the bruises that woman inflicted didn't vanish along with her." I stared at the pile of chain. "I wonder what kind of person she'll be with a different history? Maybe not too bad."

"Are you planning on looking her up?"

"No way. I think I'm going to be a little wary of blondes for a while." I suddenly noticed shouting outside. "I think all the gunplay has attracted too much attention." I went to what must have been the same point where psy-

cho-blonde had been firing from and looked downward. People who had cause to be about in the very early hours of the morning were gathering around the bodies of the dead soldiers, examining them and speaking in indistinct but clearly excited voices. "We'd better get out of here."

"Not without this." Pam indicated the now-silent device. Unlike psycho-blonde, it'd been put here by a history that still existed. "I hope it's not too heavy." She tried to raise it, then grinned with relief as it came up easily. "Not bad at all. I can handle it alone. Let's go before anyone realizes the shots came from here."

"Wait." I checked to make sure psycho-blonde's weapon had vanished along with her. Sometimes the strangest things get left behind even after the reason for their existing had looped out. But that's another story. "Where's your gun?"

Pam smiled. "Already on me. But thanks for thinking of that. *Now* let's go."

Pam and I ran again, this time out of the observatory. Once at the door, we slackened our pace to a walk, moving nonchalantly away from the growing crowd around the remains of His Majesty's brave military men. I felt sick again, even though I knew that because of historical circumstances their deaths Here and Now wouldn't even be a drop in the tides of history. Odds were that all of those soldiers would have died anyway within a few years, between 1914 and 1918.

Or during the influenza epidemic that started in 1918. But that's also another story and not one I like remembering. Then my shoeless foot hit a stone and another pain occupied my attention.

We soon entered a built-up area where the streets meandered past still-closed shops and pubs. I wondered what the local time was, thinking it must be getting close to dawn. Pam finally paused and set down the trunk. "It's high time we jumped out of here. The local cops are going to be looking for anyone who might know anything about those dead men. And as long as this homing device is still Here and Now, there's a chance someone might try to retrieve it. Do you want it?"

I had Jeannie calculate the cost of jumping that extra mass uptime and winced. "Not unless you don't want it."

"Okay. I think I know some people who'll give me a few bucks for it." She smiled and offered her hand. "Nice working with you."

"Likewise." We shook hands, then I gathered my courage. "Pam, what would you think about getting together on a non-business basis?"

"I'd like that." She named a date about a century uptime from me, and then saw my expression. "Are you up or down from that?"

"Down." I named my own date and Pam had the grace to look disappointed. There are expensive get-togethers, and then there's going on jumps for get-togethers, which only the incredibly rich and idle can afford. I didn't fit either category.

"Well, maybe something will work out," Pam offered. "Come up and see me sometime."

"If I can, I will."

"Too bad we can't see the sites of London together. Thanks again for the help. And the company. See you around." Pam smiled, blew me a kiss, and then jumped uptime, leaving me gazing at the empty place on the sidewalk where she'd been.

I checked in my pockets, confirming that my stash of ill-gotten cash had dwindled to a few small coins I suspected even beggars would turn up their noses at. Both of my feet hurt from running on cobblestones and the occasional tree trunk or rock.

There I stood in Edwardian London,

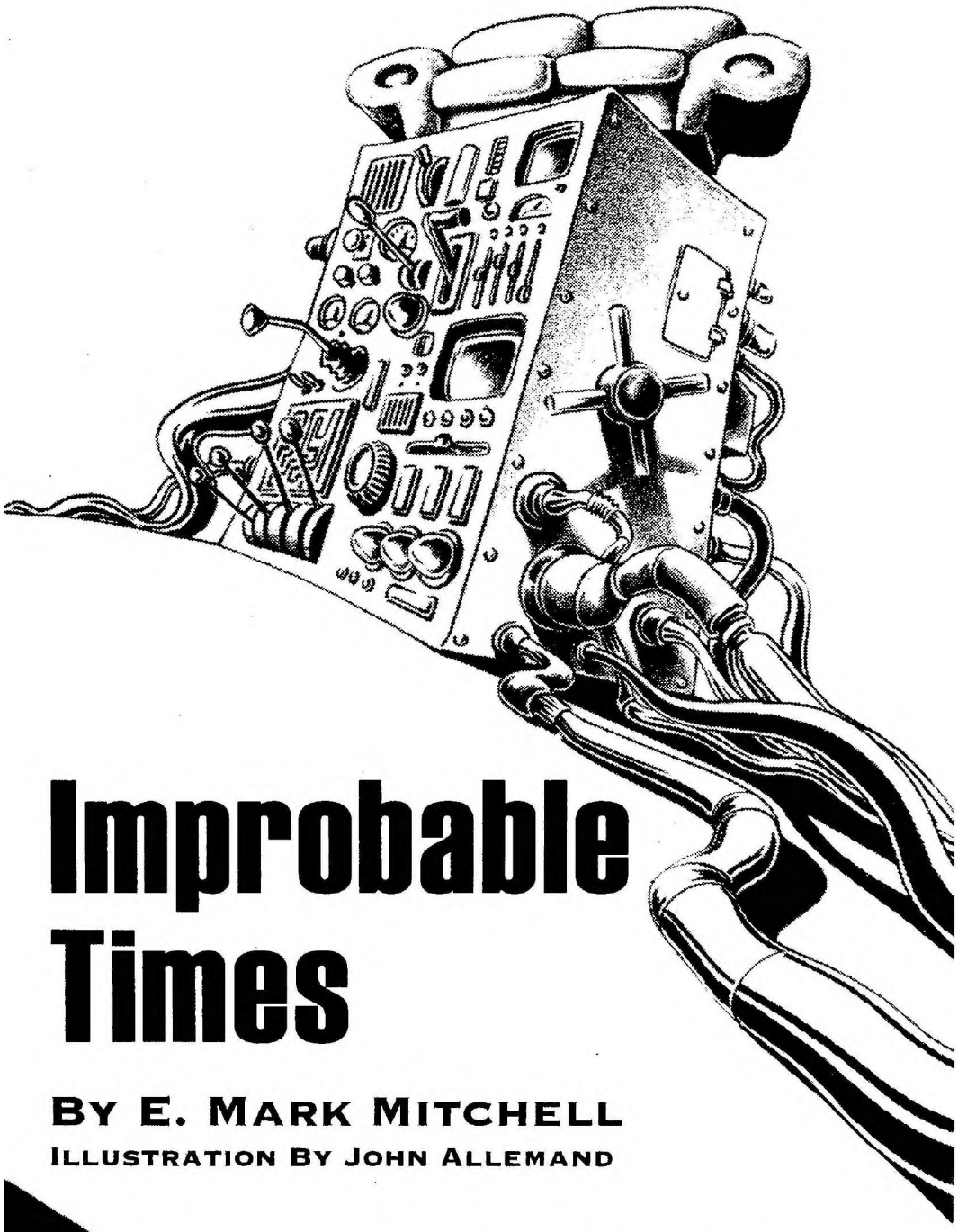
with no money, no girl, and no shoes, doubtless being sought at this moment by numerous Sherlock Holmes-wannabes from Scotland Yard. Hail the conquering hero.

"Jeannie, prepare the jump back home." Maybe I'd be able to hit up my friends for contributions to pay for my trip here and back. Bill sure as heck owed me some, but professors didn't tend to have large bank accounts and he might not even remember the entire incident. "And look up any organizations that might give me some sort of reward for saving London and ensuring Hitler's defeat. That ought to be worth something."

"You will have to convince them that the history they know is the result of your intervention," Jeannie reminded me.

"I know. Hopefully they'll accept your files on this trip." When you're a temporal interventionist, history is what you make of it, but you usually don't make enough from making history. I faced east, where a gradual lightening of the night sky foretold the Sun still rising on the British Empire. "Let's go home, Jeannie." ■

(EDITOR'S NOTE: Tom and Jeannie have previously appeared in "Small Moments in Time" [December 2004].)



Improbable Times

BY E. MARK MITCHELL

ILLUSTRATION BY JOHN ALLEMAND

Remember the Chinese curse about living in interesting times?

Bill knew there was trouble when he found a live trout in his briefs. It was getting his arbitration notes all wet, flopping weakly around the inside of the briefcase. A small example of the rainbow species, he judged. He blinked at it. It gazed back at him with one expressionless goggle-eye, and steadfastly refused to disappear like an obedient hallucination. The odor of fresh fish and river water wafted gently out into the air-conditioned meeting room, causing his client to furrow his brows in confusion. Bill gently closed his briefcase.

He couldn't do anything for the poor fish, and he certainly couldn't hand over those waterlogged papers to anyone; his reputation for oddity wasn't helping his business, and he didn't want any more stories to spread. He did the only sane and careful thing he could do.

He asked to reschedule.

Back in his cheap little car, windows rolled down to the spring warmth—rare in Chicago—driving distractedly in the general direction of home, Bill mulled over what could have happened. Occasionally, at a stoplight, he would raise the lid of the briefcase sitting in the passenger seat and take a peek at the trout. It always seemed to be looking back at him as if to say, "Don't ask me, I'm just as confused as you. Plus, I'm dead."

Spontaneous generation? Could random subatomic particles have just decided to come together into the form of a fish? No, even if something so cosmically unlikely were to happen, the water would have been too much to ask. Teleportation, then? That seemed to fit the evidence: seemed like the poor guy had been just swimming along, minding his or her own business, and then *bam*, shoved into a hostile alien environment with a lawyer. Bill automatically rejected the idea that the fish might have teleported itself: even if it were capable of doing so, nobody would willingly go to a place where they couldn't breathe. Similarly, the idea of divine intervention didn't make a big impression; whatever god or gods may exist rarely operated in such a direct and dramatic fashion these days. So, who would have done this? And why? And how? He settled in behind a moving truck to think, letting the big vehicle govern his speed.

Bill swiftly came to the conclusion that he just didn't have the kind of data he needed to figure this out. He needed someone with a deeper understanding of the esoteric, he needed someone who might know something about teleportation and spontaneous appearance and ...

The back doors of the truck flew open spontaneously, fractured pieces of the ruined padlock banging across his hood and fetching up against his windshield wipers. He stood on his brake pedal, skidding to a stop just as the huge, ugly, very solid-looking sleeper couch, a monster in pink brocade, toppled out of the truck, slamming onto the pavement scant inches from his front bumper. He blinked at the couch as the truck stopped, and burly men hustled back to apologize to him. He ignored them, turning to mutter to the trout, "You know, I think I know just the guy who might be able to help." He backed up and made a U-turn, leaving the relieved movers behind.

The air of the research facility was cold, sanitized, and smelled vaguely of ozone. The décor reflected the same sensibility. Mostly. Bill arrived in the office suite Greg shared, pushing open the nondescript door, and was confronted with a huge, heavy, pink brocade couch and an equally huge, heavy, and pink receptionist. The former looked like the more pleasant conversationalist, and the latter seemed to have more comfortable padding. Nevertheless, Bill announced himself to the woman and took a seat on the couch, which was disturbingly like the one that had almost made his subcompact a sub-subcompact. He was told

Dr. Greg was on his way.

In typical fashion, it took Greg another fifteen minutes to arrive. The man seemed to operate within his own personal time-space continuum. Bill had just identified which "Far Side" cartoon lady the receptionist most resembled when Greg bustled through the hall door, hands full of metal and plastic and circuit boards and trailing wires. He plopped the mess on the receptionist's desk and strode toward Bill, who was still struggling free from the horrible sagging clasp of the pink couch. Greg drew Bill into his gangly, surprisingly strong arms and just about squeezed the life out of him.

"Binky!" Greg exclaimed. "It's been years!"

"...ack..."

"Oh, sorry. Happy to see you, is all."

"Please, Greg, don't call me Binky."

"What, your oldest buddies can't call you by your nickname?" Greg playfully jabbed Bill in the shoulder. Bill sighed; he never liked that nickname, and Greg was the only friend who still bothered to use it, but nobody could alter Greg's behavior, sometimes not even Greg.

"Skip it. Good to see you, too."

Greg draped his arm over Bill's shoulders and steered him down the short hallway toward his personal office. "So, what brings you all the way out here? Need some legal advice?"

"Very funny. No, there's something unusual going on, and I wondered if you might have any ideas."

"I always have ideas." Greg was a genuine genius, with wide-ranging skills and knowledge, almost none of it useful in day-to-day life. He could barely heat soup, and his wife had banned him from his own kitchen after the one time he took apart the new microwave to see if the wavelength emitters were adjustable. Were it not for his wife's efforts in clothing the man, his entire wardrobe would resemble either the fluorescent eyesore that was his tie or the pink couch in the reception area. He was not one to ask about an everyday problem. But deep theory, abstract thinking, technical operations—that was where he lived most of the time, that was his true passion. If anyone could help Bill solve this mystery, it was Greg.

"First off, how do you feel about fish?"

They both stared at the trout, sitting in the middle of Greg's desk. Most of the water had evaporated, and it was getting a touch stinky. Still, it stared accusingly back at them.

"Okay..." Greg said slowly. "Okay. Eliminate the impossible. Whatever remains, however... improbable," he hesitated slightly on that word, "must be the truth."

"Sherlock Holmes's credo. And good advice in my profession, as well." Bill shifted his gaze to Greg's face. "But if you eliminate the impossible, the whole problem goes out the window, and that's obviously not going to help."

"It's not that, it's... well, I suddenly thought it might relate to the project I'm working on."

A kind of tingle started at the base of Bill's neck and put slivers of ice between his vertebrae. He kept his voice calm, though he wanted to yell. "Greg. What is it that you're working on?"

Greg leaned back, steepling his fingers. "You were always a widely read guy, for a law major. What do you know about branching universes?"

"Hmm. I read a Robert Anton Wilson book about them once, lots of sex but some physics, too, right? Something like, for every possible outcome of a given decision, a new universe splits off from the original, or something. Einstein and a couple of other guys didn't like that very much, as I recall..."

"That would be Einstein, Podolsky, and Rosen. I think you've got the basics, though you're glossing over a great deal..."

"Quantum physics isn't my strong point."

"True, true..." Greg suddenly leaned

forward. "Look, there are innumerable mysteries in this world, particularly in physics. We don't even actually have a theory that completely explains all the intricacies of how electricity works, and we've been playing with that phenomenon for more than a hundred years. Point is, there's a lot of usefulness in just researching the basics, finding out why very simple things happen, and then seeing what you can do with them."

"Greg, you're starting to scare me."

"Look. I'm just saying that what we're doing here is essentially basic research, not necessarily intended to develop a specific technology or anything. It's about finding out what makes the universe tick."

"Greg, if you don't start explaining to me what the *hell* you're talking about, I'm going to take my fish and . . ." Bill didn't have anything to follow up with, so he stood up and took the trout and put it in his pocket.

Greg stood, hand out. "Binky, wait!" He paused, then tilted his head. "Want to see it?"

It was a large, blocky machine, not unlike an old-time industrial boiler, in a huge sterile room; Bill had to put on a smock and booties and go through an anti-static hallway to even go through the door. While most of it held blank metal plating, one whole side was covered with displays and keyboards and monitors. Bill circled it, stepping over cables and pipes. It was an impressive piece of work. "What does it do?"

"Gives us glimpses into branching universes."

Bill stopped. "Okay. How."

"Have you done advanced post-doctoral work with subatomic phenomena? No? Then I imagine my explanation wouldn't make much sense. Suffice it to say that, for a brief time, we can examine several different 'option paths' from a given phenomena. I'm framing it as a proof of the Everett-Graham-DeWitt many-worlds theory, which can be interpreted to say that anything that can happen, does happen, given enough branching universes and the proper probabilities."

"Probabilities?"

"Sure! Look, everything you do could create a branching universe. Whether you scratch the itch on your nose with your right hand or left hand, or even your index finger or thumb, creates a whole new set of universes, or timelines, if you will, in which all possible options are explored. We organize them in order of probability. We figure most options don't have much impact on the probabilities of other actions, and so most branches stay pretty much along a single timeline, perhaps bundled together like wires in a cable. That's the metaphor we're using, at least . . ."

"Stick to the point, Greg."

The scientist grimaced, cleared his throat, and continued. "However, some choices have significant impact, and spin timelines off in completely different directions. Can you imagine? Sufficiently developed, we could use this technology to find the perfect outcome of any given choice . . ."

"Um . . . hold it." Bill had to break in, before Greg went off on one of his sweeping quasi-philosophical monologues. "What can you tell me about side effects?"

"Er, none. The effect is limited to within this machine."

"I think Mr. or Ms. Trout would have something to say about that. I'm thinking your machine has done something to screw up the universe, started messing with probabilities."

"That's crazy."

"So is having a trout spontaneously appear. Or at least, it's very improbable. Why couldn't you just put a cat in a box and see if you could turn it into a probability wave, something normal like that?"

"Because that's Schroedinger. Related theory, but completely different guy. Schroedinger's major premise was . . ."

"Crikey!" Bill jolted as if he'd been

shocked. "I need to feed my cat! I got so caught up, I never made it home. Come on, tell me why I'm wrong in the car; you're not off the hook, yet."

"Hope your cat likes fish . . ." Greg looked significantly at Bill's jacket pocket.

"Oh, no. This is evidence. Come on."

Outside, where Bill's subcompact had been parked, sat a big SUV. The parking lot was nearly deserted, and there were no other cars nearby. Bill noted the SUV wore his license plates, and his key still fit the lock. The seats were incongruously covered in hideous pink brocade; Bill couldn't help but think it seemed familiar, somehow. He power-unlocked the doors, and Greg eased into the passenger seat, wincing at his surroundings. Even in the dimming evening light, the upholstery was punishing.

"Still think I'm crazy? I hate these sport utes; now my car's turned into one, and I'm probably stuck with it unless we can stop whatever it is that's happening."

"The only thing that makes me think you're crazy is this color scheme. Seriously, Binky, what were you thinking?"

"Don't call me Binky," Bill growled, as he pulled out of the parking lot. "It's bad enough this fat car makes my head look small . . ."

None of the customary yowls greeted them as they entered Bill's apartment. Further, Bill immediately noticed someone had been redecorating.

"Dear God," he said, gaping at the monstrosity. "How did that even fit through the door?"

"Oh, I get it," said Greg. "You had your car interior made to match your couch." He paused. "Actually, I don't get it. That's just plain odd, man. Even I know that."

"I didn't do any of this! This pink couch is following me, ever since the trout."

"Whatever you say, Binky, it's your theory."

"Which you weren't able to convince me out of. And don't call me Binky, please."

"Can you just feed your cat? Deanna's going to kill me as it is."

"Give her a call; phone's in the kitchen. Tell her I said hi."

Bill glanced in all DaVinci's usual hiding places in the living room and bedroom, but the fat tabby was being unusually devious. The food dish by the bathroom was nearly untouched. He added some wet food to the dry kibble in the bowl as a kind of apology, and stepped into the hall to track down Greg. The physicist was standing in the doorway, speaking Japanese into the kitchen. As he approached, Bill glimpsed an elderly Asian man in a bathrobe, standing in a room that looked nothing like the one that was supposed to be there. And there was a glimmer of sunlight in the far window. As it had gone completely dark on the drive over here, Bill knew it was wrong, wrong, wrong.

"Binky, this guy wants us out of his kitchen. I thought you lived here."

"Yeah, and I thought it was night, as well. Make our apologies, and let's go. This is very, very wrong."

Bowing low, they backed out of the kitchen, and turned to find DaVinci. At least, the collar on the growling Rottweiler had that name emblazoned on it. Saying "nice doggie" only worked for so long; Bill had to sacrifice his wobbly-headed "Mr. T" figurine before they could escape into the hall.

"I thought you had a cat, Binky."

"Don't . . . ah, forget it. Let's go."

It started to rain as they drove back to the research facility. "Okay, let's break it down," Bill muttered. "I start with a fresh trout in my briefcase, then I start seeing the couch. Then this blasted giant sport ute. Then the apartment and Japan. Obviously, it's escalating, and things are just getting weirder. Why me?"

"Why not you?" Greg wondered. "I mean, perhaps it's just because of your

relationship to me. I've been the only one running tests today."

"That does seem to fit. I wonder if anyone else is having problems."

"Well, of my friends, you live the closest. Deanna and I live farther out, now. I've got Bruce and Julie's number back at the lab; we could call them, see if anything unusual is happening there."

"If we get back to the lab . . ." Bill trailed off. Snow was gusting across the road, and was swiftly piling into drifts. Chicago weather was unpredictable, but this was ridiculous. He began to think they would have use of the SUV's four-wheel drive soon; finally, a good use for the damn things. The snowfall was getting thicker by the second, a sudden blizzard in late April. "I really don't like the looks of this. I can barely see the road."

"Shapes ahead," Greg said, squinting into the swirling white. "Is that a horse?"

Indeed, a smallish horse galloped out of the snow, its fur-clad rider brandishing a sword. The metal of the blade shone wickedly bright in the headlights. Greg screamed, and Bill swerved away. He heard a metallic impact, then noticed the side mirror was suddenly missing. More riders on ponies could be seen in the snow. The SUV seemed to have left the road and buildings far behind; there was no curb, no structure, nothing to stop Bill from swinging the vehicle around and flooring it. Greg twisted to stare out the back window; Bill kept glancing in the rear-view. A few scattered dinging noises across the back announced hastily fired arrows bouncing off the roof.

"Mongol raiders, it looks like," said Greg with wonder in his voice. He turned to face forward again. "Winter weather. Mongols . . . can't be happening."

"Tell that to Genghis Khan," Bill muttered, peering through the snow to find a destination—any destination. The city seemed to have vanished, and he had no idea where he was going, but as long as he was fleeing the Horde, he was happy enough.

"Look out for that . . . thing!" Greg yelled helpfully. Bill twisted the wheel, trying to see what Greg was reacting to. The SUV skidded to one side and, as expected, started to tip. As the world angled sharply, Bill finally saw it: a huge, hairy pillar of a leg. He saw a flash of a long, curved tusk, and had time to think "mastodon!" before the SUV fell on its side.

A face-full of cold air and wet snow roused Bill as Greg pulled him from the vehicle. "Come on, Binky, get up," Greg shouted over the wind, "Kubla is almost on top of us."

"You're thinking Coleridge, not Mongolia," Bill said blurrily. "Pleasure domes and whatnot. And don't call me Binky."

"Geez, even with a concussion, you're a cranky bastard," Greg said, as they stumbled through the blizzard. Snow-muffled hoofbeats approached behind them, and adrenaline helped Bill regain his senses. He couldn't see more than a few feet away, and there didn't seem to be any sort of cover. Greg, however, pointed ahead and yelled, "Over there!"

"I can't see it!" Bill yelled back, even as they waded in the direction Greg indicated.

"Me neither! Wind sounds like it's going across something, though. Might be shelter." Aerodynamics was another of Greg's interests. A large mass, a pile of snow-swept rocks, became visible. Bill was too concerned about getting killed to feel the cold, but his teeth were chattering by the time they reached the pile.

"At least we can put our backs against something when they kill us," Bill said, glancing about for a stone small enough to heft. He was a lawyer, not a medieval warrior, but he wasn't going to go down without a pathetic show of resistance. "Was that really a mastodon back there?"

"Yeah. I almost stepped in a dropping earlier. I think there's a cave over here," Greg said, moving along the side of the pile. Bill charged after him, wading

through the accumulating snow. Yes, it did look like a cave, or at least a sheltered indentation in the rock. They heard the snorting of a horse behind them. Dull powdery thuds announced the coming of the warrior. Bill stole a glance, and nearly panicked, the man was so close. He found himself unable to breathe as the sword blade, glinting in the distant light from the tilted SUV, swung inexorably toward him. Then Greg grabbed him and half-jumped, half-toppled toward the cave entrance. The Mongol's sword whistled past Bill's face as the pair fell into the cave, and he closed his eyes in relief.

Of course, it became a problem when they kept falling. The quasi-weightlessness of being in mid-air never went away. Bill opened his eyes and saw daylight first, then a wide, flat, misty surface far in front of him second. He realized it was the Earth, as seen from a great height. The falling sensation was thereby explained.

It made perfect sense. He felt like he was falling, because he was. Skydiving without—yes, indeed, he wasn't wearing a parachute. It made at least as much sense as encountering the Mongol horde. He tried to imagine the look on the warrior's face when he and Greg had disappeared; it must have been pretty amusing. He found himself giggling, and then realized he couldn't stop. He spied his trout floating—no, falling—in the air not far from his head, falling at the same rate, and that made it funnier, somehow.

Greg, of course, snapped him out of it by grabbing hold of his arm, and swinging around so they were facing each other. "I'm beginning to think you have a point about the Probability Device."

Bill's vision faded out for a moment, and when it returned, he was throttling Greg, the scientist's face bright red while he pried Bill's fingers off his windpipe. Reluctantly, Bill let go and glanced around. The ground was coming up awfully fast; they didn't have much time left. Neither man panicked—they had been through so much in such a short time, their impending deaths merely filled them with resignation.

"I wish we had more time to get to the bottom of this," Greg said, barely audible above the rushing of air past them. Bill forgave him the regrettable metaphor.

"Well, maybe we'll hit something soft, give us a few more seconds to think about the problem," said Bill, though part of him wished the opposite.

As the ground got dizzyingly close, Bill shut his eyes against the inevitable.

They landed hard on the lumpy cushions of a horrible pink brocade couch. Contrary to their expectations, they were not immediately smeared and/or ground into the upholstery. They actually bounced a moment and settled, as if they had fallen from the top of a coffee table rather than the top of the cloud layer. They sat and savored their salvation for a moment. Then, with a wet, meaty *thwock*, the trout landed squarely on the most sensitive region of Bill's lap. He crumpled forward in silent pain, falling off the couch.

"Some kind of cavern," Greg said, looking around while Bill whimpered softly. "Don't know where the light's coming from." He looked up. "I also don't see the hole we fell through. Did we just pass through the ceiling?"

Bill was lying on a metal plate, and as he slowly recovered, he noticed it was vibrating ever so slightly. He pushed himself up, slipping the trout into his jacket pocket. "It's humming. It's a machine!"

"It's the Probability Device," Greg said solemnly. And it was, of course. They stared at it for a while. It made no sense for it to be here, but then again, Bill thought, what had made sense since this whole thing started? They climbed down and stared some more.

"Okay, now what?" Bill asked.

"Should I try to make any adjustments?"

"Don't touch it! We don't know what would happen!"

"Maybe if I shut it off, everything will go back to normal."

"On the other hand, maybe everything will be locked in as it is, unable to change back again."

"Shouldn't we test that theory?"

Bill threw up his hands. "Test the theory, test the theory . . . I swear, if I had a dollar for every time you've said that . . ." He trailed off, staring at his right hand.

After waiting a moment for the rant to continue, Greg sensed something was wrong. Bill was gazing at a stack of crisp, new dollar bills sitting in his palm. Greg snapped his fingers and laughed out loud, startling Bill so much he almost dropped his money. "That's it!"

"What's it?"

"We're the observers! The quantum indeterminacy is affected by our knowing it's going on; that's one theory we weren't taking into account!" Greg practically danced a jig. Then he swooped over and gripped both of Bill's arms, smiling. "The observer, Binky, the observer! Nick Herbert, Roger Penrose! Von Neumann may have had it right after all!"

"Schroedinger, I thought. And don't . . ."

"Well, yes, the cat too, but it applies to Von Neumann's theories. An observer affects the outcome."

"But we may be the only two people who know what's going on," Bill said slowly, "so we're the only ones really qualified to observe . . ."

"Which means we have a certain amount of control." Greg looked up toward the ceiling. "I imagine I'll find a box of jelly donuts around the corner of the machine." He half-jogged, half-skipped around the corner and shouted for joy, returning with half a jelly donut hanging out of his mouth. "Point proven," he mumbled, spraying crumbs.

Bill felt a surge, but as his thoughts continued, it drained away. "Hang on. I didn't dream up Mongols, or skydiving. Nor the trout, for that matter." He touched his pocket reflexively; yes, the trout was there. "So we may have influence over what happens, but we aren't originating it. So we can't fix it unless we can figure that out."

Greg stopped smiling, though he kept chewing. "Honestly, I don't know if we can do that. I don't know if it's possible."

"Me neither."

"Excuse me," said a tiny muffled voice. Bill and Greg looked around wildly. When it spoke up again, it sounded like it was coming from Bill's pocket. "Excuse me, please."

Bill pulled the dead trout from his pocket, and peered at it. Yep, still looked dead. "Um, hello?"

"Yes, hello," the trout said. It didn't move, remaining as dead as before, but the soft, androgynous voice issued forth from its gaping mouth, nonetheless. "I'm sorry to intrude, but I think I might have an answer."

"But you're a dead fish!" Greg objected.

"At this point, are you really surprised?" Bill said.

"Exactly. Reality is so chaotic by now, I'm the least of your worries," the fish said. "You're both concerned that you can't figure out how to control it, but the effect itself gives you an out, if you're willing to ask for help."

"So," Bill said slowly, "we can ask to speak to a friendly intelligence that can provide us with answers . . ."

". . . By using our position as observers to make it possible," Greg finished. "Of course!"

"You're a very smart fish, you know." Bill said to the trout.

"I can't take credit," the trout said, "it's this whole mess that gives me the capability. Plus, I'm dead, so I have a certain perspective. But thanks."

"I'd imagine, if we were to find a door over there on the opposite side of the cavern," Greg said, "that it would lead to

a friendly being sympathetic to our cause who would be able to help us shut this effect down and return everything to normal."

"I agree," said Bill. "Lead on."

They walked around the Probability Device, and found a portal. It wasn't a door as they recognized it, but rather a metal iris in a black frame. They looked at each other, then Greg shrugged and stepped toward it. It slid open from the center as he approached, releasing a blast of chlorine-scented air into the chamber. Greg lurched back, coughing, and the two men fled to the far side of the cavern. The iris closed smoothly.

Bill shook his head. "I suppose we should be more specific. That door should lead to a friendly being sympathetic to our cause, able to help us put everything back, who we can talk to and whose environment won't hurt us."

"Seconded. Do you think it's safe to go near it?"

"You're the scientist. But considering how it smells like a pool in here, I'll bet the chlorine has dissipated enough. Tell you what, I'll go."

"Should I hold on to the trout? You know, just in case?"

Bill arched an eyebrow. "It's dead, Greg. You think air is going to hurt it?"

"Good point."

Bill walked across the chamber, stepped up to the door, and held his breath. One large step, and the iris opened. A cautious sniff revealed nothing more than cool, sanitized air, not unlike the atmosphere inside Greg's research building. The passage curved left after the first dozen or so feet, but it looked safe enough. Bill waved to Greg, and the two of them stepped through the portal.

"Long tunnel," Bill finally said, breaking the silence. They'd been walking for half an hour through a semicircular tunnel apparently carved through glassy obsidian, with little greenish light bulbs spaced every few meters along the center of the curved ceiling. There were no branches, and no change in angle after that first turn.

"I feel like something's dragging on me, but I can't pinpoint the exact sensation." Greg turned to the fish in Bill's hand. "Hey, um, trout, do you know where this tunnel is going?"

"Hey, I can talk, sure, but that doesn't mean I'm clairvoyant," the fish said, somewhat testily. "Why do people always think the dead have supernatural powers?"

"Um . . ." Bill started to answer, but thought better of it. For just then, a fourth voice boomed through the air, deep and powerful and electronic, like James Earl Jones crossed with a Speak-and-Spell.

"Approach, humans. I have found your language, and I am now able to communicate."

They paused, waiting for something to reveal itself, but nothing else happened. They looked at each other, shrugged, and kept walking. Another half-hour and they noticed a variation in the lights ahead. Eventually, the passage opened up to a large chamber. The opposite wall held a single luminescent blue tube, and in the center sat a large pink brocade couch.

"Sit, humans, if you are tired. You have come a long way." The voice seemed to come from the blue light, but it filled the entire space.

"Thanks," Bill said, crossing to the couch and taking a seat. He didn't want to seem impolite. "My trout suggested you could help us."

"Yes. Your experiments have caused physical reality to revert to a primordial formlessness, easily malleable by the energy of intelligent thought."

"Could you tell us what we did to make that happen?" Greg sat on the arm of the couch, leaning forward, enraptured.

"It was a fluke; specific neutrino and tachyon interference with your probability experiments at precisely the mo-

ment necessary to set up the reverberations in the local subatomic particles. The effect spread out naturally from that epicenter."

"Oh, naturally." Bill kind of followed the voice's explanation, but it was way too calm and matter-of-fact to be talking about the breakdown of reality. "You said the effect was malleable to thought. Why did it respond to our words, and not just our thoughts?"

"Language is intelligent thought given physical form."

Bill waited, but no more was forthcoming. "Ah. I see. Well, then, can you help us put everything back to normal?"

"I cannot cause your reality to resume its previous form. Once released, primordial formlessness cannot be completely bound again."

Greg groaned. Bill thought of DaVinci, his apartment, his whole life. All gone, by this time. He hoped the DaVinci dog had at least chewed on a Mongol . . .

"However, I can return you to your time period before the event occurs. You would replace your earlier selves, and could thereby alter the timing of the test. Starting a microsecond earlier or later would be enough to throw off the fatal interaction."

Greg blinked. "Would we run into problems again?"

"Unlikely. Your discovery, while interesting, is not cost-effective, and has no foreseeable practical development with the current methodology. Your funding will be cut within the year." Greg flinched. "Besides, you are more likely to start another baby universe with your experiments than you are to experience another confluence such as the one that started this."

Bill noted the voice didn't provide any specific probabilities on either occurrence, which was worrisome. Then he registered something the voice *had* said. "You said 'our time period.' Are we not currently in our time period?"

"In order to speak to an intelligence capable of helping you, it was necessary for you to come forward in time approximately 1.3 million years."

"Million . . ." Greg just about fell off the couch.

"Before you ask, I cannot tell you anything about this world, or the fate of humanity. I will say that you both have achievements yet to make, particularly you, Doctor."

"But . . ." Greg started, but the voice abruptly cut him off.

"I am starting the process now. You may experience observer-based side effects for a short period, but it will pass." The blue light was getting hazy; in fact, everything was graying out, from Bill's perspective. In a few moments, subjectively, he was awoken by DaVinci the cat in the usual way, with the feline sitting on the human's head. It was the morning of the previous day, and there was more than enough time to make things right.

The next evening, instead of fleeing Mongol warriors, Greg stopped by Bill's apartment.

"Hey, I've got a couch like this in my office waiting area," Greg said, as Bill brought him a beer.

"Yeah, it seems to be a leftover. It's too big for me to move it out; believe me, I've tried. So I guess I'll have to get used to it." Bill turned on the TV, muting the sound.

"I don't remember that fish tank being there."

"No, that's new. It's the least I could do to say thanks." Bill grinned at the small trout swimming in the large tank. With no predators, no fishermen, and no competition for food, he hoped the trout would enjoy a long, content life. As far as trout go, at least.

"But how did . . ."

"Wait, hold on a second." The lottery drawing was coming on, and Bill pulled out a ticket. "I don't know if simply stating that I was buying the winning ticket was enough, so I've got to focus." As the announcer was giving the warm-up, Bill

started chanting his lottery numbers softly, under his breath. Greg's eyes widened as, one by one, Bill's numbers appeared on the little balls that popped out of the machine. Bill put his ticket back in his pocket, smiling.

"You just won sixty million dollars!" Greg gaped.

"Unless I have to share with someone. Which I am, by the way; I'm cutting you in for half. There's a big chunk of taxes, and they pay it out over the course of years, but still . . ."

"But how did . . . Binky, you just . . ."

"And don't call me Binky."

"But Bill . . ." Greg paused. "Bill . . ." His brow furrowed. He raised his chin and said, carefully and distinctly, "Bill." The scientist blinked quickly. "I can't say it. Every time I try . . ."

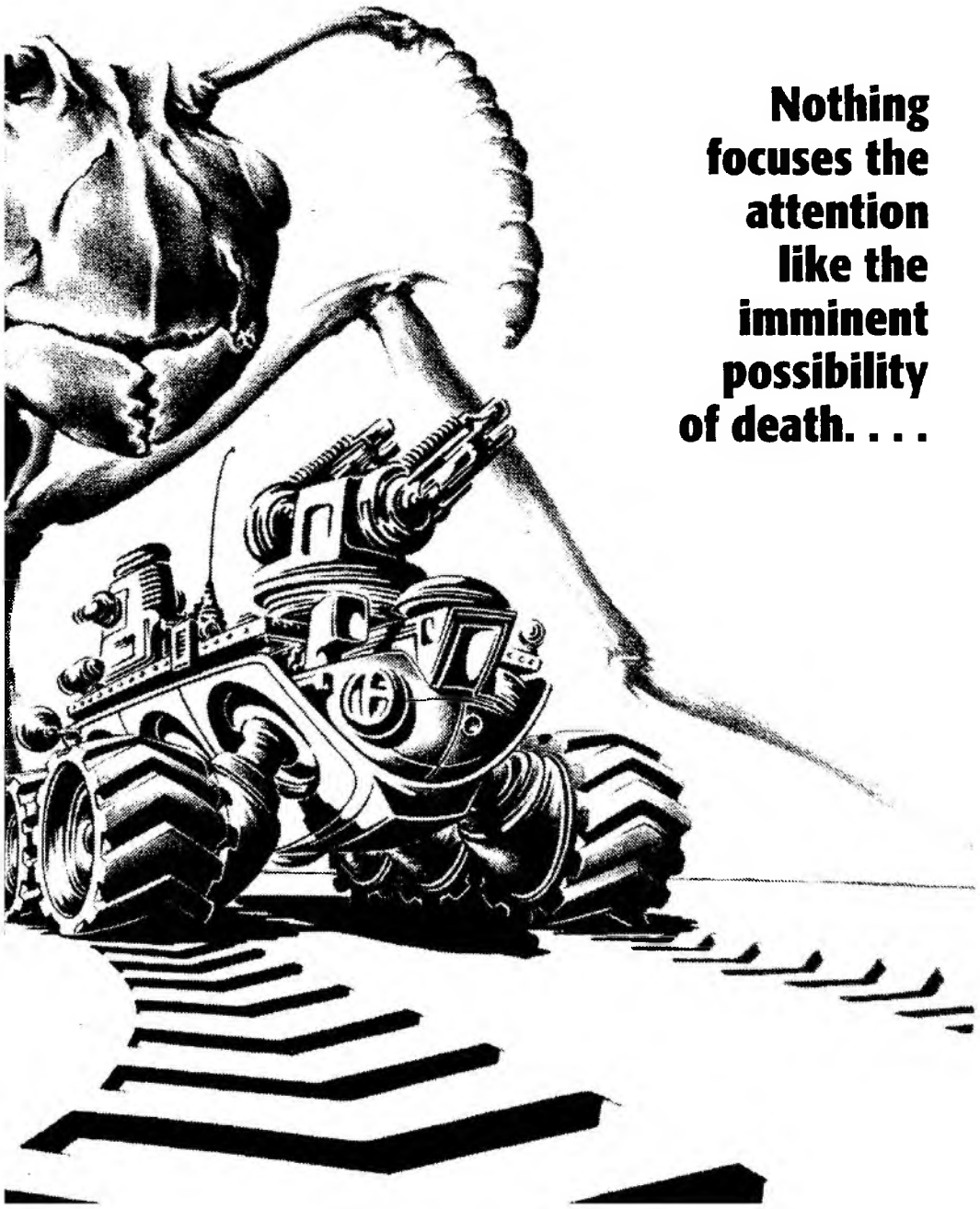
Bill grinned even wider, and held up a hand to quiet Greg's babble. "You remember when the voice said something about observer-based side effects lingering for a short time?" He glanced significantly at the fish tank, and then patted his pocket.

"You mean . . ." Realization dawned on Greg's face. It was a wonderful thing to see.

"You want to call your wife? Maybe she wants to come out with us tonight. Better hurry; we don't know how long this will last." ■

This Little World

By Carl Frederick
Illustration by John Allemand



Nothing focuses the attention like the imminent possibility of death. . . .

It was raining on Planet K. In a mere sixty seconds, hundreds of drops had poured down, washing away about a third of the indigenous population. Walter Anders, the planet's designated god, worried for his job.

"The bounded waters should lift their bosoms higher than the shores, and make a sop of all this solid globe," he said as he scooped up some freely floating globules of water laced with ants. "*Troilus & Cressida*, Act 1, scene 3." He deposited the soggy ants back onto the medicine-ball-sized planet, his hands tingling from the electrostatics that served in place of gravity on the small sphere.

But it wasn't the rain that troubled him—at least not nearly as much as the lightning.

Awkward in his magnetic boots, Walter clomped to the door connecting the studio to the control room. He shook his head. Even after a week, it was still hard to think of the two small adjoining cabins as a movie production site.

As he unclipped the lightning generator's ground from the float handle under the lock panel, he noticed the lock's "Set Combination" display was lit. He grimaced. Maybe using a ground so close to electronics had not been a great idea. "If K.V. wanted lightning," he said aloud, even though, except for the ants, he was the only living soul in the studio, "why couldn't he just add it in post production?"

Startled by a pounding from without, Walter swiveled around and slapped the "Open" button.

The door swung away. Chief Engineer Robinson, scowling, stepped into the studio. "Didn't you hear the door-chime?"

"No," said Walter. "There was no chime."

Robinson glanced at the lock panel. "My combination didn't work. Yeah. Something's wrong." He tapped a finger on the lock display, but without effect. "Engineering reported a power surge down here." He looked up at Walter and then at the meter-diameter sphere in the middle of the room. The "planet" was at the center of an aluminum tetrahedron, some two meters high. At each vertex, an air jet sent a gentle flow onto the sphere, keeping it from drifting and providing a planetary wind that could possibly equate to weather. Robinson walked over and batted at a few of the tiny water globules that engulfed the sphere. "What the hell happened here?"

"A rainstorm," said Walter. "Rehearsing a shoot. And K.V. wanted a storm, replete with lightning."

"Jeez." Robinson gazed at the globe, alive with ants scurrying about on the surface. "They look half drowned."

"The storm got a trifle out of control."

"I'll say it got out of control." Robinson spread his arms. "My gosh. Did you expect a Noah of the Ants to rise up and build an ark?" He spun around. "Lightning? What do you mean, lightning?"

In haste, Walter considered his role; should he play "wounded innocence" or "astonished observer"? He chose the former and then described what happened—ending with a theatrical sigh.

Robinson nodded, then examined the lightning generator, rolling it over in his hands. "I can't believe they'd space-qualify a device like this." He slapped the little generator back onto its Velcro bulkhead fastener. "That little gadget is probably the cause of the power surge—and our lock problem, too."

"Regrettable," said Walter, "but we need it for the shoot."

Robinson leaned against the table jutting from the bulkhead—an action of ritual rather than comfort in the

gravity-free environment. "Amazing, what we have to do for funding," he said, more to himself than to Walter, "tourism, high-tech billionaires having a fling, and now a movie production company." He rubbed a hand across his forehead. "21st Century Flix filming their next megahit, 'The Planet of the Ants'."

Walter laughed. "And with a director, my boss, who thinks he's master of the universe."

"I sympathize," said Robinson.

"Oh, you've met him?"

"God's gift to the space station?" Robinson chuckled. "K.V. is a hard person to miss."

"I dote upon his very absence," said Walter. "*Merchant of Venice*, Act 1, scene 2."

Chuckling again, Robinson headed for the doorway. "I'll see what we can do about the lock," he said. "And don't use the lightning generator again until I'm convinced it won't wreck the station." He stepped through the door from the studio to the control room. Walter accompanied him.

"Why are you guys shooting your film up here, anyway?" said Robinson. "Wouldn't computer graphics have been cheaper?"

"Much cheaper. But the publicity we get by shooting live on the space station is priceless." Walter stamped down with a magnetic boot, making more noise than was necessary. "K.V. lives and breathes publicity."

"Hard to believe he'd come to the space station just for publicity."

"Do believe it," said Walter. "We're only shooting stock background shots. There's no reason for him to even be here." He closed the studio door behind him and followed Robinson through the tiny makeshift control room and onward to the outer hatch which opened onto the space station's central corridor.

Robinson glanced back around the cabin. "What is all that stuff?" He nodded toward two chairs with joysticks on their armrests. They had seatbelts and they faced twin computer monitors. "Looks like a big video arcade game."

Walter waved an arm expansively, indicating the entirety of the tiny cabin. "This vast vestibule is our control room." He walked to one of the chairs and waved Robinson over. "This *is* a game controller of sorts. It controls a planetary exploration vehicle—a 'rover'. Tiny little thing." Pointing toward the doorway to the studio, he added, "It's on the surface of the globe in there—Planet K."

"Cute," said Robinson. "But why two?" He walked over to the second console.

"The rovers have high-resolution motion picture cameras." Walter threw a switch on the console, and an image appeared on his console display. "This is the terrain close up, at planet-level." He slipped his hand over the controller and the image moved. "So yes, two rovers. One to film the actions of the other."

Robinson leaned in and moved his hand casually over the buttons of the second rover's controller.

"Careful," Walter called out. "I wouldn't push that button. It fires one of the rover's guns."

Robinson drew back his hand. "Guns?"

"It is, after all," said Walter, "an action-adventure movie we're filming." He tried to strike a pose of "studied indifference," despite knowing that in zero-g, body language was a bit iffy.

"Jeez." Robinson stood upright. "Looks like fun." He headed toward the open hatchway while Walter went to the door to the studio.

"Oh dear!"

"Problem?" said Robinson from behind.

"Locked." Walter keyed in the combination but the door still wouldn't

open. "Yes. A problem."

His magnetic boots clanking on the metal decking, Robinson hurried over and peered at the lock control panel. "I'm embarrassed to say that I don't know much about these things." He shrugged. "We've never used them. In fact, you guys are the first who've ever asked them to be turned on."

"K.V's a bit batty about security," said Walter, looking over Robinson's shoulder. "The door. Can you open it?"

"The lock panel on the other side is probably stuck in 'Set Combination' mode." He straightened up. "If we knew the numbers on the display, we could key them in here. I bet that would trigger the lock mechanism." He pointed to a box mounted over the hatch to the central corridor. "I'll have Engineering switch on the emergency camera. Every cabin has one." Robinson turned to the wall-mounted comlink and activated it.

"Robinson to Engineering," he said. "We've a problem in the Flix studio. Could you turn on the camera in their inner cabin and read me the numbers on the lock display?"

"Yeah, okay. Standby," came a voice from the comlink. "Wait. We can't. The camera's mounted directly over the door. There's no way it could see the door's lock display."

"Jeez, you're right. My mind must be going. Robinson out."

Robinson snapped off the comlink. "Well, this really sucks, doesn't it?" He slapped his hand against a bulkhead. "I'm glad I left the outer hatch open. If your lightning blew the lock electronics, it might have blown the outer lock as well." He headed for the hatch. "Video arcade or not, being trapped in here wouldn't be much fun at all."

"One moment," said Walter. "Maybe we could use the rovers. They have cameras." He bounded to a console and strapped himself in. Then he looked over his shoulder at Robinson. "Want to have a go?"

Robinson, his hand grasping a float handle, looked over at the video monitors. "Yeah," he said after a few seconds. "Sure. I'll play."

"Splendid." Walter indicated the adjacent console. "Have a seat." He flipped on the two monitors, then bit his lip. "I hope we can do this," he said. "The rovers' cameras have very minimal pointing capability."

"Still," said Robinson as he belted himself into his seat, "we'll be on the surface of a sphere. There's got to be a position where the rovers can aim at the lock panel. Oh, wait." He unbuckled himself and floated to the comlink.

"Robinson to Engineering," he said after pushing the call-button. "Could you activate the camera in the Flix control room—I mean their outer cabin?"

"Yeah," said a voice from the comlink. "Okay. It's on."

"Do you have a clear view of the video monitors?"

"Yeah. Why?

Robinson explained the situation, then added. "And downlink the signal to Langley. Ask them to record everything."

"Will do, but they'll want to know why."

"They've got image processing software," said Robinson. "If we only get a fleeting shot of the lock panel, maybe they'll be able to deblur the image."

"Understood. Engineering out."

Robinson push-floated back to the console, strapped himself in, then grasped the joystick. "Okay, show me how to drive one of these things."

"Quite elementary." Walter gave a quick tutorial and then, their eyes on the overhead monitors, they maneuvered their little vehicles out over Planet K's terrain.

"I'll take the lead," said Walter.

"Lead on, MacDuff," said Robinson.

Walter gave a tight-lipped smile. *That's "Lay on, MacDuff."*

They drove in silence. Walter, engrossed in the landscape, was in no hurry. He drove his rover as if he were on a pleasure drive in the countryside. On the video monitor, he watched the progression of desert browns and the green of vegetation—mainly lichen and moss, but through the rover's eye, it looked like a primitive dense jungle.

"Needs music," he said.

"What?"

"Oh, just thinking. If we had a good director, 'The Planet of the Ants' might not be half bad."

"How did you get into this business?" said Robinson after a few minutes of exploring. "If I may say so, you don't seem the action-adventure type."

Walter laughed. "No, I'm not, really. In fact, I'm a recent graduate of the Royal Shakespeare Academy. I probably could have gotten a trifle better job, but this was the only way I could go into space." He looked from the monitor to the cabin's porthole where he could just see the gentle limb of the crescent Earth, luscious and blue-green against the starry black of space. "And there just didn't seem to be all that much demand for Shakespearean actors in the space program."

Robinson gave a soft laugh. "And what precisely is your job, then?"

"Second Unit Director. But actually, I'm the entire second unit." Walter struggled to keep his hand steady on the joystick. "A more accurate title might be, 'K.V.'s personal slave'." His finger hovered over the "Fire" button. "I wouldn't mind it if the man had any talent," he said under his breath.

"Yeah, I know," said Robinson. "K.V. Bushnell's sole qualification seems to be his father's money."

"The wealthy curled darlings of our nation." Walter pounded a fist against the seat's armrest. "*Othello*. Act 1, scene 2."

"You quote Shakespeare a lot."

"Only when under stress."

As they drove, the geography became less desert-like and the ground more clumpy.

"This looks like mud," said Robinson. "Probably the after-effects of your rainstorm. You know, if we get stuck, we can't just call triple-A."

"True." Walter moved his rover diagonally away. "Let's try a more arid route."

They headed toward drier land, and had just driven their rovers over a rise when they saw a circular valley before them. They halted their vehicles: the steep descent seemed impossible and the environment looked inhospitable.

Along the floor and up the sides of the little caldera, wisps of sand roiled, the fine mist of the grains making the scene look as if it were shot though gauze. Even though at rest, the rovers shuddered in what could only be a wind.

"Will you look at this?" said Robinson. "We must be under one of the air nozzles. I'll bet the air jets locking on the calderas keep the planet from rotating."

"I don't like it here," said Walter, turning his rover away from the caldera. "If our rovers roll over, we're dead meat." He smiled. "Virtual dead meat, that is."

Robinson steered his rover away as well. But no sooner had he done so, than he released his controller and cried out. "What the hell!" He stared open-mouthed at the monitor. "Is that an ant?"

The display screen filled with a big, jet-black head—antennae quivering and mandibles grinding.

"Just an ant." Walter chuckled. "I do hope the people who pay money to

see the film will have the same reaction."

As they watched, a few more ants came over.

"I think we'd better retreat," said Walter. "If they call over any more of their friends, it could get a bit dicey."

"Yeah."

Slowly, they drove the rovers in reverse, then U-turned and raced away.

When they'd made their escape and slowed their vehicles, Walter noticed a red glow in the sky. "Looks like a sunset."

Robinson focused his rover's camera out to infinity and the glow resolved into the red LED integers on the lock-panel. He gave a two-fingered victory sign. "Now, if we could only push the 'Set' button."

"Like one that stands upon a promontory and spies a far off shore where he would tread," said Walter, "wishing his foot were square with his eye. *Henry VI*, part III."

Robinson stretched back in his seat.

There came the sound of magnetic boots clanking against metal. "Who the hell left this door open?" The shrill cry came from the outer hatchway. "This is supposed to be a secure area."

Robinson jerked his head around. "Wait! Don't close the"—SLAM—"hatch."

"Hello, K.V.," said Walter. By reflex, he tried to stand as his boss came in, but his seat harness held him fast. Straining against the webbing, he pointed to the adjacent seat. "This is Mr. Robinson. He's—"

"I know. I know." K.V. crossed his arms over his chest. "A station technician."

Robinson grimaced. Then, without a word, he unharnessed himself and push-floated to the outer hatch.

"He's Chief Engineer, actually," said Walter.

"Whatever." K.V. waved dismissively at Robinson. "Look," he said, staring at Walter, "they said there was a problem here. I don't like problems. You're supposed to protect me from problems."

"Damn," said Robinson from the door. "Locked." He stabbed at the "Open" button a few times. "Locked and jammed."

K.V. pivoted around. "Hey! Can't you see we're having a conversation over here?"

Walter, taking advantage of the diversion, stole a glance at his rover's video display. The warm red glow had vanished—as had the numbers. "Robinson. Look," he said, pointing.

Robinson peered at the display. "Double damn. The "Set" indicator is lit. Looks like the inner door lock has control."

K.V. shouted, "Will someone tell me what the hell is going on here?" He clomped to the center of the cabin.

"I'd say, K.V."—Walter struggled to keep his voice pleasant—"that we're stuck in this cabin. The door won't open."

"What?" K.V. tromped to the outer hatch. He pushed at it, pounded on the lock controls, then swiveled his head to glare at Walter before turning back to Robinson. "What kind of a grade-B space station is this?"

Robinson, still contemplating the video monitor, ignored him. "I think," said Robinson, softly as if to himself, "that the only way we can release the locks is by pushing that 'Set' button."

"Mister," said K.V. in a loud voice, "I'm talking to you."

"Sorry"—Robinson kept his eyes on the monitor—"but I'm rather busy at the moment." He sprang for the comlink. "I don't like this," he said softly as he punched the "Activate" button. "I really don't like this."

After informing Engineering of their plight, Robinson took a heavy breath and faced K.V. "All right, Mr. Bushnell," he said, evenly, "What can I do

for you?"

Walter, meanwhile, had unstrapped himself from his console and leaped over to the inner door. It was still locked.

K.V. glowered at Robinson. "I demand you get me out of here."

Robinson shrugged; the gesture seemed to enrage K.V.

"You can sit on your damn haunches waiting for doomsday, for all I care," said K.V., "but I'm a pretty important item around here. Flix Films is supporting this station now." He nodded toward Walter. "I pay his salary, and when it comes right down to it, yours too." He pointed to the comlink. "So I advise you to tell them to get me out of here right now."

"Any suggestions on how to do that?"

"How the hell should I know? Use a blowtorch. You're the friggin' technician."

Robinson gave what could have been considered a smile, save that his lips formed a thin, stretched line. "We don't *have* welding equipment on board," he said. "This is a space station, not an automobile muffler shop." He gave a chortle of a laugh. "Hell, we don't even have a hammer."

"That's ridiculous."

"Hammers are just dead weight." Robinson glanced at the sealed outer hatchway. "On the station, just about every tool is specialized—designed for a specific purpose." He gave a desultory push against the hatch. "Anyway, it's really a computer problem."

"Computer problem?" K.V. laughed, harshly. "Every damned time something goes wrong these days, just blame the computer. I don't buy it. Even with this so-called space station's crummy computers. Yeah, I've seen them. They're junk."

"I don't doubt it," said Robinson. "It's twenty-year-old technology. No money to space-certify anything newer." Robinson clenched his fists. "And since the government won't give us what we need, we're forced to deal with any jerk who buys himself a ride."

"What? How dare you—"

Robinson pressed on. "This is your fault. Your stupid lightning generator." He pounded the bulkhead, making a loud thud. "And speaking of which, what kind of a fly-by-night testing lab approved that thing?"

"They were tested and approved." K.V. spoke with firmness, but Walter had been working with the man long enough to detect a tentativeness in his boss's voice.

Robinson and K.V. stood glaring at each other.

In that pause, Walter noticed that the cabin had become unnaturally quiet. He glanced over at Robinson. The engineer, a look of startled concern on his face, jerked his head around and fixed his gaze on the bulkhead. Walter followed the stare and saw only an air vent.

"Damn," said Robinson under his breath. He darted to the comlink, hit a button and, head leaning against the bulkhead, talked softly.

Walter couldn't hear the conversation—except where the voice from the other end asked Robinson to keep the comlink engaged.

Hearing a scratching sound, Walter turned to see K.V. lighting a cigarette.

With a cry, Robinson push-glided to K.V., grabbed the lit cigarette and snubbed it out. Wide-eyed, K.V. stepped backward.

Robinson took a long breath. "Things are not good," he said.

"What's wrong?" said K.V. For the first time he could recall, Walter didn't hear any arrogance in the director's voice.

Walter glanced at the air vent. "Why don't I hear machinery?"

"It's the air circulation system," said Robinson. "It's shut down."

"Why?"

"Can't say, exactly," said the Engineer. "But the lock system is linked to the emergency hull-breach system."

"I don't understand," said Walter. "Is there a hull breach? And what does that have to do with the air."

"No. The hull seems fine."

"That's good," said K.V. "Isn't it?"

Robinson shook his head, slowly. "If the electronics thinks there's been a hull breach in a cabin, that cabin is isolated from the rest of the station—even the air system is sealed so that air won't be sucked out of the station."

Robinson and Walter exchanged glances.

"And you think that's what happened?" said Walter.

Robinson gave a hint of a nod.

A high warbling tone broke the silence.

Robinson jumped at the sound. "Hull-breach alarm," he said. "Spurious. I hope. But it means we're isolated now." He turned to the comlink. "Guys. Get us out of here."

"We're working on it," came the answer.

"I don't see how they'll do it," said Robinson under his breath. "Not in time."

But K.V. apparently heard the words. "What do you mean, 'not in time'?"

"All right." Robinson looked down at his hands. "Unless we can get that door open," he said quietly, almost at a whisper, "we'll suffocate in here."

"Doomsday is near. Die all. Die merrily," said Walter. "*Henry IV*, part 1."

"Shut up, please," said Robinson.

"Sorry."

Walter thought he saw K.V. go limp—in zero gravity, it was hard to tell. But an instant later, the man drew himself up, ramrod straight.

"You're saying I'm going to die." There was a hint of tremor in K.V.'s voice.

"We'll think of something," said Robinson.

Walter almost laughed; Robinson was certainly not much of an actor—and even K.V. seemed to know it.

"How long?" said K.V.

"There's not much free space in this cabin." Robinson bit his lip. "With three people and the catalytics using oxygen . . . Oh, I don't know. Half an hour, maybe a little longer."

K.V. rubbed a hand across his forehead and then down over his eyes. "I'm going to die." He seemed to be talking to himself.

"The lightening generator wasn't really approved," said Robinson. "Was it?"

"Would it help us get out of here," said K.V., hand still over his eyes, "if I told you our idiot producer set an impossible schedule—that we didn't have time to get the approvals?"

"No."

"I didn't think so."

While Robinson and K.V. talked, Walter looked off through the porthole onto the star-sprinkled blackness. *I could be bounded in a nutshell and count myself a king of infinite space.* Suddenly and like a collision with a truck, he felt the impact of their situation. *I am really going to die.* He took a sharp breath, aware for once, of the precious value of oxygen. *This is real death—not play-acting.* And now, he didn't know how to act. *Act! What am I thinking?* He'd been acting his life—living all his life through the window of a stage. *I am a caricature of myself.* Walter resolved then, that he'd at least make a good exit. He almost laughed. Acting again, but he'd not give K.V. the satisfaction of seeing him crack. *Petty, vile man.*

A motion on the video monitor caught his attention, giving him a desperate idea. "You know," he said, not knowing if he was acting brave or actually being brave, and uncertain if in-

deed there was even a difference. "You know, we might be able to use the rovers to push the 'Set' button." He locked eyes with Robinson. "If you're right, that would clear the lock mechanism, and let us open both doors."

"The rovers? That's impossible," said K.V., his tone as imperious as ever.

"What's your idea?" said Robinson.

"Rovers have guns." Walter leaned in over a console, grabbed the joystick and maneuvered his rover to focus on the other. "And they're relatively big." He pointed to the monitor. "Look there. The launchers are on either side of the hood."

"Relatively, yes," said Robinson, "but they're still pretty insignificant."

"But there's nothing to stop the missiles—no gravity, only air resistance."

"This is stupid," said K.V. "We should be battering down the door, or something."

"A waste of oxygen," said Robinson, without turning around.

"Morons," said K.V.

Walter gritted his teeth.

K.V. turned his back, walked to the porthole, and leaned his head onto the glass.

Robinson clapped Walter on the shoulder. "Okay. Let's try your idea." He vaulted to the console seats and belted himself in. Walter followed.

As he fastened his harness, Walter wondered how K.V. had kept his composure: had so quickly reverted to his usual, nasty self. ***Maybe his nastiness is just the way he handles stress—not all that different, perhaps, than reciting Shakespeare.***

"Which way?" said Robinson.

"What?"

"Where do you think we can get off a clean shot?"

Walter, pulling out of his introspection, stared up at his monitor. "I am amazed, methinks, and lose my way amongst—"

"Not now, please," said Robinson.

"Sorry." *Damn. I'm doing it again.* Walter focused his rover to infinity. "I say. I think we're drifting."

Robinson glanced over at Walter's monitor. "Yeah, you're right. With the circulation pumps off, there're no air jets keeping the planet in place anymore."

"Maybe we'll get lucky and drift toward the lock mechanism."

"Yeah. Maybe."

It took about five minutes to find a position where they had a clear view of the "Set" button.

"How steady are your hands?" asked Robinson.

"Steady enough."

"All right. You take the first shot. I'll watch your aim. If you miss, I'll try to compensate."

"Good." Walter brought up crosshairs, and waited for the "Set" button to drift into the center of his field. He hit the "Fire" button.

Walter saw the little projectile enter his monitor's field of view, speed toward the button—and miss. "Damn."

"Jeez," said Robinson from the adjacent seat. "I can't get a shot off. We're moving too fast."

"All right, then," said Walter, wearily. "Let's move on and find another sight-line."

Robinson moved his rover to follow Walter's. "Yeah, fine." He pounded a fist onto the armrest. "But it doesn't make sense. How could the rover's recoil move this whole planet? It doesn't make sense. The gun couldn't be *that* powerful."

Walter sighed. "Except for a small electrostatic generator," he said, "Planet K is hollow."

"Hollow?"

"The shipping rates to the station," said Walter, eyes on his monitor, and hand guiding his rover, "are, well, astronomical."

"Yeah, I know. You wouldn't be-

lieve how expensive it was to have my audio system shipped up."

"We'd planned to fill it with water up here, but we'd not known how scarce water is on the station." Walter released his joystick. "This is hopeless; we're drifting too fast."

Just then, K.V. shouted at them. "What the hell are you doing? I'm dying and all you can do is have a pleasant little chat. Don't you understand what's happening? I'm going to die in here."

Walter, making claws of his fingers, brought his hands together, imagining K.V.'s neck between them. But before he could frame an answer, the sound of loud pounding reverberated through the control room.

As if he'd been hit, K.V. started. "Damn it. What now?" His magnetic boots holding him to the nominal floor, he bent his knees into a chairless sitting position, with hands over his eyes and thumbs pushing against his ears. "I can't stand this."

"It's just the crew trying to break in," said Robinson. He shook his head. "But God knows how they expect to do it."

Walter caught sight of the monitor. Through the lens of the rover, he saw the planet hurtling toward a bulkhead. "Whoa!"

"What?" Robinson peered up at the monitor. "Hey. I've got an idea."

Walter, unable to tear his eyes away from the impending planetary impact, said. "We could use one."

"We'll use the planet itself to push the button."

Walter jerked his head around and stared at Robinson. "You call that an idea?" he said. "Maybe the planet would eventually ricochet enough to hit the button, but that could take days."

"But we can put 'English' on the planet," said Robinson, "to control the direction of the bounce. Like playing a 3-D version of Pong."

Walter looked at him, blankly. "English."

"By racing the rovers on the surface, we could affect the spin. Conservation of angular momentum."

Walter rubbed his forehead. His hand came away, wet. "May as well try it," he said. "I'll follow your rover."

"And at the right time," said Robinson, "we can fire the guns to give us even more spin." He gripped the joystick. "Okay. Let's hope all the time I spent playing pool when I was a kid wasn't entirely wasted."

"Let's hope." Walter inhaled and noticed an acrid smell in the air, like smoldering electronics. More quickly than he wanted to, he had to take another breath. "By the way," he said, "it's getting a little hard to breathe in here."

Robinson nodded.

"Now," Robinson gasped. "Fire."

Walter, thinking it was probably his last conscious act, fired his rover's gun. He saw that Robinson had fired both his vehicle's guns as well. This was it.

While struggling to breathe, Walter witnessed a miracle; Planet K ricocheted from a bulkhead, throwing off ants as well as mounds of dirt. Then the sphere glided directly toward the "Set" button. Walter held his breath—what little breath he had left to hold.

Planet K hit the button square on, sending more ants into weightlessness and filling the monitor with a shower of sand. A click came from the studio's door and Walter exhaled.

With obvious effort then, Robinson struggled out of his harness and push-floated to the door. He pulled at it, and it opened—bringing an influx of oxygen-rich air to where it was sorely needed.

Walter, his head resting against the padding of the console seat, watched Robinson silhouetted against the now vacant aluminum tetrahedron. The

man's chest was heaving and his mouth was open. Walter closed his eyes and concentrated on his own breathing. Then, by the abrupt occurrence of a breeze, he was aware of Robinson floating past him toward the outer door.

"Damn it. Damn it to hell," came Robinson's voice from the outer hatchway. Walter opened his eyes and rotated his head toward the voice.

"Still locked," said Robinson over the sound of the pounding outside. "All we've done is bought a temporary reprieve."

While Robinson and Walter exchanged sad nods, K.V., still crouched, banged his fist into a bulkhead.

"Wait a minute," said Robinson, pointing toward the open door to the studio. "Is there a screwdriver in there? I can unscrew the lock panel and manually release the door."

"Yes," said Walter, from his seat—he was still too weak to move. "In the supply drawer over the table."

Robinson shot back toward the studio, disappearing into the general clutter and the floating topsoil dislodged from planet K.

Walter heard the sounds of rummaging, and then Robinson's voice. "Flathead! Who the hell uses a flathead screwdriver anymore? I need a small Phillips head. Do you have a Phillips?"

"No."

"Damn!" Robinson, holding the flathead, push-floated out to the studio and made for the outer door's lock panel. After a few minutes of fiddling with the lock, he threw down the screwdriver. It ricocheted, its specially designed soft-coated handle causing inelastic collisions with the walls, reducing the rebound speed at each bounce.

"Wait a minute." Robinson retrieved the screwdriver. "Maybe I can grind it down." Breathing heavily, he began scraping the blade against the bulkhead. "It's hardened steel, but maybe . . ."

Walter heard a loud blow against the outside door, and then a rasping noise. He looked over and saw that a thin rod had broken through. He smiled, recognizing that the rod was the tip of a Phillips head screwdriver. With another rasping noise, the rod withdrew, leaving a quarter-inch round hole.

K.V. unwound from his crouch and leapt for it, putting his mouth over the hole. Robinson flew at the man and pulled him away. No sooner had K.V's mouth left the aperture than there came another pounding sound and another rod came through—a thicker screwdriver.

"That screwdriver could easily have gone through the back of your throat," said Robinson.

K.V. put a hand over his mouth and, taking quick, shallow breaths, withdrew to the free rover-console seat.

Not comfortable with the company, Walter unstrapped his harness and floated over to join Robinson. They both watched as the hole was made steadily larger.

Then a voice came from the comlink. "Okay, the hole's large enough. We'll pass you a small screwdriver. I gather you know what to do with it."

Robinson laughed. "You bet." He reached down and grasped the screwdriver as it was passed through. He began to remove the six screws that held on the lock panel's cover. "By the way," he said as he withdrew the fourth screw. "What did you use as a hammer?"

The comlink was silent.

"Well?"

"In your lab, we, ur," came the voice. "We cannibalized your stereo—a speaker magnet."

Robinson froze. "Oh no. Not my Acousticon Twelves."

"Just one of them," said the

crewmember. "Anyway, it saved your life."

Robinson leaned his forehead against the bulkhead. "Not sure it was worth it. You don't know what I had to go through to get those speakers."

K.V. twisted in his console seat. "Get on with it," he said. "You can chitchat on your own time."

Shaking his head, Robinson took out the remaining screws. He removed the faceplate and stuck his hand in. Walter saw the man grimace and then there came a click. Robinson pulled out his hand and pushed open the door.

Five crewmembers peered in. Walter was surprised to see that one of them was none less than Commander Hendrix, the ranking officer on the station.

Hendrix walked into the cabin. There wasn't really room enough for anyone else to come in with him.

Robinson stepped back and leaned casually against a bulkhead. "Good of you to drop by, Commander," he said.

Walter smiled. *This Robinson is a rather better actor than I'd thought.*

"Oh," said Hendrix just as casually, "just wondered what you've been up to lately."

K.V. pushed himself erect from the console seat and clomped over to Hendrix. "I'm glad to see you," he said. "I'm not sure how much longer I could have kept these two from losing it." He laughed, a warm friendly laugh, and gave Walter an avuncular pat on the shoulder. "A word here, a word there, and they thought their ideas were their own." He turned to Robinson. "I'm sorry I had to be devious, but I had to keep you and Walter focused."

Walter opened his mouth in dismay. "But..."

While K.V. turned to give Walter another pat on the shoulder, Robinson and Hendrix exchanged amused glances.

"Um," said Robinson, stepping forward from the bulkhead. "I think that—"

"You behaved rather well," said K.V., returning his attention to the engineer. "It was our young companion here that I was worried about."

"I think," Robinson repeated, "that the emergency scanning camera might tell another story." He nodded toward the camera over the door. A tiny green LED showed it was active.

"Camera?"

Ignoring K.V., Robinson turned to Hendrix. "Thanks," he said. "And I mean big-time thanks."

"Any time." Hendrix turned to leave. "But, duty calls"—he shot a quick glance at K.V.—"thankfully." He left the cabin.

"What's this about a camera?" said K.V. He stood, as if rooted, looking up at the green LED.

Robinson, standing beside a console, absently played with a rover-controller. "The entire station watched it, I imagine," he said.

K.V. stood mute, his eyes wild.

"And," Robinson went on, "the signal was downlinked to Langley for image processing."

Walter, listening, lounged against the bulkhead and gazed idly at a monitor where a magnetic-wheeled rover in the studio moved in synchrony to the engineer's twiddling.

Robinson shrugged. "But considering how hard it is to keep anything secure these days," he said, lightly, his eyes on K.V., "I imagine a number of news stations around the world have picked it up and are broadcasting it live. A real life-and-death drama."

K.V., his eyes still on the LED, took a step back and sideways, as if trying to hide from the camera.

Walter gave a hint of a nod, bit his lower lip, then went over and switched off the power to the rover console.

Robinson took his hand from the

controller and pointed at the emergency camera. "All the world's a stage," he said. "*Hamlet*, I think."

Walter chuckled. "*As You Like It*, actually. But very apt."

The comlink came to life. "Call from the surface for K.V. Bushnell. From a Mr. Zandor."

K.V. yanked his gaze from the LED and over to the comlink.

"The producer," Walter whispered to Robinson. "The big boss."

"Says it's private," the comlink voice continued. "Take the call in the observation lounge. Afterward, he wants to talk to Mr. Anders." Walter stiffened. "Something about a promotion."

K.V. inhaled, sharply.

Robinson leaned in toward Walter. "Congratulations," he said, softly.

K.V., mopping the sweat from his forehead, skulked off without a word.

Walter smiled. He felt reborn—returned to the land of the living with a second chance. He'd learned his lesson. This time he'd live life, not act it. *"All the world's a stage?"* He chuckled. *Not any more. God help me, not any more.* ■

KELVIN

Who was the greatest physicist of the twentieth century? Albert Einstein, right? Most people would say that, especially now, it being the 100th anniversary of the publication of his three papers (among them, the special relativity one) during his "miracle year" of 1905. Those with more than the average knowledge of physics might have a more nuanced view of who else should be considered the genuine greatest. They might suggest others, like Richard Feynman, Lev Landau, Dirac, Bohm, Bohr, Schwinger, Sommerfeld, maybe Hawking, maybe Fermi. Worthy gentlemen, all of them. I had no difficulty coming up with their names right off the top of my head, and I left out quite a few.

Who was the greatest physicist of the nineteenth century? Ummm . . . hmmm. Maxwell, maybe? Some equations are named after him. Joule? They named a unit of energy after him. Helmholtz? (But what did he do?) Faraday? Great experimentalist, but he couldn't do math. How about Sir William Thompson? You know—Lord Kelvin, remembered chiefly these days, if at all, for saying heavier-than-air flight wouldn't work. He also has a unit of temperature named for him.

Kelvin?

But what did *he* do? you ask. Pretty much everything, I reply.

I can forgive anyone for being ignorant of the work of Lord Kelvin. My copy of the *Encyclopedia of Physics* (Addison-Wesley, 1981) makes scant mention of him, and then only in a couple of articles. One article mentions his work in electromagnetism, the other his work in thermodynamics. He made prodigious contributions to both areas of physics, yet he didn't even get his own half-page biography in the book. To add insult to injury, in Sir Horace Lamb's classic tome *Hydrodynamics*, Kelvin is referenced either by himself or with his co-author P. G. Tait more often than any other scientist save one, Lord Rayleigh. So that's a third branch of physics in which Kelvin was a towering figure in the nineteenth century.

I also was ignorant of Kelvin. I had assumed he'd had something to do with thermodynamics because of the temperature scale, and for figuring out that there even *was* an absolute zero, but that was about it. I even grew up within a mile of a huge Kelvinator manufacturing plant (they made refrigerators), but until I read a biography of Kelvin (see below) a few weeks ago, I never connected the name of the company with the scientist. Then I became interested (within the last few years) in vortex knot models of subatomic particles. Since Kelvin spent many of his later years working out the properties of the "vortex atom," it became impossible to avoid him.

So when one of my book clubs listed a new biography of Lord Kelvin called *Degrees Kelvin* (1) by David Lindley as a featured alternate, I jumped on it. This column is not a review of that book, but I will say a couple of things about it. The

first is that it struck me as being a very good biography about a now fairly obscure but nevertheless very important scientist. Lindley came to write the book not because he was long fond of Lord Kelvin, but because while he was writing a book about Ludwig Boltzmann, he encountered the young Kelvin, William Thompson, a brilliant scientist, highly regarded by his contemporaries. Realizing that he'd missed out in not knowing the real Kelvin, he wrote the book to remedy that situation for others. My second comment is that "Degrees Kelvin" is an unfortunate choice for a title. You see, one measures temperature in Kelvins, not in *degrees* Kelvin. I expect the title will perpetuate that common mistake. That having been said, the book is a good read, well worth your time and money.

When he was just sixteen, before he had even started his studies at Cambridge University, William Thompson began publishing papers in the mathematical journals. His father was an able, though not remarkable, mathematician, so he helped William get that first paper published, even though his son supplied all the genius behind it. The paper involved the work of Fourier (of Fourier series fame) on heat flow. Young Thompson was enamored of Fourier's work, and so when another paper came out by a mathematician named Kelland, which claimed that Fourier's work was inconsistent and full of contradictions, sufficiently so to render his claims invalid, Thompson took up the challenge to refute Kelland.

And refute him he did! Fourier's original paper was a bit sloppy, the author having assumed a bit too much about the likely perspicacity of his readers, omitting some explanations and making a number of goofs. The paper was also unfortunately riddled with printing errors. But young Thompson saw through these problems. As Lindley puts it: (Kelland) ". . . simply saw the problems and stopped dead. Where Kelland displayed a pedantic sense of logic, Thompson demonstrated real insight. He showed himself more acute than Kelland and more rigorous than Fourier." (Lindley, p. 19)

This makes Thompson a prodigy of the highest order.

Thompson continued to do exceptionally well at Cambridge, publishing a dozen papers in the *Cambridge Mathematical Journal* while an undergraduate. His third paper in that journal was particularly remarkable, for it was his first work of real physics. In it, Thompson was able to apply Fourier's heat flow mathematics to Michael Faraday's electric "lines of force." Lindley says: "Fourier's treatment of temperature distributions became in William's adaptation an equally general way of dealing with distributions of electric charge. The method (subsequently developed by Thompson and others) is still taught today." (Lindley, p. 35)

Not bad for a kid who would, were he around today, be too young to vote.

Kelvin's early promise would not be squandered—he had an exceptional academic career, was highly respected by both his peers and the public, and became as famous in his day, at least in England, as Einstein became in ours. However, unlike Einstein, Kelvin was known for more than just scientific work. He had a practical, inventive side that few theoretical physicists ever share, and that few can adequately appreciate. Some of his contemporaries thought Kelvin wasted too much of his time on practical matters, like undersea telegraph cables, and a reliable maritime compass. But his talent for tinkering is one of the things that endears him to me.

Kelvin figured out the physics of sending telegraph signals thousands of miles through wires that are underwater. It isn't so easy to do this if you don't understand the fundamentals of electromagnetism. That is, if the wire is in air, you

can send in your series of dots and dashes at one end, and you get the same thing out the other almost regardless of how long the wire is. But with many miles of your wire underwater, the signal that emerges at the far end will be both delayed and mostly noise. The difference is that sea water is a conductor rather than an insulator. It came as quite a shock to early proponents of undersea telegraphy when the first test cables behaved so differently from their in-air counterparts.

Faraday, when asked for an explanation, noted that the higher capacitance of the cable when in water was likely the cause, but he couldn't do the math. In fact, in those days, inventors simply didn't do the math anyway—they experimented to see what worked. Kelvin was asked, essentially, to explain Faraday's explanation. Though he had to infer from a brief account what Faraday said, as Lindley describes: "... that was all he needed ... In several pages of calculations, Thompson worked out, as no one had done before, the theory of transmission of a pulse of electricity down an insulated underwater cable."

Kelvin was one of the first to apply science to the problems of technology! And he enjoyed doing it so much that it probably cost him permanent fame, and led to his current obscurity. Though Kelvin did groundbreaking work in so many fields, even including the establishment of that most cherished of physical laws, conservation of energy, his distraction with technological matters kept him from "finishing up" his pure scientific work. His genius is evident in many fields of classical physics to those who look into the origins of things, but as Lindley put it: "(Kelvin) never quite finished things off in a way that would allow history to judge him the true creator of any of the subjects he tackled." (Lindley, p. 155) So while others were doing the work that would ultimately bring *them* lasting scientific fame, Kelvin might, for instance, be found at sea on a ship laying cable.

Another thing that led to Kelvin disappearing from the history of physics was his dislike for the way mathematical formalism was taking the place of genuine physical understanding. In Sir Edmund Whittaker's landmark work *History of the Theories of Aether and Electricity* (2), he says: "In that power to which Gauss attached so much importance, of devising dynamical models and analogies for obscure physical phenomena, perhaps no one has ever excelled W. Thompson." At this point, Whittaker includes a footnote where he says: "The value of a dynamical model is, that it will have properties other than those which suggested its construction; the question then arises as to whether these properties are found in nature." Kelvin, though an exceptional mathematician in his own right, was always driven to "finding the right model." Getting the mathematics right was an important thing, but Kelvin always wanted to have a picture in his mind of what was "really happening." Otherwise the job wasn't finished.

So while the Maxwellians (those electrodynamicists who came after Maxwell) were busy exploring the mathematical implications of Maxwell's theory (including Oliver Heaviside who, via vector calculus, reduced the theory to the set of equations seen on T-shirts today), Kelvin busied himself with trying to work out the correct model of the aether demanded by the mathematics.

This pursuit eventually led Kelvin to develop the "vortex sponge" model of the aether. You can think of it as hollow vortices in a perfect fluid, a sort of "*froth* theory of the aether," as Rayleigh derisively called it. (Lindley p. 286) Nowadays it's suspiciously reminiscent of the "spacetime foam" we read about so often. Of this model, Whittaker says: ". . . among the many mechanical schemes which were devised in the nineteenth century to represent electrical and optical phenomena, none pos-

sesses greater interest than that which pictures the aether as a vortex sponge." (Whittaker, p. 303)

Unfortunately for Kelvin, the vortex sponge model was analytically intractable without a computer, and Kelvin couldn't get it to work. This is similar to the way Einstein finished out his life, working on a unified field theory he, too, couldn't finish. Nevertheless, neither of these pursuits should be considered either failures or wastes of time. Much of value continues to come out of Einstein's later work, and I'm confident that Kelvin's vortex modeling will earn its proper respectable place in history, several decades hence. But explaining why I feel that way would take a whole bunch of future columns.

In the end, perhaps it can best be said that though Kelvin remained brilliant and inventive until the very end of his life, as the exemplar of nineteenth-century physics, his fame suffered all the more when his way of *doing* physics went out of style.

References

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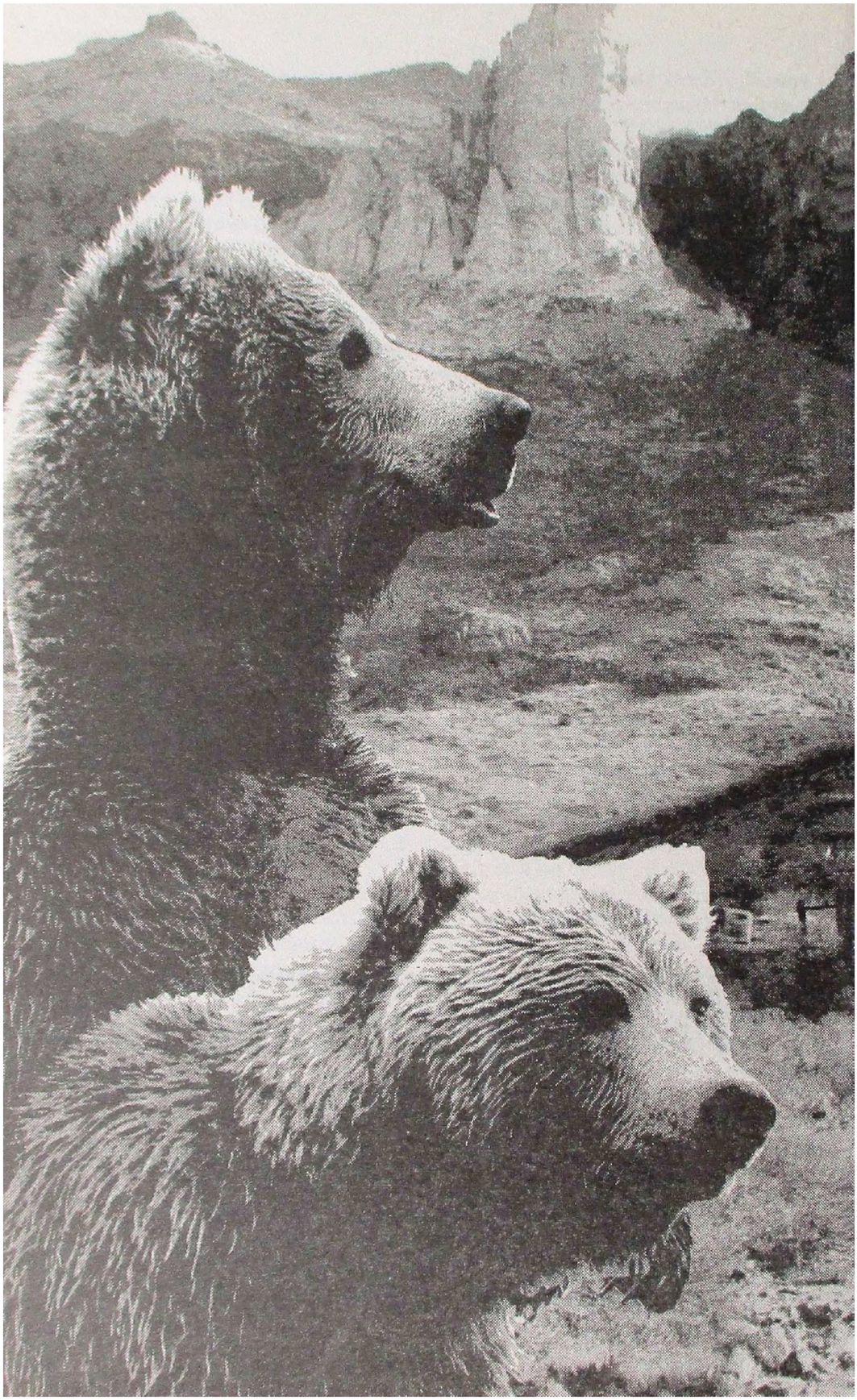

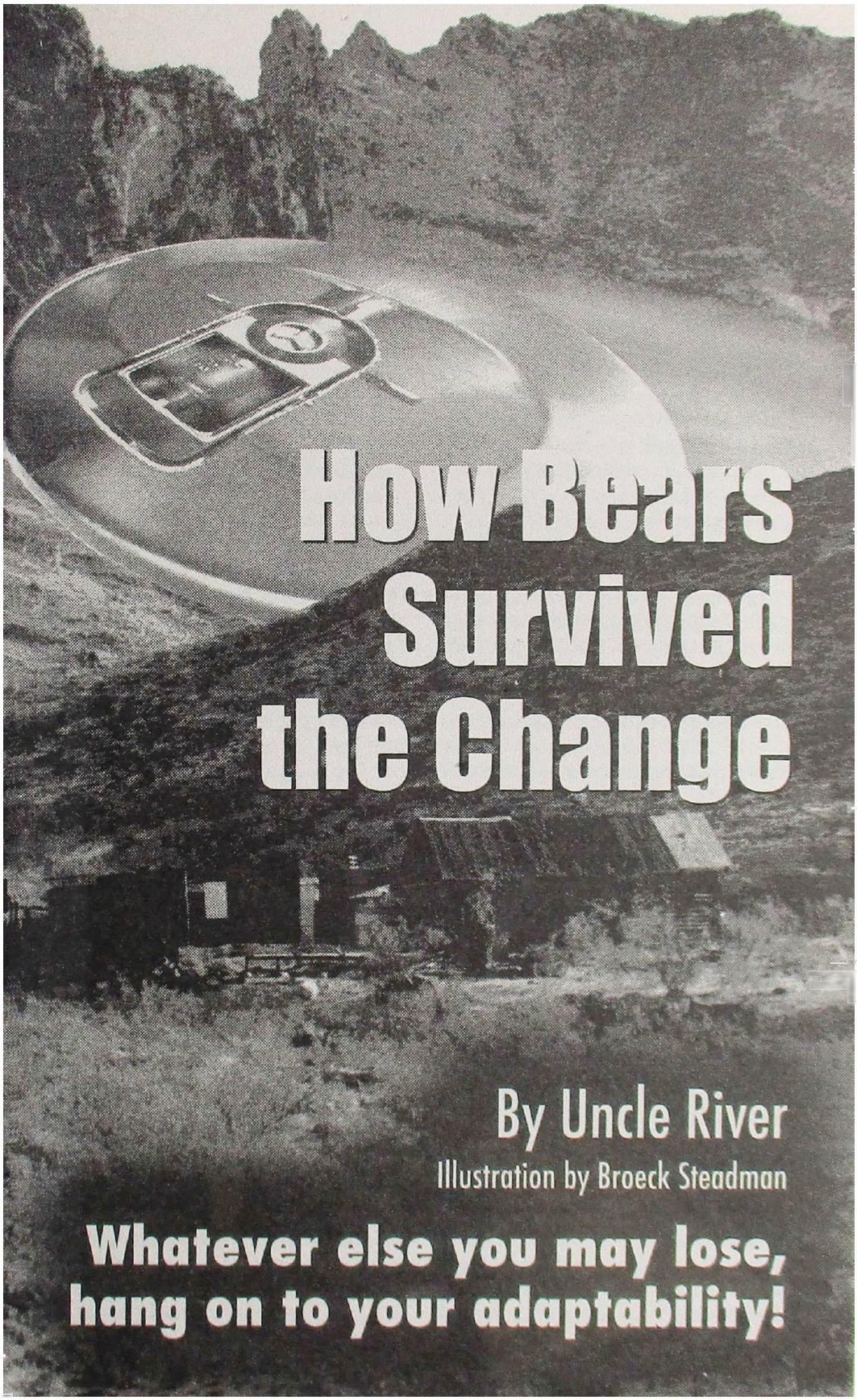

How Bears Survived the Change

By Uncle River

Illustration by Broeck Steadman

Whatever else you may lose, hang on to your adaptability!

They didn't.

Bears were extinct.

But they came back.

The Change:

When the Earth tipped over.

When the Star Wars (no, not the movie) mini-satellite space weapon misfired. Oh, you didn't know we really had them up there? A lot you didn't know! Like what they really were for. Or why the Soviet Union went broke competing, trying to develop their own.

No, not to protect our—or anyone's—cities. Silly propaganda. No, not to deter a nuclear First Strike, shooting down enough incoming ICBMs to preserve retaliatory capability. Slightly-less-silly propaganda.

One of the things the coherent-beam mini-satellites *were* supposed to do, and did neat as can be when fired straight down, was knock out electrical power. They made a lovely concussion too. But they never were supposed to fire all at once, straight down.

Too bad. Best laid plans and all that.

Could have been worse. Global warming may have saved life on Earth. Thickened the atmosphere a little. The concussion centered higher. Cushioned, as it were.

That concussion! Quite a bang, when twenty thousand coherent-beam space shots struck all at once. So much bang that it made a teeny, tiny hiccup in the Earth's spin itself. Just enough to overcome the gyroscopic effect. Wobble won out.

Just barely, very briefly. Not enough to fling the atmosphere and oceans off into space and leave a bare rock tumbling chaotically. Just enough that the Earth's solid crust slipped sideways around the liquid interior before the gyroscopic effect of the continuing spin saved the day by stabilizing again.

Quite the mess, as it was! Yet remarkable how many species did survive, and eventually revive: Lilacs and poison ivy. Elk. Zebras. Dragon flies. Scorpions. People. Honey bees. Mountain lions. Rabbits.

But not bears. Not a one.

Yet, eight centuries later, there they were again.

Earthquakes and volcanoes had settled a lot by then. Dust had settled. Climates had stabilized. Life had been healthy for a couple of centuries. Forests had grown back. Human communities. A few anyhow. Human population was back up to about a million, planet-wide. Enough to have human names for places, including the area where bears showed up again: just above Areno, in the mountains around the Tubal-Kessa border.

But how?

Perhaps it all began with Bill Redpath's problem with the IRS, back in the 1980s. Bill Redpath and Maryllyn Agado were caretaking Bulldog and Petunia's house at the time, in the famous (look it up in any ghost-town book) old gold-and-silver mining town of Mogollon, New Mexico, while Bulldog and Petunia were off in Tucson having a baby and making enough money to be able to afford to have a baby.

"I never should have filed a tax return," said Bill. "I did get a rebate from the state, but I really only filed because I thought it was the right thing to do."

"The IRS refused to believe anyone *could* live on only $1,800," Maryllyn explained.

"Demanded records to prove the income I *didn't* have," said Bill. "What records? Crazy! Made *me* crazy!"

"Maybe that's how the aliens learned about it!" said Maryllyn. "They didn't exactly *like* crazy. But it . . . sort of rang a bell for them. They showed up in the cutest little UFO."

"Zipped right down in the canyon," said Bill. "That's *some* flying! If you have a heart attack in Mogollon on a windy day, don't expect the Medevac chopper to even try to land in that nar-

row canyon."

The aliens never did make it clear how they heard of Bill's IRS problem. But they did explain that they were looking for a demon that had escaped from their zoo.

"Turned out to be a different demon," said Maryllyn.

"Too bad," said Bill.

The aliens were friendly, though. Came back to visit.

"Or some did," said Maryllyn. "We never could tell them apart."

"I'm not sure it mattered," said Bill.

Have you ever wondered why alien encounter stories are all so odd? It is because our planet has been in a bubble in time. Well, it was, during the Abysmal Epoch. Popped back out to the real timeline at the Change, though it still took a while—centuries in fact—for anyone to find us again. They'd been wondering where we went!

But while we were stuck in the bubble in time for twelve of our millennia or so, most aliens couldn't find us. Only members of telepathic species and ones who were really stoned.

"Our aliens were pretty coherent," said Bill.

"More coherent than *you* were by the time the IRS got done with you," said Maryllyn.

"But they seemed to be in telepathic . . . A whole species in telepathic rapport," said Bill.

Then Bulldog and Petunia came back.

Panicked, actually. Fled the big city. Showed up in a frenzy, unannounced.

All things considered, they were pretty decent to Bill and Maryllyn. They would have let Bill and Maryllyn stay on indefinitely. But, well, it was Bulldog and Petunia's house, and they did have a family.

And Elvira really was getting old.

So perhaps we should start with Elvira. She *is* how the bears got into the picture.

Elvira Sonderfeld sort of inherited the Mogollon Rooming House, due to the Great Flu Epidemic of 1918.

Elvira was not related to the previous owners. But they were among the many who fled Mogollon, another panic in its day, due to how hard the flu hit what, at the time, was the biggest producer of silver and gold in the new state of New Mexico. The real reason why the flu hit so hard in Mogollon was the prevalence of silicosis, which had the miners' lungs half turned to stone *before* the flu ever hit. But the owners of the Mogollon Rooming House didn't think of that. All they knew was that people in Mogollon were dying like flies, and that though the flu was bad everywhere, it wasn't *that* bad everywhere.

Elvira was a generous-hearted teenager then. She nursed the sick, who filled the abandoned rooming house, until the epidemic passed. She had been working there anyhow, and stayed on afterwards. Mogollon still was a thriving mining town of several thousand, in its tight, remote canyon. There still were roomers, or at any rate soon were again when the flu abated, who needed someone to keep the establishment running.

Elvira assumed that the owners would come back. She kept books, as well as the kitchen and bedding, neat and ready for inspection, right through the '20s, when it was just as well the bears were not yet around, Prohibition notwithstanding . . . And Prohibition didn't withstand much in Mogollon.

In the '30s, grateful citizens helped Elvira obtain a deed to the now clearly abandoned property. She never did learn what became of the previous owners.

During WWI, Mogollon's production of silver and gold had been highly valued by the United States. The value held through the '20s. The depths of the Great Depression, in the early thir-

ties, missed Mogollon entirely. But then the price of gold was regulated by the federal government.

$14 an ounce, and everyone was *commanded* to turn in their Gold Certificates. Just a few weeks later, those who didn't—or who had insider information and knew to wait—were informed again to turn in their Gold Certificates to the U.S. Treasury for redemption . . . at $35 an ounce.

Even at $35 an ounce, gold was less profitable than it used to be. But Mogollon continued to produce, and Elvira continued to run the Mogollon Rooming House.

Until 1942, when the federal government ordered the mines to shut down, declaring gold and silver not essential to the WWII war effort.

Mogollon emptied out, and the Mogollon Rooming House with it. It took a while. But, eventually, Elvira, now middle-aged, found herself one of only a dozen residents of a ghost town, that had been a small city when she was growing up there. The Mogollon Rooming House was unsalable. Elvira *didn't want* to leave. But she did get lonely.

Elvira was not sure when the bears moved in. "1957, maybe, or 1958. It was before that mayor from a town in Germany showed up, I recall. He wanted a photograph of himself with the bears. That was 1964, I believe. The bears had been with me several years by then."

Elvira and the bears. Just part of life in Mogollon, like flowers blooming on the sunny slope above one side of the single street through the canyon in January, while the shady slope that rose on the other side of the street still held three feet of snow in May. The only important point, to Mogollon's few other residents, often gathered at the Bloated Goat Saloon, was: "*Don't* show up for any of Elvira's delectable cooking with liquor on your breath. Even the smell makes the bears ornery!"

So Elvira stayed. And so did the bears. Years went by, eventually decades. Elvira grew older, and eventually Elvira grew old.

Elvira stayed healthy. Her cooking stayed wonderful. She took to tucking her toes under a warm, snoozing bear, to enjoy a cool, quiet canyon dusk. But a time came when it really was getting hard for Elvira to chop her own firewood.

Then there was the drought. The acorn crop failed. Everyone helped get in a couple of pickup loads for the bears. Compassion there, but self-preservation too. Elvira's bears were more civilized than some local humans. But they *were* still bears.

Maryllyn Agado got along well with the bears. She began taking cooking lessons from Elvira. Bill Redpath got along with the bears too. Though not totally abstinent, they both might as well have been by Mogollon standards, and didn't mind a bit to refrain when anywhere near the Mogollon Rooming House.

They never would have asked. For that matter, Elvira never would have asked for help. But she realized at once, when Bulldog and Petunia showed up so abruptly, that, after all, there was lots more room in the Mogollon Rooming House than in Bulldog and Petunia's little house.

Besides, *everyone* in Mogollon (where population was back up from its all-time low of four—not counting the bears—to somewhere around thirty) knew that Bulldog and Petunia practiced the Christianity they preached. But did they ever preach!

Elvira wouldn't ask for help. But she would offer . . .

So Bill and Maryllyn moved into the Mogollon Rooming House, with Elvira Sonderfeld and the bears.

Which is why, when, after several more visits, the aliens invited Bill and Maryllyn to go for a ride in their UFO, it was entirely natural for Elvira to go

for a ride right along with them.

And the bears.

Well, why not?

There was plenty of room.

Which was odd, in a way. The UFO didn't look big enough. But inside, it was quite roomy.

There were three aliens.

The same ones who first showed up, looking for the escaped demon? Hard to say. They made everyone comfortable, bears included. Then they took off.

But, well, communication was . . . approximate?

Telepathic, of course. That was the sort of alien they were. But for them, species-wide rapport *was* reality as they knew it. What they thought the relationship was between their human and ursine guests, who could say? Congenial. Obviously. That was why three humans and eight bears *could* climb aboard the neat, little (except not so little inside) UFO, to go for a space ride.

Maybe the aliens didn't realize that the rapport between the humans and the bears did not include the sort of ability to explain things that the aliens didn't need among themselves and which we achieved among our species by use of language.

What happened was, when the UFO went into free fall, the bears panicked. Flailing about, one of them bumped . . . something. Whatever it was, what Bill and Maryllyn and Elvira registered as if one of the aliens had said it, was more or less: "Oh no! It broke the wormhole warning gauge!"

Bill and Maryllyn and Elvira had not had time to get used to free fall themselves, let alone to settle the bears down, when all three aliens abruptly went catatonic.

The UFO did . . . something . . . disconcerting.

And then, fairly promptly, the UFO reestablished a relationship to gravity, and landed. The door opened.

Before Bill or Maryllyn—let alone Elvira, who was still healthy, but *was* well into her nineties by then—could get their feet under them, all eight bears tumbled out the door and took off.

"Are the aliens dead?" asked Maryllyn.

"I don't think so," said Bill.

"If I'm still alive, they certainly ought to be," said Elvira, patting her hair back in order.

They all were more disconcerted than suffering any physical distress.

The aliens' condition didn't help. Even looking at them was disorienting. Being telepathic and all, what they—and their UFO for that matter—looked like was an inextricable mix of whatever they really did look like physically and the communication medium itself between their species and ours. Catatonic, they still projected, but did not communicate.

No wonder the bears were in such a hurry to get out!

Bill and Maryllyn and Elvira climbed out too.

Where were they?

Not in Mogollon, but apparently in some fairly similar, apparently uninhabited canyon.

The aliens just lay there, apparently alive, but all three of them comatose. They might as well have been some sculpture with confusing lighting from a SF convention art show.

Now what?

At least the "apparently" aspect of . . . *everything* . . . rejelled to substantial things being . . . *something definite* . . . outside the UFO.

Things could have been worse, in ways that Bill and Maryllyn and Elvira readily could think of, and several more of which what had happened to them would leave them mercifully unaware.

For instance, they missed the hyperinflation. And the Panama Canal incident. Didn't have to live through those

events, and never knew it.

Not to mention the Change itself. Well, that one they would eventually know about.

For now, they *were* thankful that the weather was pleasant, and would have been even more so, had they any idea what they had missed.

It was Elvira who suggested that they make camp a few bends down the canyon, away from the UFO, even though the disorienting feature of the aliens' telepathic oblivion projected only a dreamy vagueness, not really unpleasant, once they had solid ground under their feet again.

"No telling why the UFO did what it did when our hosts conked out," Elvira said, "or what else it will do. But I don't think my bears will come back even close to it. I want to be where they can find us."

It seemed reasonable to Bill and Maryllyn. They checked on the aliens once more, then left them where they were, inside the UFO. They didn't know what else to do for them.

"Heavens," said Elvira the next morning, "it has been years since I slept on the ground. Has me feeling like I'm ninety years old."

"But Elvira," said Maryllyn, a bit concerned, "you *are* ninety years old."

"And then some, thank you very much," said Elvira, "but let me tell you something. Being ninety years old is one thing. Feeling like it is quite another!"

No telling how long it would have taken for anyone to find them, or them to find anyone, but for Tarry's vision.

While the aliens' comatose telepathic projection was like the sort of dream that seems compelling while it is going on but, on waking, turns out to have been too amorphous to remember at all, Tarry's vision, if a bit vague on *what* it was about, did at least project a clear and specific *direction* to its compelling feeling.

Up the Tubal River, Tarry's vision called him, from his warm, desert river valley home, to the rugged, magnificent mountains, that he always had meant to visit one day anyhow but might never have gotten around to it, but for that compelling vision. A vision that did not really show Tarry anything, so much as call to him, with an urgency that said: "Come! Follow the river to its source!"

Well, why not?

So he did, with his Tubal flashlight, with its wonderful modern insulation so light and safe, slung on his belt, to set in the Sun for an hour to charge, and thereby be able to light both camp and a campfire at night.

Up the Tubal River Tarry traveled, passing through congenial Tubal village and wild country between, into the mountains where travel was not just a walk but a hike, and green spread, with more rainfall and with winter snowcover, up the sides of bird-and-flower-filled forested slopes and mountain meadows. At last Tarry arrived at the high mountain village of Areno, situated near the outflow of its lake, in its sparkling mountain valley with pines and even aspens, where people grew quinoa more than corn, lots of raspberries but few melons, and where cotton and okra wouldn't mature in a season at all.

Like so many in Tubal, Areno was a village of poignant contrasts: One man in his early thirties was so robust that he habitually swam in the lake in a mountain blizzard and wore nothing but a kilt year-round. Another the same age, who had been his childhood playmate, now sat crippled by the nerve disease that had entered Tubal's heritage after the Change, before people realized to move far enough away from the WIPP Contamination Site, legs useless, hands spastic, and soon to sink to the starvation that would finish off the afflicted if nothing else took them first,

when the disease progressed to the point of making it impossible to swallow.

But most in Areno, as in all of Aztlan, with the Terror thankfully three centuries ended, earthquakes much more moderate if still frequent, and weather wholesome and consistent, were healthy, if not quite the extreme to go bare-chested all of a mountain winter to reassure all with the fierce vitality their ancestors once had needed to survive at all, to be anyone's ancestors.

A visiting lowlander with a vision was quite the diversion in an isolated mountain village. Several of the Areno villagers found it a pleasure and no imposition at all to row one of their largest boats across the lake, to help and accompany Tarry on his way, to seek the headwaters stream someplace on the other side, that he still felt drawn to, for whatever reason there is why visions draw people to do anything.

Up the canyon on the far side of the lake they hiked, Tarry in his cotton tunic, comfortable enough even in the mountains in late summer, the five Areno villagers who accompanied him in linen or wool. They crossed the stream several times, on rocks and fallen logs, or some places small enough just to jump across. Hints of coming fall color showed a few places, and purple asters informed mountain people that summer indeed was nearing its end. But the day was warm, and, to one accustomed to often-harsh desert air as Tarry was, a fragrant mountain breeze was moist and gentle.

Not even terribly far up the canyon did they hike, before they heard some unidentifiable large animal crashing off through the brush, and soon after came on three strangers, of rather light complexion and very foreign dress.

Two of the strangers, a woman and a man, looked to be in their thirties, the third, a very old woman. All looked healthy.

But they did not speak a word of Aztlanian.

"That certainly isn't Spanish," said Bill.

"Or Apache," said Elvira.

"You know Apache?" Maryllyn asked.

"Not to speak it," said Elvira, "but enough to recognize it."

"Apache?" said one of the new arrivals, a dark-complected man a little older than Bill and Maryllyn, dressed in a cloth-belted, tan and somewhat travel-stained tunic, with something hanging from the belt that looked a little like a small French horn with a very small bell.

Just then, a large cinnamon bear ambled out of the bushes, followed by two smaller blacks.

The Tubals gaped, wide-eyed.

Before anyone had time to do anything further, the UFO took off, from where it had rested a few bends farther up the canyon, straight up.

The bears plunged back into the bushes. Had they not, the Tubals probably would have.

"Things certainly have been abrupt lately!" said Elvira.

Maryllyn shook her head. "Did you catch that?"

"Why, so I did!" Elvira said.

"Me too!" said Bill.

They could see that the others had too. In case there was any question, the same man who had spoken earlier said, "Mogollon?"

They all knew, though it was months before they had enough language in common to discuss it: The reason why the three aliens went catatonic was that, after the bear bumped the wormhole warning gauge, and broke it, in its panic at free fall, the UFO did indeed fall into a wormhole. As luck would have it, a wormhole not through space, but through time, through what our planet experienced as eight centuries, drawn by the same vortex that popped our planet out of its bubble. When that

happened, the aliens lost contact with the rest of their species.

Though they regained contact immediately on emergence, it took a day for coherence to settle. When it did, the aliens came to, and the UFO took off.

Resettling coherence took so long because the aliens' whole species got a little disoriented, all over again. The first time at their abrupt disappearance. This time, at their abrupt reappearance on the Cosmic Web. Things got quite goofy, for about a day, on those aliens' home world, and for all of them, everywhere in the cosmos that there were any.

But they got their act, as a species, back together again pretty quickly. The disappearance, and even more the reappearance, of three of their members was a shock to them. But, after all, members of their species were born and died all the time. It wasn't as if individual perceptive/active nodes coming and going to and from existence was all that shocking.

In a way, the shock that it took a whole day for the alien species to recover from, for the three on the UFO to snap out of their stupor, was us, popping out of our millennia-long bubble in time, back onto the real timeline. Actually, our planet already had popped back out, in potential as it were, at the Change. But it was reestablishing contact that made the potential real.

All of which, for the time being—and, cosmic distances being what they are, even with UFOs, that *are* so "unidentified" because we don't understand how they work, for a while to come—meant considerably more to the aliens than to us. The cosmos is big, and so is time, and both are . . . stretchy. Even now that our planet no longer was stuck in its bubble in time, it would be a while before we and the rest of the cosmos reestablished regular interaction.

In the meantime, Bill and Maryllyn and Elvira would not be going back to Mogollon.

Mogollon no longer existed. *That* canyon snapped shut like a couple of hands clapping in the Change. The Change, after all, *was* a world cataclysm.

Which was why, when it happened, planetary human population abruptly dropped by something like 99.997% . . . to somewhere around 300,000, planetwide.

Due to mechanics of the tip, about half the survivors were in Aztlan, and thus in relatively easier touch with each other than with anyone else. There really were not exactly 144,000 of them. But the number in Aztlan, to know of each other, was close enough to that figure that there was quite the religious reform when, after centuries, the Terror at last moderated enough for life to get somewhat less desperate . . . and perhaps at least partly for that reason, religion too. It was then that descendants of Aztlanian survivors of the Change, including Tubals, learned that there *were* survivors, and by then a fair number of their descendants, lots of other places on the planet. Thus the number that Aztlanians (of by that time several cultures, if more or less one language) initially knew to have survived the Change was simply irrelevant.

Just as well. That religious reform stifled some inclination to rigidity which could have become very unpleasant. Instead, it turned later Aztlanian religion to a language for learning whatever one might of the Unknown. *Much* nicer! Which, though neither he nor the villagers of Areno knew it, was a good deal of why Tarry's response to his own vision was simply to set out seeking, and the response of those he met was simply to find the vision and the visionary interesting, rather than a grandiose command or a threat.

Bill and Maryllyn and Elvira, not to mention the bears, and the UFO which they all saw accelerating straight up before it got high enough to zip into

Cosmic Distortion Mode without problematic entanglements with planetary matter density, all were a fair source of excitement for Tarry and the Arenoans. But no one got too nutty over it. Not even the bears.

And Bill and Maryllyn and Elvira, and after a fashion the Tubals too, did understand what the aliens communicated, as the aliens' own coherence rejelled. The reason why the UFO landed where it did was that it had a default system. Priority Level One was: If the crew is incapacitated, go back to wherever you were last, so long as leaving there had *not* been in, "Run for your life!" mode. That didn't work, so Priority Level Two was: If you can't find wherever you were last, land the first place you can find similar in atmospheric composition, structure of terrain, and such.

Since Mogollon no longer existed, the UFO just set down in a canyon of similar altitude, shape and alignment.

What the bears thought of all this, who can say? Rapport, even among our own terrestrial species, let alone between our species and theirs, just is not full telepathy, a point on which the aliens may not have been entirely clear.

Whatever the bears thought of their new circumstances, they came back to visit, often, as long as Elvira lived. Which she did, more or less to the age of 104, though it was a little confusing to reckon, as she and the rest of them had not landed in the canyon above the lake by Areno of Tubal in Aztlan at quite the same time of year that they left Mogollon . . . .Not to mention the intervening eight centuries.

Whatever they thought, the bears throve. Six of them were female. They all had twins or triplets. Eight is a tiny genetic stock to restart a species, but it must be possible. After all, bears were extinct. Those eight were the only ones there were for the healthy population of bears to descend from, as the species did indeed reestablish itself, in the once-again healthy world that eventually had emerged at the further end of the Terror, from the Change.

Bill and Maryllyn learned to speak Aztlanian, if never without an accent. They throve too. Bill wanted to reintroduce electricity. It didn't work. He never figured out why.

"Who cares?" said Maryllyn. "Sun-lights are much nicer."

"Especially now that we have perfected lightweight insulation for the flashlights," said Tarry, who remained a friend, and didn't even razz them—too much—about their accents. "They don't even blow up any more if you forget to pull them out of the Sun and they overcharge."

Bill patted the flashlight on the belt of his Tubal tunic. Linen rather than cotton. He and Maryllyn had visited the river valley with Tarry, but they settled in the mountains. The flashlight held enough of a charge to read by, all evening.

Which Maryllyn occasionally did, though usually indoors with a Sun-light which, being stationary, could have enough insulation for a charge to last several weeks of stormy weather.

Bill read sometimes too, but he never got quite fluent enough in Aztlanian to enjoy a full evening of it.

If any books existed in English, Bill and Maryllyn didn't know of them.

They did occasionally see bears, though. Lots of people did. People and bears got along pretty well. Some said this was because Tubals, and Kessians too just across the mountains to the west, had Apaches in their ancestry, who tradition said knew bears as kin.

But anyone who had the privilege to get to know Elvira Sonderfeld knew the real reason why the bears that reentered the world eight centuries after all bears had gone extinct in the Change were so well behaved . . . for bears. It was because they all were descended from those eight bears of Elvira's. ■

NetPuppets

Richard A. Lovett &
Mark Niemann-Ross

Power can be a subtle—and increasingly insidious—thing

Dennis Brophy wasn't born with a silver spoon in his mouth. He was more a listener than a talker: a questioner, not an idea person. But if the old saw about silver spoons ever got extended to computer mice, that would fit Dennis to a tee. Who needs to be a great orator when you can make computers dance at your whim? Dennis had never met an operating system he couldn't master, or an interface so arcane he wasn't the first to deduce its logic.

If he'd wanted to, Dennis could have been a millionaire many times over by the time he was thirty, but he enjoyed playing with computers more than he did figuring out ways to make money with them. As long as he could afford the latest upgrades and wasn't starving, he was happy.

Lately, he'd become fascinated by orphan web sites. It was amazing how many there were, established by people who spent a great deal of effort constructing them only to abandon them. The best lurked on academic computers, where processing time and disk space were essentially free, paid for by academic funny money no bean-counter would ever notice.

Dennis was deep into one of these when a strand of long, brown hair brushed his cheek. He jumped, looked up, and found Linda Frasier leaning across his shoulder, reading the monitor.

"What's that?" she asked. Linda had the adjacent cubicle and had a habit of visiting him when she got bored with her work, which was nearly as often as he got bored with his. Her job was almost as far beneath her as Dennis's was beneath him, but neither had the ambition to move on. The perks more than made up for the tedium, anyway. Working in the tech-support department of a large pharmaceutical company, they had access to the latest high-end computers, and their supervisor didn't care

how much they slacked off, so long as they kept the department chiefs happy and were on call for emergencies. It was a perfect place for people who liked to mix work with play.

"I'm not yet sure," Dennis said. "It has something to do with the Psych Department at"—he glanced at the URL—"vdu.edu, whatever that is. It calls itself NetPuppets, and it looks like some kind of simulation. If we're to believe the 'last modified' date, it's not been touched for several years. My guess is it was some grad student's project and the student is long gone."

"So what does it do?"

Dennis scrolled through the screen. "Not much in the way of instructions," he said. "That's part of what makes these things fun. Nobody ever bothers to document them. But I'd guess we start here." He pointed to a button labeled *Create subject profile*. "'Create' is always a good word."

"Let's try it," Linda said.

"My thought, exactly." Dennis clicked the button and watched a new screen emerge. *Enter baseline demographic conditions*, it said, followed by a bewildering array of information fields—although Dennis noticed that only a fraction were designated as mandatory.

"Definitely an academic site," Linda said. "Nobody else would speak in terms of baselines. What are our options?"

Dennis continued to scroll. "It looks like we can pretty much pick what we want. I think we're creating people: kind of like setting up gaming characters, but more realistic. We need to give them jobs, incomes, work and residence addresses, ages—all kinds of trivia."

"Let's create a married couple in their thirties or forties," Linda said.

"Sounds good. And as long as we're picking their addresses, let's put them somewhere around here—just in case it's linked to some geographic database and starts asking questions about Virginia or Venezuela or Victoria or wherever the hell VDU is."

"As long as we're creating computer characters, let's make them something interesting," Linda said. "Not just clones of ourselves."

Dennis grinned. "What, are you saying I don't have much of a life?"

Briefly, the banter dropped from Linda's voice. "I was thinking of myself," she said, and Dennis realized just how much both of their lives, working or goofing off, played out before computer screens. At least she had a cat waiting for her at home. He himself had once had a fish tank, but lugging a new monitor up from the car, he'd knocked it over and the fish had died. He still had the monitor but he'd never replaced the fish.

The moment passed and Linda was again her cheery self. She knelt beside him to ease the strain of leaning across his shoulder. "Okay," she said, "let's make the guy the younger of the two, by more than just a year or two. Let's make him thirty-two, and her . . ." She paused. "Old enough to be a bit insecure about the difference. How about forty-one? It's a psych program: let's give it something to chew on."

"Good idea," Dennis said, typing. "We need an address. I've already put in our city, but it's prompting me for details. Want them to live on the West Side?"

"No, let's make them poor. Put them somewhere way out Southeast. That's all trailer parks and cheap apartments."

"Okay, it accepted that. Or at least it's not complaining. What else? Kids? Jobs?"

"No kids," Linda said. "And let's make them not-all-that-nice people. Give him a couple of drunk-driving citations and her a drug record. Can you do that?"

"Looks like it. I'm just typing in keywords, and so far it's accepting them. It seems to be debugging the profile, line

by line, and informing me if something's impossible. Slick system. Drug possession or dealing?"

"Both. But make it small-time stuff. Let's make them stoners, not drug lords."

"Got it," Dennis said. "I specified an income in the $20,000 to $30,000 range, so if she's still dealing, she's not very good at it. Want me to give them day jobs, or just let the computer pick? Right now it's offering to fill in the remaining blanks itself."

Linda was spared having to decide when an icon began blinking on Dennis's screen. "Drat," he said. "Looks like someone's got a problem. Time to do what I'm paid to do."

"Can we save this and come back later?"

Dennis stared at the screen. "That doesn't appear to be an option. However . . ." he centered the mouse on the *submit* button. "Maybe we can save our place if we tell it we're finished." He clicked the button. The screen blanked, then was replaced by another. "Profiles accepted," it read. "Reference number VDUpsychtest.11.05."

Dennis copied the code number onto a Post-It. He sighed. "And now, for work. Last time I got an emergency page, some fool in the chem lab had pulled loose a power cord. You'd think they'd learn to check such things before pushing the panic button."

Two days later, Dennis found Linda eating a sack lunch and reading a book in the employee lounge.

"Look at this," he said, handing her several sheets of paper-clipped printout. "I got an e-mail this morning from that NetPuppets website. Apparently, it did save our entry and has been processing it, thought it's sure been taking its sweet time about it."

Linda took the paper. "'Match Confirmation Report,'" she read. "Any idea what that means?"

Before Dennis could answer, he was clapped on the back by Gordon LeGuerin, another member of the tech service department. "Sounds like someone's finally realized he's never going to get a date without the help of science," he said, grinning. "So, who's the lucky confirmee?"

Dennis usually enjoyed Gordon's humor, but that one hit a bit close to the mark. Before he could come up with a suitable reply, Linda bailed him out. "Merely the figment of some website's imagination," she said, passing the printout to Gordon.

Gordon glanced at the top page. "NetPuppets?"

"We think it's a psych simulation," Linda said. She took back the sheaf of papers, reread the cover page, and then flipped to the next one. "Wow," she said. "It took our bare-bones sketch and fleshed it out. Look at this: 'Subject 1, female, Caucasian—we never specified race, did we?" Dennis shook his head. "Born in Hartford, Connecticut. High school, college, good grades—a lot better than mine—MBA. Manhattan accounting firm. Looks like a fast track to something big, doesn't it?"

"Yeah," Dennis said. "Then she marries 'Subject 2.' I wonder why the program didn't make up names for them when it was doing everything else."

Gordon snorted. "That's easy. Game programs are best if you get to name your own characters. Everyone knows that."

Dennis pondered for a moment. He had no imagination for this kind of thing. "How about Jack and Jill?" he said.

Linda made a face. "That's almost as bad as Dick and Jane. If we're actually going to run this simulation rather than just tinker with it, we can do better than that."

"Yeah," Gordon said. "Names are important. This gal sounds like she ought to be a Morgan or a Bentley or something like that."

That sounded okay to Dennis, but

Linda thought otherwise. "Yuck," she said. "How about Nicole? Or, I've got it—Hillary."

"Sounds good to me," Gordon said. "What about the guy?" He took the printout from Linda. "Hmm, he's a Southern boy. Born in Alabama in . . . wow, he's a lot younger than she is, isn't he?"

"Yeah," Linda said. "That's one of the things we specified, but it's not quite what we asked for. Hillary's forty-two, and I'm sure we said forty-one. I wonder why the computer changed it?"

"Maybe she had a birthday," Dennis said, just to remind his friends that he was still part of this discussion.

Linda shot him a look. "Yeah. Sure." She turned back to Gordon. "How old is 'Subject 2?'"

"Thirty-four."

"So he's older than we asked for, too. Weird."

"Maybe it's a bug in the program," Dennis said. "For all we know, this thing was never finished."

Gordon was peering over Linda's elbow as she flipped pages. "Well, it sure did a great job of building characters," he said. "I know some gamers who'd love to get their hands on whatever algorithm it's using." He pulled the papers away from Linda, who initially resisted, then relented. "Did you tell it to make your guy a jock?"

Dennis shook his head. "No."

"So it came up with that on its own, too. It says he was a track star in high school, then at Tulane. Where's that, New Orleans?"

Dennis nodded. "I think so. But I grew up in Kentucky. New Orleans was a long way away."

Gordon flipped a page. "Degree in physical education, mostly Cs. Somewhere in there, he took a shot at the Olympics. He made the trials, but lost in the finals. So what's the attraction between him and upwardly mobile Hillary?"

Linda took back the printout. "That's easy," she said, a moment later. "He was a 400-meter runner. You ever watch the Olympics? Those guys are hunks. He wound up at a Porsche dealership in New York City. I bet that's how Hillary meets him."

Gordon laughed. "So she test-drives the car and keeps the salesman. He needs a good Southern jock name to help catch her attention." He grinned wickedly. "And Dennis does *not* cut it. Who was that Florida quarterback who nearly won the Heisman?"

"Ricky Ray Gillette," Linda said. "Hey, don't look at me like that. Women watch football, too."

"Ricky Ray," Gordon said. "Bit of a mouthful, but yeah, I can see that catching ol' Hil's attention."

Dennis glanced at his watch. They'd used up half the lunch hour, and so far all they'd done was choose names and implicitly invite Gordon onto their team. Maybe it wasn't so bad that the simulation moved so slowly. Playing in a group would be fun, but agreeing on moves was going to take forever. "If we're going to actually *do* anything today, we'd better get going," he said. He retrieved his printout and shuffled to the last page. "Ten years after they marry, *Ricky Ray* and *Hillary*"—he emphasized the names to signal his hope that this discussion was *over*—"wind up here, a long way from New York City, living on the south side in some cheap apartment." He looked up. "Odd, that's not quite what we specified, either, though it's certainly equivalent." Linda shrugged and he turned back to the printout. "Ricky Ray has a suspended license for repeat drunk driving; she's got a drug record. But it's for pill popping, not marijuana as we'd imagined it. Looks like she got caught forging prescriptions. Weird how the program changes things like that, although I guess Linda and I weren't very precise on that."

He was sure, though, that they had specified a residence in far Southeast,

not closer in on Southside. Still, that change made sense. With his suspended license Ricky would need public transportation, and that was better in Southside than in Southeast.

Gordon was grinning like a kid with his first ice-cream cone. "It's all the dinky little changes that makes it such a cool character-development algorithm," he said. "It took your ideas and gave them life. That's one sophisticated program. So what do we do next?"

"Well, since Hillary and Ricky Ray started out on the fast track, then crashed, it might be fun to lift 'em back up," Linda said. "Especially if the program's going to keep giving us stories like this. This is better than a soap opera."

"Okay," Dennis said. "Let's have them win the lottery." He looked around the lunchroom and spotted another coworker hunched over a laptop. "Hey, Keith," he said. "You got wireless on that thing?"

Keith looked up. "Of course."

Dennis tossed his lunch sack in the trash and moved to Keith's table. As Linda and Gordon followed, he handed the printout to Keith. "Log onto this site, and"—he waited while Keith typed—"use that access code."

"Got it. 'NetPuppets.' Are you trying to buy Pinocchio on-line?"

"No," Gordon said. "We're the puppet masters. Electronic gods of the puppet universe. Want to be part of the God Squad?"

"Sure." He studied the screen. "And what rewards or punishments should we bestow on our subjects today?

"We want them to win the lottery," Linda said. She looked at Dennis and Gordon. "Right?"

There was a chorus of agreement and Keith resumed typing. "Boy, that's a bare-bones interface," he said. "Here we are. 'Commands.' Let's try 'Win Megabucks lottery.'" He hit return and waited a moment. "Whoa, that's weird." He swiveled the laptop so the others could see. ERROR—006, the screen said. REQUEST EXCEEDS MANIPULATIVE PARAMETERS. "What the hell does that mean?"

"I think it means it won't let us rig the lottery," Dennis said. "The more I think about those character sketches, the more real-world this simulation appears to be. I bet that if our characters buy lottery tickets, they're going to have exactly the same chance as anyone else. If we want to change their lives, we're going to have to do it one step at a time."

"So much for being masters of the universe," Gordon said. "If we want to make them shape up, what should we do?"

Linda was studying the printout. "Maybe we need to find out why their fortunes took a dive," she said. "We got in a hurry and skipped that part."

"Good idea," Dennis said. "After all, it is a psych program, so we're probably supposed to think psychologically—"

He was interrupted by Linda's gasp. "Yeah, we really overlooked something," she said. "Listen to this: Two years after they married, our subjects—sorry, Hillary and Ricky Ray—were the parents of twin girls. Hillary took six months' home leave, then returned to work. Ricky was doing night school at something called Brooklyn Teacher's College. I bet he was working toward his teaching certificate so he could actually *use* that phys ed major. They hired a nanny to take care of the babies, but two years later the nanny and the babies were clobbered by a hit-and-run driver. The nanny lived; the babies died. The driver was never caught. No wonder their lives fell apart."

"So winning the lottery wouldn't have done anything but give them booze and pill money for the next twenty years," Dennis said. "How *do* we get them back on track?"

"Send them to a psychologist," Linda

said. "These folks need help."

"Try it," Dennis said, and Keith typed again. But again the screen said his request was impossible.

"What *can* we do?" Gordon asked. "This is getting frustrating."

"'Request exceeds manipulative parameters,'' Linda repeated slowly. "I think we're going at it wrong. We're trying to think as though we *are* them, but maybe we're supposed to find a way to *manipulate* them into getting counseling."

"How?" Gordon asked. "Spam them?"

"Nobody reads it."

"Direct mail?"

"For a *shrink*? How would you get a friend to seek counseling?"

Dennis liked this line or reasoning. It ran true to the spirit of a psych program. "Let's hit them with stories of people who've been helped by counseling," he said. "Some of that Dr. Phil/Dear Abby stuff."

Keith was busy typing. "Good idea. I'm asking the program to order them some inspirational literature, donated by a 'concerned friend.' I'm also asking it to send a bunch of 12-step literature." He paused. "And just for kicks, I'll add a general request for related literature." He quit typing. "No error message so far. I'm now hitting 'submit.'" He depressed the mouse button. "Looks like we're on the right track." He paused again, waiting for the website to process his request. "Hmm, that's another odd response."

Dennis leaned across Keith's shoulder to get a better view of the screen. MANIPULATION IN PROGRESS, it says. NO FEEDBACK POSSIBLE FOR AT LEAST 24 HOURS.

"Wonder why it takes so long?" Keith said.

Dennis remembered the two-day delay between the first submission and response. It was almost as though the simulation was proceeding in real time. Maybe it was merely designed to teach patience to psychotherapists, but this was certainly a convoluted way to do it.

The next day, Dennis received several messages from NetPuppets informing him that various items had been mailed to Subjects 1 and 2. But that was all. A full month passed with no more messages. At first, he logged onto the site daily to check Hillary and Ricky Ray's progress. But always he received the same cryptic response. MANIPULATION IN PROGRESS. NO SUBSTANTIVE FEEDBACK. Eventually, he gave up. Then, one morning, he found a new message in his e-mail. "Intervention complete," it read. This time, the message carried no details other than advice that additional information was available online.

It was a busy morning, and Dennis didn't have time to check the NetPuppets site until he'd dealt with the latest crisis, an urgent demand for memory upgrades for the computers in Facilities Development. That department hadn't come close to taxing the capacity of its present units, but Personnel had gotten upgrades, and the Facilities chief was complaining about favoritism, so Dennis spent three hours pulling out perfectly good chips and replacing them with bigger ones nobody needed. Not that he really cared: it wasn't like it was his money.

He did find time, however to e-mail Linda, Gordon, and Keith to suggest that the God Squad reconvene for lunch. Keith again brought his laptop and the other three watched as he logged onto the NetPuppets site and entered the code that opened the Ricky Ray and Hillary simulation.

"Click that," Linda said, pointing to a button labeled *News*. Keith obliged and found a page that led off with two obviously news-related topics: *Intervention log* and *Results of interventions*. But there were also several other links that hadn't been present the month be-

fore, the most significant of which were *Finances* and *Medical*.

Without being asked, Keith clicked *Results*. Several items appeared, including a list of publications that had been sent to the couple and the dates on which they'd been mailed. But most interesting was an item dated that morning: "Payment made to Good Samaritan Counseling Center." Clicking on it, however, produced nothing more.

Stymied, Keith leaned back from the computer and looked to Dennis for advice. But Linda was ahead of him. "Try finances," she said. "Or medical."

Keith did, then whistled. "Hey, we've got their entire financial history. Visa bills, car payments, bank statements—the works. Was all of this here before?"

"Not that I know of," Dennis said. He might have missed it, but all told, he'd spent a couple of hours browsing the site on his earlier futile searches for a response. Dennis was beginning to think that the simulation was running in real time. First, it had waited a day to send the mail. Then it had taken a month for Hillary and Ricky Ray to react. Sometime in the interim, the program had "discovered" all these new lines of information. Very weird.

Linda and Keith were already paging through the financial entries. "There's the counseling payment," Keith said, "posted to their Visa last night. It's only $25, though. Who gets a shrink for $25? Maybe it's some kind of co-pay."

Dennis was having trouble reading the fine print of the Visa statement, but Linda was closer to the screen. "I don't think so," she said. "These guys are in debt up to their eyebrows." Reaching across Keith, she exited from the financial database and clicked *Medical*. "And they don't seem to have health insurance. I think it's one of those sliding-scale things, where you pay what you can afford." She continued to manipulate the computer. "Do they have any income at all?" She squinted at the bank statements. "Yeah, here we go. Ricky Ray is collecting paychecks from some used-car lot on Meridian Road. What a comedown from selling Porsches to Manhattanites. If Hillary's got a job, I sure don't see it."

"What are these?" Keith asked. "All these small deposits, every Friday." He ran the computer mouse over them and laughed. "Hey, these things are buttons!" He clicked one and laughed again. "It's annotated! Like a bank statement prepared by a private detective."

"Or one of us with time to do a lot of illegal stuff," Linda said. She glanced at Dennis. "You're right—this is a great sim."

Gordon was still staring at the screen, where Keith was examining Hillary's weekly deposits. He watched for a moment, then he too laughed. "You know what those deposits have in common? They're all mixtures of cash and small checks from folks out in the West Hills. Hillary's a housekeeper!"

"So Hillary and Ricky Ray not only need a 12-step program, they're also broke," Keith said. "We did something about the former. What if we give them some money?"

"We already tried that," Linda said. "Remember?"

Dennis thought about it for a moment. Had they tried it the right way? This program liked subtlety: realistic manipulations, not commands. "Maybe we need to think smaller."

"Like what?"

"What if we get Hillary a better job? Once upon a time, she was this superduper hotshot. Why not start circulating her resume and see if she can make a comeback?"

Keith started typing. "Sounds good. And so far, I'm not getting any error messages. What about Ricky Ray? If this thing's going to be so slow, we ought to have more than one iron in the fire."

Gordon clasped his hands behind the small of his back and leaned forward, stretching his shoulders. "I've got it," he said. "We know that Ricky Ray's a big jock, with a phys ed major and an out-of-state teaching certificate—or most of one, anyway. He'd make a great coach, and the DUIs shouldn't be that big a problem, so long as he doesn't have to drive anywhere. Let's see if we can snag him a part-time coaching job. It's a start, and I don't think coaches need certificates."

From that point on, progress was slow but steady. Hillary got a job interview with a downtown accounting firm, and while she didn't land the job, pretty soon she was sending out resumes on a regular basis, without intervention from the God Squad. But Ricky Ray was the first to get a job, coaching track and cross-country for one of the Metro schools. The school, which really existed, had a dismal record in the intra-urban conference.

"No reason they wouldn't actually take a risk on someone like Ricky Ray," Keith said, after pulling up the school's recent results on the Internet. "Especially at what they're paying him."

Dennis agreed, but continued to be intrigued by how the simulation intertwined their characters' lives with real events. As the weeks mounted and the God Squad shifted to meeting monthly, after work, Dennis decided the realism was addictive. Without it, he would long ago have lost interest in the slow-moving program.

Also intriguing was the way he and his friends found themselves living vicariously through the characters. In part, it was because Hillary and Ricky Ray's lives were so different from their own. But it wasn't as though they were using Ricky and Hillary as stand-ins for what they themselves had always wanted. Quite the contrary. In real life, Linda was laid-back nearly to the point of sloth, but now, she was the one who most intensely wanted them to have everything *now*. It was as though she was testing out the fast-track life to prove to herself that she'd been right never to pursue it. Dennis himself was fascinated by the opportunity to play at manipulating people, rather than machines, while Keith, who drove a rattletrap car and only had three pairs of blue jeans and a half-dozen T-shirts to his name, had become the squad's leading materialist. Only Gordon, to whom everything was always a joke, seemed unaffected.

Watching his fellow squad members, Dennis was reminded that psych experiments were seldom what they appeared to be on their face. Not long ago, he'd read about one that had claimed to be an advertising study in which people were shown what they were told was a new line of ads for Disneyland, strongly featuring Bugs Bunny. Afterward, some of the ad-raters could recall meeting Bugs on their own childhood visits to Disneyland. The catch: Bugs couldn't possibly have been at Disneyland. He was a Warner Brothers character, not a Disney character. The study had nothing to do with ads; it was designed to test the accuracy of childhood memories.

Given the devious minds of psychologists, Dennis couldn't help but wonder what the simulation was designed to test. Maybe it really *was* intended to teach patience. If so, Dennis was very much the wrong subject. He'd always been content to go with the flow, so long as it was fun.

Keith, however, had become so obsessed with Ricky and Hillary's housing situation that Dennis wasn't sure he was enjoying the game. En route to one God Squad meeting, Keith had gone miles out of his way to drive through the neighborhood where Hillary and Ricky supposedly lived. "It's the type of place where the strip-malls have bars on the windows," he report-

ed. "We've *got* to get them out of there. But let's wait until they can afford somewhere nice."

"As if he knows what nice is," Gordon murmured.

Keith heard it. "I do too!" he said. "I once went to a party out in East Lakeridge. If I won the lottery, that's where I'd live."

"But not if you had to work for it."

Even Keith was grinning now. "Then there wouldn't be any time for play!"

A month later, Hillary finally got a job—not a great one, but a starter position as an accountant for a plastics manufacturer on Goose Island. But it wasn't until several months later that the God Squad learned something that changed the entire complexion of the game.

By this time, the *News* page had grown so many data channels that all four God Squadders were bringing computers so they could work simultaneously. They'd also shut off the e-mail notification feature to avoid being incessantly spammed with updates.

The big discovery came by accident, when Dennis and Keith were puzzling about how to increase Ricky's coaching income, while Linda and Gordon were examining other aspects of the couple's finances.

"You know," Keith said, "Ricky ought to try private coaching. I have a friend who hired a coach to train him for the Boston Marathon. He paid $125 per month for group sessions that met twice a week. Multiply that by a couple of dozen runners and it's a nice chunk of change even if we drop Ricky's fee to, say, $100 a month."

"How can he get clients?" Dennis asked.

"By running an ad on some running website. It can't be all that expensive."

Dennis shrugged, hit Google, found a dozen choices, and picked one that looked local. He copied the URL and returned to the simulation.

"The hard part's going to be figuring out how to get him to run the ad," Keith was saying. "Too bad we can't just tell him what to do."

Dennis was looking at the intervention screen. *I wonder,* he thought, and started typing, fully expecting an error message the moment he finished. The best feature of the interface was that the simple act of typing a command debugged it, even if you didn't actually submit it by clicking "enter." Since many commands could never be made to work, it saved a lot of time. There was no sense spending an hour debating an idea only to watch it hit one of those irritating "exceeds manipulative parameters" messages.

Surprisingly, this command produced no such response. But sometimes that merely meant the problem was too subtle. *What the hell,* Dennis thought, and clicked enter. Technically, it was a breach of God Squad etiquette to do so without first talking to the others, but he didn't really expect it to work.

Suddenly, Linda jerked back from her computer. "Whoa!" she said. "What did you guys just do?"

Dennis looked up guiltily. "I requested a one-month banner ad on a running website," he said. "Nothing should have happened because I was still trying to figure out how to make Ricky Ray place the ad himself."

"Well, apparently he didn't wait for you," Linda said. "Something called RacerAdsInc just charged $395 to his credit card."

Everyone was stunned by Dennis's accidental discovery that the God Squad could spend Hillary and Ricky Ray's money directly. Gordon asked Dennis to verify that it really worked by simulating a book order from amazon.com.

"What book?" Dennis asked.

"I don't know. Anything you want. The weirder the better." Gordon

paused. "No, why not make it something relevant? Something about coping with the loss of a child."

When NetPuppets accepted the request and a charge appeared on Hillary and Ricky Ray's credit account, Dennis tried a few other experiments and quickly discovered that the God Squad's spending power was limited to things that really were available online. But there was still a lot they *could* buy. Linda insisted that Dennis tell NetPuppets to find a site that sold better-grade jewelry and order Hillary a diamond tennis bracelet, "with love, from Ricky Ray." Not to be outdone, Keith ordered Ricky a 37-inch, flat-screen television as a gift from Hillary. Then Dennis called a halt to the spending spree by pointing out that Keith and Linda had just set back their housing quest by at least six months. "That coaching ad better work," he said, "because in the last five minutes, we've damn near maxed out that credit card. I realize it's not actual money, but it doesn't grow back any faster than the real stuff."

Over the next several months, finances became the primary focus of the game. Linda took charge of Hillary and kept her resume in constant circulation, seeking a better-paying job. She even resorted to padding it with glowing references. Dennis was worried. "Don't have her change jobs too often," he warned, "or she'll become unemployable. And if you're going to exaggerate things, don't get caught, or it'll be back to cleaning houses."

"Don't worry," Linda said. "I'm not applying for anything that's not a huge step upward. And anything more than trivial doctoring of her credentials doesn't work. I tried it. In her first couple years of college, Hillary took a lot of science courses—maybe she was thinking of going to med school or something. Then she choked on both chemistry and calculus: a D+ in one and a C—in the other. NetPuppets let me change the transcript to replace those with As in a couple of rinky-dink electives, but then someone wrote to the college and pointed out the 'error.' I think our Hillary's got a conscience."

"Too bad she's also got a drug record," Keith said. "She'd make a good CPA, but she'd never get a license. CPAs make big bucks."

"Maybe she could be a consultant," Dennis said.

Linda shrugged. "I don't think she knows enough about computers."

"No, not a computer consultant. I was thinking of a business consultant or an environmental consultant—something like that. At work we're using some consulting firm to help plan that new biotech lab out in Trout River. I was up in Accounting the other day and heard them gossiping about how much we're paying those guys. I don't remember the figure, but it was a lot."

"What's the name of the firm?" Linda asked.

"Something boring, like Environmental Research Services."

Linda was already on Google. "Got 'em. Environmental Assessment and Research Services, actually. EARS. How cute. Their offices are in the NewBank Tower, 44th floor. Ritzy. No wonder they charge so much." She paged through the EARS web page. "Hey, they've got a job opening for something they call Research Specialist III. Maybe we just got a break. This thing's limited imagination won't let me submit Hillary's resume unless there's a real opening in the outside world, and there just haven't been many good ones. A company like this would give her a lot more upward mobility than that plastics outfit she's working for now."

Linda started to type, but Dennis interrupted her. "Wait a sec," he said. "You're still on the EARS site. You've got to do it through NetPuppets, or you're really applying for that job."

Linda laughed and shook her head.

"Oops," she said. "Sometimes this thing feels almost too real."

"Yeah, and it's got a mind of its own," Keith said grimly. He'd taken over Ricky Ray's private-coaching career and earlier that evening he'd grumbled that he was about ready to throttle Ricky. Now he explained. "As of last month, Ricky was coaching fourteen athletes. That *should* be $1,400 per month, but he won't charge all of them the full rate. Some are paying as little as $5 per week. It's like he thinks he's some kind of social worker—just like that shrink he and Hillary are still seeing, except the shrink's probably making plenty of money from his other clients, while Ricky Ray and Hillary are living in that damn *apartment* out trailer-park land. I mean, we got him that big-screen TV, but he's hardly got anywhere to *put* it."

More months passed, and Hillary and Ricky Ray's fortunes slowly improved. Hillary got the job with EARS and was soon promoted to Research Specialist II. Then she transferred to Economic Policy Specialist II. "Great," said Keith, when he heard about the shift. "That means she's found a niche. She's on the way now!"

Meanwhile, Ricky Ray enrolled in a local college to complete his missing courses. But the best news came in November, when Linda made her monthly check-up of the couple's finances.

"I'll be damned," she said. "Hillary's got a rich aunt."

"How do you know?" Gordon asked.

"She just got a big check from some old lady in a retirement center in Phoenix."

"How big?" Keith interjected.

"Forty thousand dollars big," Linda said, reciting the figure as though it was something that happened every day.

"I smell a down-payment," Gordon said. "Good-bye apartment."

"Not enough of a down-payment," Keith muttered. "I thought we were trying to get them into someplace ritzy. Like East Lakeridge."

"Or one of those swanky houseboats in Riverside Marina," Linda said. "I vote for those. They're really cool. But you're right: even with $40,000, they're not going to get financing for anything nice. Damn. This is taking forever."

"Maybe we can speed it up," Keith said. "If the aunt's got money, it stands to reason that the rest of Hillary's family does, too. And check this out: there's now a button for family history."

Dennis stared at the new icon, but didn't bother to click it. "It's like the program just learned how to trace Hillary's family now that they finally reconnected with her," he said. "I wonder why it does things like that?"

"Who cares?" Keith said. "I bet there *is* money there. It's just a matter of figuring out how to get it."

The God Squad didn't meet again until late December, and then it was at a Christmas party in the EARS offices. Dennis learned about the party when he was upgrading network software for Contract Services and spotted a stack of invitations on someone's credenza. Curious to see what the EARS folks looked like, he cadged a couple of you-and-a-guest cards and convinced the others that free booze alone was a good enough reason to crash the party.

Unfortunately, all but Linda badly missed the dress code. "I told you blue jeans wouldn't cut it," she hissed to Dennis when she first saw him. "You could have at least worn a tie."

Dennis shrugged. "Don't own one."

Linda shook her head. "And you never heard of going to the mall?"

Dennis could feel his ears burn, but did his best to shrug it off. Underdressed or not, free booze was still free booze.

Naturally, the conversation turned to Ricky Ray and Hillary. "I had this really

frustrating experience with Ricky," Keith said. "One of his runners entered the New York City Marathon last month. The *News* box said the guy had finished thirty-seventh. That's good, but I thought we could do better, so I asked the program to move him up a few notches."

No breach of etiquette there: the God Squad had long ago given Keith sole control of Ricky's coaching.

"Anyway," Keith said, "the website accepted the change, but a few days later he was back in thirty-seventh place. I kept trying but I just couldn't make the change stick. Sometimes it seems like our characters *resist* our attempts to help."

"Hillary's giving us problems, too," said Linda, returning from the bar with her third glass of wine. She was sampling her way through the wine list, apparently bent on trying them all. This one was white. "Did you see what she and Ricky Ray did with all that money?" She tested her wine. "Hey, this stuff is good. A lot better than what I usually drink."

"I hope she's not buying wines," Dennis said. "Ricky Ray's probably best off teetotaling."

Wine made Linda flirty. She swatted him playfully. "No, nothing like that."

"Please don't tell me she got a Porsche," Keith said. "I know she might have sentimental attachments to the things, but she's never going to get a nice house if she blows her money on a car."

Linda stomped her foot, wine sloshing dangerously. "Would you get *off* that house thing? I thought we were going to get them a house*boat*. Anyway, that's not what I meant." She paused theatrically. "She's not *buying* anything. She's giving it away."

"*All* of it?" Keith was aghast.

Linda shook her head. "Three thousand dollars, so far," she said. "Three checks, the week after the money arrived. "A thousand dollars to the City Rescue Mission—you know, that big homeless shelter down on Front Avenue. Another thousand to Mothers Against Drunk Driving. And a grand to Holy Redeemer Lutheran Church."

The last name rang a bell in Dennis's memory. "Is that the place with the 12-step program?" He wondered if making restitution was one of the steps. "Maybe they're trying to give back to society."

"Maybe," Linda said. "You know how NetPuppets keeps giving us those new menus every now and then? There's now one on community activities. It says they started giving away money sometime last summer. I checked back through their accounts, and they've been making lots of little donations. Twenty dollars here, $50 there. It adds up to about a tenth of their income."

"I'll be damned," Gordon said. "What else did that new menu tell you?"

"Well, we already knew that Ricky Ray's giving away coaching services, cheap. It also says that he and Hillary have been going to a soup kitchen twice a month to feed street people. But the weirdest one is that Hillary's volunteered for some Mayor's Task Force on Pedestrian Safety. Why on earth would she waste her time on a job like that?"

Dennis knew the answer to that one. He smiled sadly, and Linda figured it out too, despite the wine.

"Oh," she said. "Her twins." She swallowed the last of her wine and set the glass on a nearby table. "How sad."

"Sad or not," Keith grumbled, "all this community service stuff is going to cut into her overtime. At this rate, they're never going to get a house." He held up a hand, staving off Linda's protest. "Or a houseboat." He swigged his own beer. "It's *our* money. We got it for them. Why does that stupid program make it so hard for us to get them ahead?"

Dennis sipped a beer, while Linda hit the bar to try the pinot gris. "Remember, this is a simulation, not a game," he said. "What would you do if someone tried to push you into working a whole bunch of overtime?"

Keith sighed. "Tell 'em to jump in a lake," he said. "But that's not the point. Hillary's not me. I can do *me* just fine. I want to play at that yuppie executive thing without really having to *do* it, if you know what I mean. But she keeps wanting to be this creepy"—he paused, searching for the right word—"*Girl Scout*. And Ricky's just as bad."

"To beat that, we're going to have to seduce her, not force her," Dennis reminded him, surprised by how much he was starting to share Keith's goals.

Linda was back from the bar. "How do we do that?" she asked.

"Easy money might help," Gordon said.

Dennis snorted. "So we're back where we started again, with the lottery. *It didn't work.*"

"No," Gordon said. "I'm talking about something that's already part of the game." Grinning, he took a swig of his beer. "We know that Hillary has a rich aunt, right?" Everyone nodded. "An *old*, rich aunt." He paused again, milking as much suspense as possible from playing the provocateur. "What do you bet Hillary's in the will?"

"Yeah, but that could be a *really* long wait," Keith said. "Maybe we should just quit with all this get-ahead stuff and stomp Hillary and Ricky Ray back where they came from. When my nephew got one of those sim games for his birthday, one of the first things he did was put his people in a house with no doors, to see how long it took 'em to starve. It might be fun to see how quickly we could get Ricky Ray and Hillary back on the booze and pills."

"Let's not do that yet," Gordon said. "We've got an awful lot of time invested in this. Besides, I think we can get money out of the aunt pretty quickly."

"What, you're going to order up a hit on her? I doubt that'll work any better than trying to rig the lottery."

"No." Gordon said. "We don't need anything so dramatic. Have you ever heard of an old person who's not on a whole bunch of pills? I bet we can mess with her prescriptions. We work for a drug company. Surely we can figure out a deadly combination."

Keith grinned. "Gordon, that's perfect. We get to take someone down without undoing everything else. *That* sounds like fun!"

Dennis wasn't so sure, even after he reminded himself it was just a game. Was there any way Hillary and Ricky could be blamed? He couldn't think of any, but other ramifications were also possible. "Just how strong is Hillary?" he asked. "The aunt's the only member of her family who's supported her during her comeback. As far as we can tell, the rest wrote her off long ago." Well, actually, it was the NetPuppets simulation that had had them write her off, but the distinction was hard to keep in mind. "Do you think she could handle it if the only person who's been nice to her dies in yet another tragic accident?" Especially a drug-related accident, now that she was consulting for a pharmaceutical company? We might wind up doing Keith's 'stomping' by accident."

Nobody had an answer to that one, although they all had opinions. The one thing they were sure of was that Hillary and Ricky Ray were in danger of settling into a rut from which they might be hard to dislodge.

Already well on their way to memorable hangovers, none of the God Squadders noticed another couple who walked past them on their own way to the bar. The woman was petite with jet-black hair and a black dress that accentuated a well-maintained figure. Only the crows-feet around her eyes betrayed that she was older than her

escort, a tall, lean man in a blue blazer and chinos. He was drinking diet cola. She ordered raspberry juice and tonic, with a twist of lemon. When she raised her drink to taste it, a diamond bracelet flashed in the light. She wasn't really thinking about much, just enjoying an evening out with her husband, who she was looking forward to introducing to her coworkers. She was so proud of the way he'd taken back control of his life and was not only teaching his high school kids the discipline of running, but how to be strong in the rest of their lives, as well. How to avoid making the mistakes the two of them had made.

Then she froze, the glass halfway to her lips. Her free hand reached for her husband's and squeezed it, hard. "Jerry," she said, leaning close to him to keep her voice from traveling. "It sounds like those people over there are talking about the money we got from Aunt Louellen!"

Jerry Jeff Hackett nodded. The blood had drained from his face, converting what was normally a year-round tan into something that looked like badly applied makeup.

"I noticed," he said. "Earlier, they were talking about a runner who sounded an awful lot like Frank Murdo. He had to send that plaque back three times before he finally convinced the marathon folks he hadn't won it."

She glanced around, looking for an inconspicuous way to continue eavesdropping, but what she saw instead was her project manager bearing down on her with a broad grin on his face. "Natasha," he boomed. "I've been looking for you. And this must be your husband." He pumped Jerry Jeff's hand. "I'm Walter Shapiro, and I have the pleasure of working with your brilliant wife. Speaking of whom"—he turned to Natasha—"you've never met Helen Wong, our liaison with the client. The last I saw her, she was over there somewhere . . ." He turned to look, and Natasha shot a final glance at the foursome lounging near the bar.

". . . Her twins," someone was saying, ". . . how sad," and for a moment Natasha was so strongly transported back to that terrible day that she thought she might black out. But Jerry Jeff had heard too, and the pressure of his hand was a magnet, pulling her back from the past and rooting her to the here and now, where what was done was done and destroying herself would do nothing to undo it. Then Walter's voice washed back to her and she realized that amazingly, she really was strong enough to deal with this.

"There she is," Walter said. "Hey, Helen . . ." And then he was leading her and Jerry across the room, and the conversation faded behind her, with the woman babbling about houseboats, which was almost as disconcerting as hearing the others talking about Aunt Louellen. For months, some realtor had been bombarding her with ads for houseboats. But she couldn't imagine what that had to do with Aunt Louellen.

Two hours later, Natasha and Jerry Jeff were alone, walking to the parking lot where she had left their car. Somehow, she had survived meeting Helen without making a fool of herself, though she had no memory of what she'd said. Instead, snippets of overheard conversation were still floating through her head, arranging and rearranging themselves into shifting patterns.

"How on earth did those people know about Aunt Louellen's gift?" she asked. She didn't have to tell Jerry who *those people* were. "And about Frank Murdo," she added.

Jerry Jeff shook his head. "Better question: why were they calling you Hillary and me Ricky Ray? And they never looked at us, even when Walter Shapiro was practically shouting your name. How could they know so much

about us and not have a clue who we were?"

Natasha raised Jerry's hand to her lips to kiss it. Then she paused, staring at her tennis bracelet. She let her hand drop back to her side. "Did you hear the way they were talking about 'Hillary' and 'Ricky?'" she asked. "It was like they thought they owned them."

"Very creepy," Jerry said. They walked on in silence. "It really has been a strange year," he said eventually. "All those twelve-step brochures and job offers out of nowhere. People asking me to coach them based on an ad I know I never authorized, and nearly cancelled. Do you think those folks are somehow *making* things happen?"

Natasha looked again at her tennis bracelet. "You really didn't buy this thing, did you?"

He shook his head. "I kept telling you that, but you thought it was so sweet, I gave up."

She couldn't decide whether she was relieved or disappointed. "It *was* sweet," she said. "But insanely extravagant."

"And I presume you didn't buy me that silly TV," he said.

She stopped, and turned to face him. "No. I thought *you* bought it for yourself, then claimed I did in some feeble-minded effort to cover it up."

There was no humor in his smile. "It's the type of thing I might have done," he said. "Back in the bad old days. But not now. And never for a TV. I'd have been happier with a fishing pole. I only watch that thing because I thought you bought it for me."

She kissed him, hard, on the cheek. "And that, Jerry Jeff Hackett, is why I'll always love you."

By the time they got home, they'd listed dozens of strange coincidences. Some were probably true accidents, but Natasha was increasingly convinced that most were not. Each time she replayed the fragments of conversation she'd heard, more pieces fell into place. "Characters" . . . "news box" . . . "website" . . . "NetPuppets."

It was frightening, because if she was right, she and Jerry Jeff were being manipulated by people who didn't even know they existed.

Jerry's face was grim. "Who *are* those people?" he asked. "And how do we get them to leave us alone?"

"I don't know," she said. She suspected that her own expression matched his. "But with a little help from Walter and Helen Wong, I can sure as hell find out the *who*. As for the *how*, maybe we can find that website they were talking about." After all, how hard could it be to locate something that called itself NetPuppets?

Still, she thought, even though some of the things that had happened in the past couple of years felt as though some alien was trying to make her and Jerry Jeff into people they never wanted to be, others had been marvelous.

Natasha had also heard enough of that woman's comment about the twins and the Pedestrian Safety Task Force to know that it carried an insight she herself had been dodging. Was there a way, she wondered as the computer whirred to life, to keep the good while protecting herself from the bad? More importantly, was there a way to get what she secretly wanted more than anything else—but which, until now, she'd presumed to be impossible?

Michael Graves hesitated before knocking on the door. A tidy plaque promised that inside he'd find Cassandra Rollins, Ph.D., but he wasn't sure of his reception. Long ago they'd been friends. More than friends, actually. Then she'd finished her Ph.D. while he'd floundered over his, because his heart hadn't really been in it. Now he was reappearing, unannounced.

He blew a short hard breath to settle the butterflies, then knocked—briskly

and professionally.

"It's open," a familiar voice said. He twisted the knob and found a cluttered office—the type of place that might be home to an ambitious young professor. Which was exactly what Cassandra was. She was also totally amoral, but you can't tell that from an office. Not that Michael himself was afflicted with the world's strongest conscience. But sometimes, Cassandra scared even him.

She hesitated momentarily when she saw him—the briefest of memory searches. She hadn't changed much, but he had: less hair on his head, more on his face. Then recognition flared and Cassandra shoved back from her desk, where she'd been taking notes from some heavy-looking treatise.

"Michael!" She was hurrying to give him a hug, and Michael felt an odd sense of loss. He'd have felt better if Cassandra still harbored resentment over his long-ago disappearance, but apparently, he'd never meant that much to her. She'd always had a habit of observing her way through the world, remaining detached from true entanglements. It had made her one hell of a researcher and a great partner-in-crime, but relationships would never be her forte.

"What have you been up to?" she asked when she released him. "What's it been? Four years?"

"Three," he said. "And I've not been doing anything special. A little of this, a little of that." He flashed the grin that had charmed her all those years ago. "Then I decided it was time to settle down and finish my thesis. I got back last week." As he talked, he wandered her office peering at the spines of books, picking things up and setting them down. He'd always been a watcher, too. Just not *quite* as detached about it as Cassandra.

"What's this?" he said, picking up a piece of letterhead. "'Rollins & Associates, Market Research Consulting.'" He looked around. "Where are the associates?"

Cassandra tapped her skull. "Up here. It's just a business name. Maybe someday I'll activate them, but not until I get tenure. The U. puts limits on how much outside consulting I can do before then, and frankly, there isn't much time. But even if I can only give them a few hours, clients pay a lot for a psychologist who's also a marketing genius. Which I am, thanks to your secret weapon."

"We had a lot of fun with that, didn't we?" Michael said. His webcrawler and her Bayesian psych routines. "I knew you'd eventually find something better to do with it than playing practical jokes. Remember old Professor Hardesty?"

"How could I forget? We got him good, didn't we?"

"He deserved it."

"And Dean Pickesworth?"

Michael laughed. "She knew I was responsible for that, but could never figure out how." Time for business. "Look, I don't have much time, but I wanted to stop in, rather than just call. There's been some activity on that old site."

Cassandra took back the paper with the Rollins & Associates letterhead. "I still use it to test out psychological theories. Things they won't let you do in the lab. Sometimes I use it to try out marketing ideas."

"Fairly often, in fact."

Cassandra shot him a quizzical look.

"Just because I haven't been around doesn't mean I'm not watching the activity log." He grinned, back to being partner-in-crime rather than former lover. "You sure caught my eye when you gave it that catchy name. I take it you're also using it for bait?"

"Not recently," Cassandra said, "but a couple of years ago I did a whole series of papers on the psychodynamics of how people interact with computer characters. Do they keep their morals

or throw them out the window? And what does it mean, either way? It's easy to get funding because everyone's so worried about computer games. I changed the name so people would stumble onto the site and think it's a simulation, but it's way more realistic than any game. What those people did inspired a lot of real experiments."

Michael was amused. "The best simulation is reality you don't know is reality, huh?" Which brought him to the reason for today's visit. "What we have now, though, is reality which has learned it's a simulation and may be trying to simulate itself."

"Want to say that in English?"

"Recursive is more fun. And this is about as recursive as it gets."

He forced himself to get serious. "There's a group of people who've been using the site for a year," he said. "The folks they're manipulating have somehow figured it out, because *they* logged onto the site last night. Which is what prompted me to hunt you up."

"What do you think they're planning to do?

"I haven't a clue. As of last night, they were just looking around. But the things they looked at made me think they might be planning manipulations of their own." He decided not to tell her that his crawler had been designed to notify him, not her, if the site produced any odd activity. Better to let her assume that he'd just happened to be looking at the activity log so soon afterward. "Should we just lock them all off the site?"

"Are you kidding? This could get really interesting. Who knows? It might get me another paper."

Michael wasn't surprised by that reaction. It was pure Cassandra. "Publish or perish?"

"You got it."

At the next God Squad meeting, Linda arrived visibly upset. "I got this in the mail," she said, displaying a brochure from an organization calling itself the Simulant Protection Society. "It says that people who abuse computer characters are more likely to abuse children."

"I got one, too," said Gordon.

"Mine compared it to torturing kittens and said I was going to become a psychopathic killer," Keith said.

Dennis had gotten both versions. "Think there's anything to it?"

"I don't know," Linda said. "The timing's sure weird. Almost karmic." She hesitated. "Maybe when we get tired of Hillary and Ricky Ray we should just let them live happily ever after, off in computer space."

Keith snorted. "Cyberspace karma. That's ridiculous."

"Maybe," Gordon said. "But if we want to generate some good cyber-karma, we could try to do something about Hillary's kids."

It was Dennis's turn to be disgusted. "It's never going to let us resurrect them."

"I wasn't talking about that," Gordon said. "I was talking about replacements."

"I think she might be getting a bit old for that," Dennis said. Off to the side, he could see that Linda was looking more disturbed than ever.

"Getting her pregnant's not the only way," Gordon said. "I haven't a clue how we'd do that, anyway. I meant adoption. It would be a great challenge. Trying to get an agency to overlook the drugs and DUIs—"

"Where did you come up with that idea?" Linda interrupted.

"A phone call, actually—from an adoption agency that thought I'd missed an appointment. Obviously, it was a screw-up, but it did get me thinking."

Linda's face was ashen. "I got one of those, too," she said. For a moment, Dennis was afraid she might faint, but there was plenty of strength in her voice when she turned to Keith. "Still

don't believe in karma?"

"Hey, I've got no problem giving Hillary and Ricky the good life," he said.

"If it's karma you want *and* some bad fun, maybe we should create some new puppets," Gordon added. "Base them on folks who've got it coming to them, like that shift supervisor in Accounting who's always giving everyone grief."

"Let's do more than one," Keith said. "How about that VP in marketing who thinks he's the most important thing on the planet?"

The talk was making Dennis feel uncomfortable, somewhat as he had when they'd discussed killing Hillary's aunt. *Lighten up,* he told himself. After all, it was only a game. "How about that snotty receptionist in Legal?" he asked. "You know, the one who looks down her nose at you because you're not wearing an $800 suit?"

The next day, Cassandra smiled as she read the activity log. Michael's recursion study wasn't the only one she'd get out of this.

Contentedly, she pulled a notepad toward her. *Possible inverse correlation*, she wrote. *Large group = lowered inhibitions???* No group this big had ever before logged onto the site. Previously, all she'd seen were singles and pairs.

Her smile enlarged to a wolfish grin. *Publish or perish,* indeed. However this came out, she, for one, was definitely going to publish. More than once, she suspected. If these people stayed as busy as it looked like they might, they could carry her the rest of the way to tenure.

On the far side of campus, Michael was also examining the activity log, pulling up a trap that allowed him to review everything entered into the website, keystroke by keystroke. Off and on for several weeks, one of Cassandra's foursome had been testing commands—not entering them, just debugging them. Nothing odd in that, except for the commands themselves, which involved an eighty-five-year-old woman's prescriptions.

Michael had always known that his program was powerful. He and Cassandra could have gotten rich by selling it to the government, but even she had known that was a bad idea. After you sold it, where would you hide?

What he hadn't realized until now was that the program was the perfect assassin's weapon.

If he told Cassandra, she'd see it as a chance for yet another paper. Perhaps it was better simply to add a few lines of code to preclude prescription tampering.

But he had more in common with Cassandra than he liked to admit. He too was an observer. The guy playing with the debug routine might be yet another kind of spectator—the type who can't resist toggling switches or pushing buttons just to see what happens.

Cassandra would be fascinated by the psychological fine points of a simulated murder plot so realistic it was actually the real thing. For Michael, it was more like watching a reality show. He couldn't help but wonder which group would be the winner of this odd sport, played for higher stakes than either realized. He also wanted to know whether, if the submit button ever was clicked, the scheme would actually work.

When the showdown finally came, it was the result of one of those coincidences which, when you stop to think about them, aren't really all that coincidental. After all, even in a city of a million residents, the running and coaching community is a small, insular group.

It was Keith who found the critical clue, a couple of months after the God

Squad had altered, faked, or erased enough records to make Hillary and Ricky Ray look like good candidates for adoption. Driving to Keith's apartment for that month's meeting, Dennis had been thinking about the fact that however much Hillary might have resisted the squad's efforts to improve her academic record, she'd done nothing to block their present work. But when he suggested to the group that Hillary's conscience might be fading, Linda shook her head. "Motherhood's a strong drive," she said. "A lot stronger than money." The words were simple, but there was an undercurrent to her tone that reminded Dennis that ever since they'd started the adoption project, Linda had seemed abstracted—increasingly hinting that she was dissatisfied with her own life.

In the awkward silence, Gordon studiously ignored Linda, while Keith busied himself with his computer. Only Dennis met her eye, wondering whether a time might come when he, too, might want a life of real responsibilities. Or did he prefer the vicarious responsibilities of a computer game—ones that he could blow off whenever he felt like it? He was still trying to figure out what, if anything, to say to Linda when Keith drew everyone's attention with an explosive, "What the hell?"

"What-the-hell what?" Dennis was relieved to be pulled from his unaccustomed introspection, but not really in a mood to talk. Keith was examining a file that appeared to have something to do with Ricky Ray's private coaching. "Don't tell me you tried to change another race result and got him in trouble."

"Nothing like that. I was just checking to see if Ricky had any new clients. There's only one: Walter Rose."

"So?" Gordon asked.

"So Walt's the guy I told you about way back when. The runner with a private coach. The one who made me realize Ricky could go into the same business."

"And?" Dennis's mind was still on Linda, and his thoughts were oddly sluggish.

"Walt's a real person. So why is he showing up in a sim?"

"Why not?" Linda asked. "Race results are posted online, right? Maybe he did well in some race and the sim latched onto his name. It's done weirder things."

"Yeah," Keith said. "Maybe." He reached for the phone. "Let's find out." He dialed, waited a moment, and waved the others to silence. "Hey Walt," he said. "Yeah, I know it's late." He glanced at his watch and winced. "But I hadn't realized it was *this* late. . . . Look, as long as I woke you up, I've got a quick question. Who's that coach you use? No, I'm allergic to sweat. But I have a friend"—his eyes swept the room—"Linda, who might be interested . . . Wait a moment—" He grabbed a pen, located a scrap of paper, and scribbled something on it. "Is that the guy you told me about last year? When? What's it cost? Thanks, Walt . . . Yeah, sorry to call so late. It's that computer night-owl thing. Next time, I'll remember to look at the clock."

Keith hung up. "Walt has a new coach," he said. "The guy's name is Jerry Jeff"—he checked his notepad—"Hackett. Walt shifted to him last month based on a recommendation from somebody named Frank. He says Hackett charges on a sliding scale, based on ability to pay, and that he's an all-round nice guy who coaches at a local high school. Walt doesn't remember which school, but I bet we can guess. How the hell are Walt's payments to this Hackett guy showing up on Ricky Ray's account?"

Dennis was thinking back over their efforts to get Ricky started as a coach. "That Internet ad I requested," he said. "Do you think NetPuppets hacked the site and actually placed it? It never

crossed my mind to look at the real site."

"Too late to find out," Keith said. "I dropped the ad months ago. Besides, if NetPuppets actually placed an ad, why would it do so in this other guy's name rather than Ricky's?" He paused. "Unless . . ."

"Oh gads," Gordon breathed. He was staring at Keith, leaning back in his chair as though physically recoiling from what he had heard. "You don't think . . . ?"

Linda had been alternately pecking at her laptop and drumming her fingers in waiting-for-the-Internet impatience. "Gads is right," she now said. "Not only is there really a Jerry Jeff Hackett at that high school where Ricky supposedly coaches, but the EARS website lists a Hackett among its staff. Her name is Natasha, but the promotional bio they've posted for her sounds an awfully lot like Hillary."

Dennis felt nearly as shell-shocked as Gordon looked. "So when we do something on NetPuppets," he managed to ask, "does it really happen? Or is this just an elaborate game of 'pretend?'"

"Easy enough to find out," Keith said. "Let's buy something real, and have it shipped to us. Something inexpensive we can get right away."

"Like what?"

"How about a pizza," Keith said. "We could have that in a few minutes, rather than waiting a day or two for FedEx."

"And beer," said Gordon. "I need some beer."

It seemed to take forever for the pizza to arrive, although when Dennis checked his watch, it turned out to be less than an hour. Just before Keith had placed the order, Dennis's brain had come back to life and he'd suggested that the pizza be delivered to a self-service car wash up the street, where he could pick it up while pretending to be cleaning his car. "Technically, we're committing some weird kind of credit card fraud," he said. "No sense in laying a trail that leads right to us. If there really is a pizza."

"Yeah," Linda said, but it was obvious that she'd be surprised if there wasn't. "I'll keep you company."

"I think you're being paranoid," Keith said as he flipped pages in the phone book, looking for the car-wash address. "We've done a lot of other things with that credit card and nobody's complained."

"True," Linda said, "but this is the first time we're spending money on ourselves." She turned to Dennis. "Let's take my car; it could use a wash, anyway."

Waiting for the pizza, they hadn't said much, but there hadn't really been much to say. Dennis spent the time fervently hoping there would be no pizza and that he could go back to naively playing the NetPuppets "game," but Linda had shaken her head when he voiced that wish. "Even if this is just a bunch of coincidences," she said, "I'm out." Then she added cryptically: "There's just been way too much cyber-karma."

Later, as they drove back with the pizza box warm and solid on Dennis's lap, neither spoke, but something between them was subtly different. A case of cold beer sat at Dennis's feet, and the car was redolent with the aroma of pepperoni. The all-too-real smell was anything but enticing, and Dennis had no interest in the beer. He had a hunch that his next few decisions were going to be critical, and he wanted a clear head.

When Linda and Dennis returned, they found that something had also changed in Keith's apartment. The difference was reflected in the studied nonchalance with which Gordon accepted the proof of the new reality, in the form of the pizza and beer that Dennis wordlessly plunked onto the

coffee table.

"How interesting," he said, helping himself to a slice and snagging a beer. "Too bad we didn't get some of that great sicilian from that place over on Northwest 23rd."

Keith wasn't one to let himself be out-cooled by Gordon. "They have some nice microbrews, too," he said, popping the top on a Coors. "But I bet they don't take Internet orders."

"Good point," Gordon said. He slid the pizza box toward Dennis and Linda. "Have some. It's not like we can give it back to Nancy and Jolly Joe."

"Natasha and Jerry Jeff," Linda said stiffly. Her expression was unreadable, but Dennis felt a mixture of panic and unreality. There had been a time in his life when he'd had a recurring nightmare in which he'd done something awful, and on waking, felt an overpowering need to cover it up. It was only when he'd realize that he didn't actually know what he'd *done* that he would slowly understand that it had again been the dream. He felt the same way now, but this time, he knew exactly what had happened, and the more he thought about it, the more details fell into place.

Keith shrugged. "Have it your way. It's not as though we've actually done anything bad to these folks. Except"—he saluted the others with the remains of his slice—"for this little experiment. And all it cost them was the price of a mediocre pizza. Everything else we've done has been for their own good."

"Like trying to force them to move to East Lakeridge?" Linda asked. Her voice was curiously subdued, but Keith jerked like he'd been slapped.

Gordon chewed his pizza. "And a houseboat is different because . . . ?"

Linda shrugged. "I didn't say it was."

Keith started to respond, but was interrupted by the ring of the phone. "Whadya bet it's Walt," Gordon said, "calling back to return the favor?"

Keith shook his head. "Not his style." Rather than picking up the handset, he punched the speaker button. "Yeah?"

There was a pause as the caller digested that monosyllabic greeting, then a female voice emerged from the box, distorted not only by the tiny speaker but also by emotion. "You bastards," it said, followed by a mix of anger and tears from which Dennis caught only one coherent fragment: "Why did you do it?"

Keith snatched up the phone. "Who is this?" he demanded. "Hillary?—I mean, Natasha? You don't understand! We can pay you back! It was just an experiment. We thought it was all a—hello?" He shook his head and slowly returned the phone to its cradle.

"How did she know where we are?" Linda asked.

"Maybe she didn't," Dennis said, suddenly understanding her earlier reference to cyber-karma. "There are only four of us. If she already knew who we are, maybe she was just running down the list. But why's she so upset about the pizza? And how on earth did she find out about it so quickly?"

"I don't know," Linda said. "Perhaps she'll talk to a woman." She reached for the phone. "If we're lucky, *69 will get her back."

"Bad idea," Gordon said. "It's not the pizza."

Linda stared at him, but was no longer moving toward the phone.

"You remember the rich aunt?" he said, and Dennis felt his gut clench. "Well, she's, uh, no longer with us."

"You didn't!" Linda said.

Gordon fortified himself with another slug of beer. "Remember," he said, "we *all* thought it was merely a game. And it looked like it would be so *easy*." He took another swig of beer. "Well, the *concept* was easy. It took a few weeks to work out the details. She was getting her prescriptions filled online, so I just changed one and overrode the computer-generated alert that would

have warned her. The best part was that not only will Hillary—or Natasha—inherit, but also she winds up with a nice little lawsuit against the pharmacy. It seemed perfect: she gets to collect not once, but twice."

"Even in the *game*, you were supposed to consult us," Linda snapped. Then her voice broke. "How could you *do* that?"

Gordon shrugged. "In a game, you sometimes do things just to see what happens. It's half the fun, and you guys—especially you, Linda—were starting to get so stodgy about it, just like . . ."

"Just like we were dealing with real people? Just like—"

"Enough!" Keith interjected. "What's done is done."

Dennis was still trying to come to grips with himself as a murderer, or at least a member of a murder conspiracy. "What do we do now?" he asked.

"Nothing," Gordon said. "We haven't committed any crime. In the eyes of the law, all I killed were a bunch of electrons. I had no reason to believe they had anything to do with a real person."

"What about conspiracy after the fact? Isn't that the same thing as committing a murder?"

"Not when the so-called 'murder' was merely a misunderstanding. We've still done nothing wrong."

"Tell that to Natasha and Jerry Jeff," Linda said.

Dennis pondered that for a moment. "Do you think they'll try to retaliate?"

"Could they?" Keith asked.

"I can't see why not," Gordon said. "We know they've been messing with us already—little stuff to encourage us to do all of this adoption nonsense. Linda's cyber-karma."

"Damn," Keith said. "I said something on the phone about 'paying back.' I meant money, for the pizza. Do you think she took it as a threat?"

"Who knows?" Gordon said. Amazingly, he laughed. "This is like a computer game come to life. Like it or not, guys, this is war." He popped the lid on his laptop and accessed the NetPuppets site.

"Whoa!" Dennis said. "We're not at war *yet*, so don't even *think* about doing something until we've talked about it. That's what got us into this mess in the first place."

"So, what, you want to wait until they strike first?"

"Let's just make sure we've thought this through." Dennis groped for an argument that would make Gordon see reason. "We absolutely *don't* want to do something that merely makes them madder. And if we give it a bit of time, maybe we can think of some other way to protect ourselves."

"I doubt it," Gordon said. He turned to Keith, and Dennis realized that Keith was the swing vote: in a 2-2 tie, Gordon would do his own thing. Outvoted 3-1, he'd probably wait.

It obviously wasn't a role Keith wanted. "Damn," he said. "They could totally wreck our lives."

"How about a compromise?" Dennis said. "Let's give it a week and see if we can find a way to protect ourselves without going on the offensive."

"A week's too long," Gordon said. "But it's going to take some time to think up strategies that would take them out quickly enough that they can't strike back." He closed his laptop. "I'll tell you what. I'll work on offense. You think about defense. If you havn't found anything in a couple of days, I'll have several commands debugged and ready to launch, and then we can pick which ones to use. Meanwhile, we need to be wary of everything that has anything to do with the Internet."

"And that's just about everything," Keith said.

It was well past midnight when the God Squad finally adjourned, but Den-

this was far too keyed up to sleep, so he and Linda drove to an all-night Starbuck's where a pair of mocha lattes assured that neither would be getting any sleep that night.

"I'm scared," Linda said as they settled into overstuffed armchairs at an out-of-the-way table. "Gordon has a point. What are we going to do? Go live in a cave for the rest of our lives?"

Dennis had been worrying about the same thing on the drive over. There were an endless number of ways of using NetPuppets to hurt Natasha and Jerry Jeff. It would be trivial to max out their credit cards, drain their bank accounts, and ruin them financially. NetPuppets could probably also hack into police files and create records of a drunk-driving accident with Jerry Jeff at the wheel, or make it look as though Natasha had forged another round of drug prescriptions. But none of those would prevent Natasha and Jerry Jeff from doing something similar.

It was hard not to think like Gordon: looking for a first strike strong enough to preclude retaliation. Prescription tampering had already been done, and everyone would be on guard for that. Not to mention that real, premeditated murder was pretty drastic. But would it be possible to fake medical records that would get Natasha and Jerry Jeff locked away in a mental institution? Or create criminal warrants that would land them in prison and keep them there for years? Inmates weren't allowed unmonitored access to the Internet, so it might be possible to strike so quickly that Natasha and Jerry Jeff couldn't get to a computer before they were in jail.

But Dennis didn't voice these thoughts to Linda. "I don't want to hurt these people," he said instead.

"Yeah," Linda said. "I like Hillary." She hesitated. "This may sound silly, but when I realized she wasn't real, it almost felt like I'd lost a friend."

Dennis shook his head. "It's not that silly," he said, and Linda shot him a glance that warmed him more than he would have thought possible. Then her eyes shifted off into space. "You know," she said, "we may have been going at this all wrong."

The apartment complex was as cheaply made as Keith had said, but it was recently painted and there was no gang scrawl, overflowing garbage hoppers, or rats scurrying across the parking lot. The Hackett unit sported gaily colored drapes and butterfly suncatchers clustered around a stained-glass daisy that sparkled in the evening sun. A fat, orange-and-white cat—a color Dennis would have called "punkin'" during his Kentucky youth—dozed on the window ledge like a melting tub of butter.

Linda strode boldly to the door, but Dennis held back. Last night, Linda had convinced him that, with their computers, they were so accustomed to experiencing life vicariously that they'd nearly forgotten the advantages of the real thing. Now, Dennis wasn't so sure. It wasn't as though there weren't good reasons for keeping an interface between yourself and potential unpleasantries. "Are you sure this is a good idea?" he asked.

Linda latched a hand onto his elbow and propelled him forward. "Yes. It's the only way."

"What if they have a gun?"

She released his elbow, stopped, and turned to face him. "You have *got* to be kidding. Jerry Jeff and Natasha are Hillary and Ricky Ray. Have you ever seen *anything* that might indicate that we have to worry about guns?"

"No, but I didn't see anything about a cat, either."

Linda sighed. "And I didn't know that Natasha likes butterflies. But butterflies and cats are in character. Guns aren't." Before Dennis could protest further, she rang the bell. "Get ready," she said. "I hear steps."

Natasha was dressed in business clothes, but with her hair pinned up and an apron around her waist. Another surprise: Dennis had never thought of her as cooking. But then he himself never cooked unless you counted microwave dinners. Her only jewelry was a simple wedding band and a delicate gold cross on a chain around her neck.

Linda didn't give Natasha a chance to speak first. "Hello," she said. "I'm Linda and this is Dennis. We came to apologize."

Dennis didn't know how he'd react in Natasha's shoes, and for a moment, it seemed that Natasha didn't know, either. She took an involuntary half step backward, and briefly, Dennis thought she would slam the door in their faces. That might well be what he'd do, in her place. Then her hand strayed to the cross, caressing its outline with her thumb and forefinger. An unconscious gesture or a source of inspiration? Again, Dennis didn't know, but it clearly signaled some kind of decision.

"Where are the other two?" she asked.

Linda shook her head. "'Apologize' isn't in their repertoire."

Not to mention, Dennis thought, *that he and Linda hadn't bothered to tell them about this visit.* But that was okay by Dennis. Flying solo had been how Gordon had gotten everyone in trouble. If this worked, he could fume about it as much as he wanted. Keith would be thrilled simply to have dodged the bullet.

Natasha nodded. Her fingers again strayed to the cross, then she stepped back again, this time in invitation. "You might as well come in," she said. "Jerry and I aren't exactly without blame in this ourselves." Jerry wasn't in the room. "He's at the track, giving everyone their workout schedules before we leave for the funeral," Natasha said before Dennis could ask.

Natasha insisted on fixing tea, while Dennis and Linda silently surveyed the tiny living room. Baby books and adoption materials were stacked neatly beside the sofa. A couple of giant trophies squatted on a shelf, and bookshelves held an eclectic mix of literature, coaching guides, and 12-step meditations.

"Any surprises?" Natasha asked, as she returned with the tea.

Linda blushed and started to say something, but Dennis interrupted. "Yes," he said. "What's the cat's name?"

To his amazement, that broke the ice. Maybe he was a better people-person than he'd ever given himself credit for being. *Or had tried to be*, he thought, surreptitiously glancing at Linda.

They talked idly for a few minutes, trying to figure out how to make small talk with someone whose secrets you already know. Then Linda took a deep breath. "I don't know how to say this," she said, "but I really am sorry about what happened to your aunt."

"Me too," Dennis said, wishing the words didn't sound quite so lame.

"I'd like to believe that I would have vetoed it if I'd known Gordon was planning it," Linda continued. "But who knows? Like everyone, I thought it was a game."

"I know," Natasha said. "Once I calmed down, I figured that out, myself. I shouldn't have made that phone call."

"Yes," Dennis said. "We'd barely figured out that you were real, and then suddenly we were afraid you might be planning revenge."

"I won't say it hadn't crossed my mind," Natasha said. "But only briefly." She set down her teacup. "I believe you two are sincere, but we're still at an impasse. Basically, we've all got guns pointed at each other's heads, and the fact that your friends aren't with you isn't a good sign. What do you suggest we do about it?"

Linda grinned. "Actually, that's pretty easy," she said, with a *pour-turn*

wave to Dennis.

"It takes two computers," he said. "Mind if I get a laptop from my car?"

Two time zones away, Michael was eating dinner when the alert sounded. Carrying his plate to his desk, he tapped the hot key that brought up the NetPuppets site, wondering if this was the start of the inevitable confrontation.

Instead, he found that both sides had logged on within moments of each other and were now debugging the same command. As Michael watched, they simultaneously hit enter—and erased their respective games.

Michael stared at the screen as though it had been one of his own files that had suddenly vanished. A peaceful resolution wasn't anything he'd thought remotely possible, and he began mentally running through the list of players to see where he'd miscalculated. He knew a lot about their personalities, not only from the materials collected by his site's search engine, but also by watching the way they ran the simulation. He was particularly intrigued by the one who liked to log on as Gordo.

A few months ago, Gordon had created a private NetPuppets account, to which he'd periodically backed up the Hillary and Ricky Ray simulation. Now, Michael wondered whether Gordon had told his colleagues about it. If he was a betting man, Michael would have given long odds that Gordon's backup account was a secret and that he would not easily consent to erasing it.

Michael pulled up the account and found it intact. Not only was the Hillary and Ricky Ray scenario still there, but so were three others, all involving employees at the company for which Gordon and his companions worked. Originally, Michael remembered, several members of the foursome had been tinkering with these scenarios, but the other three had lost interest and Gordon had continued on his own, creating profiles, then canceling them and creating slightly new ones each time the computer matched him up with someone. It had taken Michael a while to realize that Gordon had been seeking to generate matches with very specific people—and then Michael couldn't do anything to nudge the simulation in the right direction because he didn't know who the right people were supposed to be. Recently there hadn't been any activity, but Michael wasn't sure whether that was because Gordon had finally gotten his matches or because he'd become too involved with the Hillary and Ricky Ray scenario.

Since Gordon wasn't online at the moment, there was no urgency, so Michael took time to finish his dinner before deciding what to do. Then he cancelled Gordon's backup of Hillary and Ricky Ray, and entered a block that would prevent him from attempting to recreate it. That would leave Gordon wondering how his friends had found his account, but since they wouldn't be talking about it, he probably wouldn't, either.

The other three scenarios, Michael left running. They represented yet another new twist: one in which the manipulator knew he was manipulating real people but the people didn't suspect. Cassandra would be fascinated.

Vaguely, Michael wondered whether he should feel guilty, but all he felt was the need to exercise a modicum of caution. If necessary, he could always pull the plug on the whole NetPuppets site and recreate it later, under a new name, but that was a hassle he'd prefer to avoid. As for the old lady—well, it wasn't as though she'd been going to live forever, anyway.

It really was a lot more fun than watching a reality show. ■

Frank Kelly Freas, 1922-2005

Frank Kelly Freas, one of the most prolific and versatile artists in the history of science fiction in general and Astounding/Analog in particular, died in his sleep of natural causes at his home in Los Angeles on Sunday, January 2, 2005. Born August 27, 1922, in Hornell, New York, he is perhaps best known in some circles as an early illustrator for Mad Magazine, largely responsible for the character of mascot Alfred E. Newman. Science fiction readers rightly remember him more for his towering contributions to our field: a truly astounding number of covers and interior illustrations for this magazine, and a great many for a wide range of other magazines and books, a body of work that earned him an unequalled number (eleven) of Hugo awards as best professional artist. He also painted nose art on World War II bombers and created a series of memorable posters and a Skylab mission patch for NASA.

Those are the bare facts, but having worked with him both as the author of stories he illustrated and as an editor who commissioned work from him, I remember him for far more than that. Kelly had a unique ability to tailor his approach in every painting or drawing to the story it would illustrate, capturing the essence of it in a way that went beyond the author's words and often adding details that the author hadn't thought of but wished or she had. On one occasion I liked things he invented for a novelette of mine so much that when I later expanded the story to a novel, I wrote Kelly's additions into it. His work could range from photographic realism to whimsical cartoonishness in whatever proportions an assignment required, and while much of his work exudes a playful sense of humor, he took illustration very seriously. He thought about what he did, and why, and preserved some of that thinking in several articles and the text portions of three books which any aspiring illustrator (or writer) would be well advised to read attentively.

We'll miss him a lot, and extend our sincerest condolences to his surviving family and friends, including his wife, Laura Brodian Freas, a daughter, a son, six grandchildren, and a very wide sampling of the science fiction community.

THE REFERENCE LIBRARY Tom Easton

Dark Crusade, Walter Hunt, TOR, $25.95, 416 pp. (ISBN: 0-765-31117-8).

Human Resource, Pierce Askegren, Ace, $6.99, 280 pp. (ISBN: 0-441-01079-2).

Mindscan, Robert J. Sawyer, Tor, $24.95, 273 pp. (ISBN: 0-765-31107-0).

Spin, Robert Charles Wilson, Tor, $25.95, 364 pp. (ISBN: 0-765-30938-6).

Reflex, Steven Gould, Tor, $24.95, 380 pp. (ISBN: 0-312-86421-3).

Speaking of the Fantastic II: Interviews with the Masters of Science Fiction and Fantasy, Darrell Schweitzer, Wildside, $19.95, 198 pp. (ISBN: 0-8095-1072-3).

America as Second Creation: Technology and Narratives of New Beginnings, David E. Nye, MIT Press, $17.95 (tp), 371 + xii pp. (ISBN: 0-262-64059-7).

The fourth volume in Walter Hunt's "Dark" saga (following *Dark Wing*, reviewed here May 2002; *Dark Path*, July/August 2003; and *Dark Ascent*, April 2004) is **Dark Crusade**, and it is a worthy continuation of the tale, although, as before, if the reader is not familiar with the earlier volumes, it will be tough going.

Recall that humanity's space empire fought the belligerent zor to a standstill, found a footing in the zor mythology, established alliance and a degree of mutual understanding, provided a human bearer (Gyaryu'har) for the zor sword of state (the gyaryu), and lost both gyaryu and Gyaryu'har to the shapeshifting, insectile, mind-warping vuhl. But then Jacqueline Laperriere rose to play the role of Qu'u, a figure out of zor legend, in the quest to climb the Perilous Stair, recover the gyaryu, and preserve both humans and zors from the forces of darkness, the esGa'uYal—which is *not* the vuhl. That may be something mysterious called the Or, and then there is the mysterious Stone, who can use a rainbow bridge to walk away from a ship in jump, has helped Laperriere recover the gyaryu, dropped hints that the zor myths are not what they seem, and indicated that something else entirely is going on.

What is that something else? Hunt still isn't telling. But Stone is back, helping an AI modeled on Niccolo Machiavelli gain full sentience and take over the Guardians, trained by Owen Garrett to spot the vuhl shapeshifters when they try to get close to the emperor. Meanwhile, John Smith, an ex-guardian with a strange origin, has teamed with Owen Garrett to form Blazing Star, a paramilitary group with a talent for countering the vuhl psychic attacks and even paralyzing their fleets. Blazing Star aims to exterminate every last vuhl, and when it combines with the fleet, it soon becomes clear that it cannot possibly quit when the vuhl are gone.

What will the next target be? Recall how it all began, with Stone manipulating events to exterminate the zor. There are still ominous signs in the zor dream-

land, the Plane of Sleep, although ancient guardians have been awakened. There is something out there that wants to destroy humans, zor, vuhl, and all. There is a hint that the target is "meat creatures," but I suspect—given Hunt's talent for red herrings—that there is something else behind it all. First, however, Gyaryu'har Laperriere must put herself at risk to forestall the imminent catastrophe. If she can survive the final debacle . . .

Well, of course she does, even if she does wind up stuck waaayy out in the galactic boonies. She has a long, long voyage home ahead of her, but perhaps she will gain a clue or two on the way. Or maybe Stone will kindly provide another hint or two.

And of course there will be another volume—or two, or more—to look forward to. The total really should add up to seven, so that Walter "Salome" Hunt can tear aside the full complement of veils.

Graphic-novel author Pierce Askegren's prose debut, **Human Resource**, is a very readable romp through a future corporate dystopia. Governments are bankrupt, so the Moon's Villanueva Base is owned by a consortium of five corporations that supposedly do not compete—different product lines and all that—but in reality watch each other very closely. And when Erik Morrison arrives as EnTek's new Site Coordinator, everyone is very interested in his past as a "troubleshooter." Right from the start, he's being hit on by everyone in sight, beginning with Doug Stewart, annoying snack food sales rep. Before long he's being told he really has to meet Wendy Scheer, over at the government-run SETI project. And when Wendy comes on stage, she immediately displays a quite inhuman talent for making people like and cooperate with her.

Inhuman? This is only the first volume of the "Inconstant Moon" trilogy, and we soon learn that a missing prospector, Ramirez, had found something mysterious before he vanished. What's more, the sample he left behind is a bit of uninformative hardware. Pardon me if I leap to the conclusion that aliens are involved, and even that Wendy is one of them!

Not that Askegren reveals any such a thing, though by the end Ramirez does turn up and we learn just what it was that he found, as well as how thoroughly topsy-turvy the *status quo ante* is about to turn. If Wendy is not human, we won't know till the next volume, or perhaps the next. For now, we must be content with a very smoothly done puzzle story that leaves us more than willing to give the next a try.

Robert J. Sawyer's **Mindscan** is a disappointment. The premise is intriguing enough: The Immortex company has developed the Mindscan process to copy a human mind from a living brain into a computer installed in a robotic body. It's expensive, at least at first, so it's being offered only to the elderly wealthy. It leaves the meat body and brain intact, so once the meat or "shed skin" signs all property and personhood rights over to the robotic copy, off the meat goes to a retirement home on the far side of the moon, there to fade away without further contact.

Hero Jake Sullivan, heir to a beer fortune, is rich enough, but he's not elderly. Because he has a birth defect that puts him at risk of sudden death from irremediable stroke, he signs up anyway. Once installed in his new body, he waves good-bye (mentally—new and old aren't allowed to meet) to his old self and heads home to pick up his life again. Unfortunately, his mother rejects him, his girlfriend doesn't want to have anything to do with him, and his dog doesn't recognize him. Mentally, he's the same old Jake, but there's something about the meat, or at least about the way people perceive it. The dog is easy to understand—robots don't have the right

smell. So's the girlfriend, especially if she held any dreams of procreation. But Mom? She insists that he is no longer her son. The flesh of her flesh is on the far side of the moon, waiting for his stroke.

Fortunately, Jake has met an elderly woman, Karen, who made pots and pots of money as a famous writer. Fortunately for the meat Jake, modern medicine comes up with a nanotech cure for what ails him. Unfortunately, the meat Karen dies (she was old, after all) and Jake's doctor passes the word to the folks on Earth. Unfortunately, Karen's son decides that since she's dead, and a robot can't possibly really be her, her pots of money should be his. He rushes off to court to have her will probated.

And that's where the story bogs down. There are side elements—meat-Jake decides he wants to go back to Earth now that he's cured, and he tries to force Immortex to let him; silicon-Jake is holding weird conversations with quantum-entangled duplicates; silicon-Jake and silicon-Karen, despite the difference in meat-ages, are having a very nice romance—but the bulk of the novel is a tedious courtroom recounting of arguments for and against regarding Immortex's robotic copies as real persons. Sawyer makes it clear that they are, but the US has continued down the conservative road.

What's the upshot? Sawyer breaks a fundamental writing rule when he tells, not shows. He just jumps a hundred years down the road to let Jake report the long-ago verdict and say, in effect, "So we emigrated." It's a logical enough punt, with plenty of historical precedent, but it's not very satisfying.

Or maybe it's just too hard to sympathize with rich characters whose problems (other than age or hereditary defect) are so far removed from those of the rest of us.

It's a safe bet that Robert Charles Wilson's latest, **Spin**, will be on the next round of award ballots. The premise is simple, albeit a bit bizarre: One night, the stars go out and satellites come tumbling out of the sky. A barrier has been erected around the Earth. The Sun, or a facsimile, shines through, and astronauts who hover above it for weeks come down only seconds after it went up. The reasons are entirely mysterious, but it seems to many that it is a fair presumption that aliens—soon known as the Hypotheticals—are involved.

The characters are more complicated. Tyler Dupree is just ten when it happens. He is in the yard of the Big House with his friends Jason and Diane Lawton. His father was once the partner of Jason's Dad—E.D.—in an enterprise aimed at commercializing aerostats as communication platforms. After he died in a highway accident, E.D. invited Tyler's mother to become the Lawtons' housekeeper and live in the guesthouse on their estate. Jason, a genius at science and engineering even when young, is being groomed to be his father's heir. To E.D., Diane is entirely secondary, but to Tyler, she is something else. At ten, he hardly understands what that "else" might be, but he knows there is a bond. Their mother, Carol Lawton, is an alcoholic.

The loss of comsats with the Big Blackout means no telephone, no Internet, no global TV. But E.D. Lawton's aerostats are the ideal replacement. Soon things are up and running again, and E.D. is wealthy and powerful. Research reveals that the barrier involves time, and the universe outside is spinning merrily along. Earth is caught in a bubble of slow time, a day passing for every hundred million years outside, and it is soon apparent that it will be no more than a few decades before the Sun expands to roast its planets and dies. E.D. gets a research effort going, with Jase in charge, utterly obsessed with understanding and if possible solving the mystery. Diane turns to religious extremes. Tyler goes into medicine, and in due time he must do his best to help

both Jase and Diane deal with severe illness.

What could one do if one day's effort produced a hundred million years of result? One answer is to take advantage of the expanding Sun and its warming of Mars. Send bacteria and plants and animals and finally humans. Take a couple of years to do it all, and then send up a satellite to contact the new civilization. Do they have answers? Do they have answers that Earthly humans can or will use? Different questions, and if we have some idea that answers exist because of the way Wilson has chosen to tell his story—a few days at the very end interspersed with prolonged recollections—we don't know the specifics until the last few pages.

All I will say about those specifics is that they are as grandiose in scope and sweep as anyone could wish. They unify everything, they impose structure on time, space, and fate, and Olaf Stapledon (SF's first cosmic visionary) would have loved Wilson's vision.

Don't miss this one.

A dozen years ago, Steven Gould's *Jumper* introduced Davy Rice, who discovered in a moment of stress that he could teleport. Neat trick and all that, and the novel played at some length with the implications. By the end, he was helping out the NSA as a very special sort of secret agent. He also had Millie, who was already getting used to being jumped from hither to yon. Breakfast in Paris, lunch in Tokyo, a walk on a Tahiti beach in between.

But the secret agentry has brought him to the attention of the wrong people. As the sequel, **Reflex**, opens, Davy is meeting his handler at a little restaurant. Moments later, Davy's drugged, Brian is racing down the street with Davy over his shoulder, and bullets are flying. Then Brian's dead, Davy's being bundled into a stolen ambulance, and Millie, stuck without her teleport in the Aerie, a Southwest cliff house accessible only by rockclimbers (or teleports) is wondering why Davy isn't returning from his meet.

Eventually, being a resourceful gal, she breaks out the rockclimbing gear and rappels over the edge of the cliff. And when the rock comes loose, she discovers that she too can teleport.

Meanwhile, Davy is discovering that he's stuck. His mysterious captors have chained him to a wall; since when he jumps, he takes with him anything fastened to him, and the wall's too massive, he can't go anywhere. He can, however, jump around the room, dragging the chain with him.

His captors have also done a spot of surgery, implanting a device that, if they push the button or he gets outside the range of a signal, triggers massive vomiting and so on. They're using it to condition him to obey orders.

Meanwhile, Millie is busily trying to find him with the aid of secret agents and street people. Unfortunately, the NSA agents are getting called off the case, quite as if their superiors don't want Davy found. But Millie is intelligent and persistent, a few helpful clues fall into her hands, and the FBI is still on the case.

Davy, of course, is doing his best to confound his captors, in the process learning that the seductive villainess has the same scars he now bears. He is in the hands of a brutal outfit that has enlisted some very effective technology to ensure loyalty. And it is an open question how many layers of the hierarchy extend above the seductress. If they go far enough, *Reflex* will have to have at least one sequel.

When the physicist studying Davy has him try bouncing back and forth rapidly between two spots, in hope of seeing a portal, he tries again in private and discovers that he can almost literally be in two places at once, and the portal will let air or water flow through it. This later proves very useful, though Gould forgets that when Davy is chained he can-

not jump any distance. If you forget too, the ending will be immensely satisfying. If you do not, your disbelief will abruptly lose its suspension and come crashing down.

You may also wonder why it is so difficult for a wife to find her husband when she can teleport to any scene or location she has memorized. Logically, she should be able to imagine him as a scene and jump directly to him. Is the problem that the location must be fixed? Well, Davy showed in the earlier book that he could quite easily jump to a moving target (a thug dropped from high in the air, and retrieved after a frightening drop). Perhaps this is a new wrinkle for Gould to develop in the next book.

Have fun, but keep an eye on those chains.

In **Speaking of the Fantastic II**, Darrell Schweitzer presents fifteen interviews (conducted between 1983 and 2002) with well-known SF&F writers. The interviewees are Peter Beagle, Octavia Butler, Philip Jose Farmer, Charles Harness, Michael Kandel, the late R. A. Lafferty, Jack McDevitt, Tim Powers, the late Charles Sheffield, Susan Shwartz, Michael Swanwick, the late Evangeline Walton, Gene Wolfe, Jane Yolen, and George Zebrowski. In each case, Schweitzer elicits illuminating comments on how the writer got started, on the ensuing career, and on the writing process. If your interest in these writers extends beyond their works, this is a nice book to have.

Note that the production values are much improved over the previous *Speaking* volume.

David E. Nye brings a keen eye to the history of technology in the United States. I used his *American Technological Sublime* in classes for years. I may well use his latest, **America as Second Creation: Technology and Narratives of New Beginnings**, too.

The thesis of the earlier book was—in extreme brief—that in America technological wonders—from railroads to the nuclear bomb—evoked the same emotional response as natural wonders such as the Grand Canyon. This response was the blend of awe and terror and wonder that had long been called "the sublime." There was, to me, a clear connection to the sfnal "sense of wonder" that helped explain why twentieth-century science fiction was predominantly American.

He actually mentions science fiction in *Second Creation*, but not till very near the end. Here his thesis is that the history of technology in America has been marked by a series of "foundation narratives." During the colonial era, the dominant technology was the axe, and the foundation narrative told how one man with an axe could clear the land for a homestead, and an ample supply of men and axes advanced civilization into the wilderness, taming it, subduing it, and putting it to its divinely ordained use, indeed putting the finishing touches on the first creation. Later technologies were mills, canals, railroads, and irrigation. Each had a narrative in a similar vein, emphasizing the power of the technology to put the barren wilderness to human use (as of course defined by white males of European origin), to expand the realm of civilization, and to enhance prosperity.

Similar narratives have been the preoccupation of science fiction since its start. Space travel, genetic engineering, nanotechnology, artificial intelligence, and a great deal more, all have been about expanding the human realm, boosting prosperity, and so on. Much of it has read much like the boosterism of land agents selling farms in areas opened up by the railroad, or in arid zones made fertile by irrigation. In recent decades, there has also been a more critical line of thought in SF, with writers paying attention to side effects of new technology. This has tempered the hype with a healthy dose of realism. The lack of this tempering is a large part of what makes

some older SF seem unreadably naive.

Nye notes that from the beginning the foundation narratives have been opposed by "counter narratives." These narratives did not come from the boosters, but from those hurt by the technology, or from those possessed of more critical thinking skills. The axe displaced the natives and created environmental problems. The mill, seemingly benign when scaled to a village, created wage slaves, poverty, oppression, labor unrest, and of course environmental problems when enlarged. Railroads led to monopolies, oppression of small farmers, and destruction of wildlife and natives, as well as deforestation. Irrigation lead to more monopolies, more oppression, and more environmental disasters. Yes, says Nye, technology can do marvelous things for us. But it gets out of hand, it gets turned to less than noble ends, and it has side effects that deserve attention. Those side effects came to be recognized during the twentieth century, but even today many people cling to the untempered foundation narratives and use them to justify such proposals as drilling for oil in the pristine Arctic National Wildlife Refuge and stripping protections from rivers and national forests in order to enrich loggers, farmers, and ranchers (yes, I'm referring to the Bush administration's latest moves). "The vision of second creation . . . has become a national myth of origin." If we are to avoid the problems and move toward a sustainable society—as we must—"Americans [must] embrace new stories that move beyond second creation."

Has Nye turned from the history of technology to environmentalism? It may seem that way, but environmental impact is only one of the side effects he discusses. There are also economic, social, and political inequities that have played major roles in the history of this country. What he has done is to look at the impacts of technology—both the intended, hyped impact and the actual impacts—in a dispassionate, even-handed way that must encourage skepticism whenever we hear another booster. If science fiction writers read the book, it may well affect their approach to their fictions. If the readers read it, they may become more discerning or critical. Either way, SF would benefit. ■

BRASS TACKS

Dear Stanley Schmidt,

Thank you for your editorial in the 75th anniversary issue of *Analog*. This brought my *deja* a lot of *vu*. I am only about one year younger than *Astounding*. I was born in a rural area near Utah Lake in 1930. As I grew, I was often a trial to my mother because of my adventurous bent. I learned to read early and loved it. In our small, country grade school, there was only one "science" book, a slim volume called *Seeing Stars*. I read that book so much that the school gave it to me (also, I was the only one who liked it). At night, I would go quietly outside sometimes, in just my overalls, and stand under the cloudless skies, far from city lights, and stare in wonder at all the stars. I remember reaching up my arms and trying to fly by sheer will to them. Sometimes, my mother would let me sleep in the alfalfa field so that I could see those stars whenever I could keep my eyes open. I only had a few books and read the "spots" off them and devoured "Buck Rogers" and "Flash Gordon" in the Sunday comics. When I was 10, my father was drowned in an accident in Utah Lake. Mother could not keep up the small, part-time farm by herself, so she and I and my smaller brother and sister moved into the small town of Provo, three miles from the farm. Soon after moving, I discovered a great wonder. The town had a "Carnegie public library" and I could easily walk to it. It was only 1-1/4 miles away—all paved sidewalks. I walked timidly into the library and was kindly directed to the children's section in the basement. A kindly lady took me in hand and had me read from several books. She looked at me and shook her head slightly and said, "Even though you are under age, I am going to give you a note to allow you to use the adult section of the library. I went upstairs and after the one librarian had a whispered conversation with the other librarian, I was issued a grown up library card! What a thrill. I immediately noted that the supply of books was really vast and that they were placed in order. I found the fiction section and made another amazing discovery; all the books by the same author were placed together. The first thing that caught my eye was the name "Tarzan." I had seen the first Johnny Weismuller movie with my father shortly before his death. I quickly started through the "Burroughs" shelf as fast as I could (I still think someone should plant a "Welcome to Mars—John Carter" sign on the Red Planet). On the way home from one of those library trips, a magazine cover caught my eye. You guessed it! *Astounding Science Fiction*. Mother kindly gave me the 25 cents and worlds of wonder were unfolded to me. I scrounged any odd jobs I could to get movie and magazine money. I watched eagerly each month for such as *Amazing Stories*, *Thrilling Wonder Tales* and all those other marvelous pulp magazines. Even then, *Astounding* was my strong favorite, but I took a lot of kidding from adults and other youths about the title (Are you Astounded?). I kept a full collection of *Astounding* in the top of the kitchen cupboard, with Mother's permission, and kept that little library in order until I

married and moved to an apartment where there was no room for it. While reading *Astounding* I noted that many of the heroes were physicists. I wanted to be one. Later, when I found out how really slow the physics game is, I decided to become an engineer (now retired) instead, and ended up in a checkered career with 22 patents with my name on them. Pretty good for a little farm kid. My two sons also work in the engineering field. And I owe a lot of it to *Astounding/Analog*!

I was always stimulated by the John Campbell Editorials. What a great editor he was and we are fortunate to have Dr. S.S. to carry on in a less-prickly-but-just-as-stimulating fashion. I think that it is phenomenal to have a publication of this sort that can keep up reader interest and content consistency for so long a time. I had my 74th birthday in October and have adopted the custom of referring to my age as "0.74C," as in "Centuries." I am very thankful that my favorite magazine is still around after a great run of "0.75C." I sincerely hope that *Analog* outlives me by many years.

Yours truly,
Jack Lee Williams
Fallbrook CA

Dear Dr. Schmidt:

The 75th Anniversary Issue was one of the best compilations that I can recall. It was fun! The pictures were a hoot.

It inspired me to dig out my 50th Anniversary Issue (Ben Bova was on that cover, too) and unsuccessfully search for my copy of the 25th Issue, which probably disappeared during one of many household moves. The oldest issue saved is March 1953, when I was eleven years old.

My, but the fifty-one years have gone by fast, but the good stories and editorials last and last. It certainly is time for me to finally write and express my sincere appreciation for the hours of reading pleasure, the times of wonder, the insight, and the constant search and provocative questioning inherent in good science fiction.

With a blaster in one hand and a voluptuous brunette at my side I undauntedly face the *Analog* future.

Sincerely,
Russell Brown
Broad Run, Virginia

Dear *Analog*,

I am very much enjoying the serial by Jack Williamson. I have only one complaint. There seem to be many typographical and grammatical errors in the text. It looks as though no one even attempted to edit it. It is making it far less enjoyable to read than I would like. I realize this is nitpicking, but the errors are numerous and egregious. I cannot believe the author made this many mistakes. Otherwise, I have been enjoying *Analog* since the early 1960s, and will continue to do so.

Paul Basile

It isn't nitpicking at all: there are unquestionably more errors in Mr. Williamson's serial than we would have liked, though I hope you'll agree (as a long time reader) that our editorial standards are usually much higher that what this incident might illustrate.

We've received numerous letters on this topic, but truthfully, yours is the only one I've taken the time to respond to, for two reasons. First, you frankly have a much more civil tone than most of the other letter writers, and second, you requested an explanation, and you're certainly entitled to one.

The exact details of the error are somewhat unclear, but without boring you with a detailed rundown of our editorial procedures, the simple answer is that a combination of technical snafu and simple human error led to us running an early, unedited version of the story, rather than the version that had the corrections from myself, Mr. Williamson, Stan, and our proofreader.

Every element of the magazine

(short of the actual artwork and physical printing) is done with desktop publishing software, by a very small number of people. I take pride in the fact that many folks (including some of our writers) assume we're a larger operation than we really are, but every once and again, our small stature is apparent.

I bring this up not to make excuses (the ultimate condition of the magazine is my professional responsibility, and the errors are nobody's fault but my own: Mr. Williamson actually sends us some of the cleanest manuscripts in the field), but to show that nobody's perfect: it only takes an individual neglecting to save a file once—out of dozens of revisions of dozens of files every month—to make quite a mess, and we can only endeavor to not make the same mistake next time.

I hope that serves as a suitable explanation. We're glad to have people like you reading.

Trevor Quachri
Associate Editor

Dear Dr. Schmidt:

I really liked the science fact article "Where Are They?" in the current double issue, as it seemed to clarify things a little and answer some of my questions, but there seems to be another possibility that hasn't been explored.

Please bear with me while I go off on a tangent, as I'm trying to build an argument that's relevant to the question.

I know that you've written an editorial recently about the "mind downloaded into computer" scenario where you discussed the difference between an original and a copy, although I don't remember which issue, to be honest with you. [October 2001 *-ed.*]

Now, if the brain uses up half of the oxygen and about a third of the sugar that we ingest, then that must mean that the material that makes up a brain gets turned over on a regular basis . . . which also means that my brain is actually a gradually made copy of a younger man's brain, and that means that the only thing that gets carried over or copied is the information and the way that my brain processes it.

If this is the case, then my mind was gradually downloaded into my current brain from an earlier brain, and that must mean—in principal, at least—that minds can be downloaded.

In all probability, interstellar travel is extraordinarily difficult and expensive at best. It may be easier for a civilization to build a world-covering supercomputer that hosts a virtual reality so that they can retreat into this digital environment if and when their real environment becomes uninhabitable.

In a virtual reality, I would imagine that time moves slower—which would create the subjective appearance of a longer lifespan. Computer hardware is much more durable than flesh-and-blood, which means that the habitable zone around a star becomes all but irrelevant as the star ages on the main sequence (although I find it hard to believe that much of anything could survive a supernova).

With automated self-repair capability, I imagine that this virtual environment may, in many ways, be more durable than the "real" environment that it's modeled after—and may represent the only practical way for many civilizations to survive.

In short, the great silence may be a result of older civilizations building their own perfect worlds.

If this seems unlikely, then I ask you to consider drug addiction—which can be viewed as an escape into a perfect pharmacological world, or religious fanaticism—which is the promise of future escape into a perfect world . . . and we have no shortage of drug addicts and religious fanatics.

Kevin Levites
West Palm Beach, FL

There's some truth in your observa-

tion about gradual replacement of minds, or at least bodies, but that gradual piece-by-piece process, even if it happens just as you describe it, is still significantly different from "destroy whole here and create copy there." And I don't think it does happen quite as you describe it. Until recently it was commonly believed that neurons didn't *regenerate or get replaced; recently it's been found that that does happen, to some extent, but most of that sugar-and-oxygen use attributed to the brain goes into powering its operations, not replacing it.*

Dear Dr. Schmidt,

I was interested in finding out if you are aware of, or have considered ever creating, an archive of the various essays published by Campbell and Bova and others in the earlier years of the magazine. This thought came to mind when I was reminded of an essay Bova had written back in about 1973, where he updated a concept originally presented by Campbell concerning the stages of social development. In that essay, Bova extended Campbell's definition of man as "barbarian, tribesman, and citizen" with the description of the "para-barbarian." This was one among many writings that influenced my thinking as a young person, and one of the reasons I always appreciated that the magazine was fact and opinion as much as it was great fiction.

It would be sad to think these essays are lost or (at least) buried somewhere, indefinitely out of sight. . . .

Tony Higgins

It would be a nice thing to have, but I don't see any likelihood of its happening soon—we just don't have the staff to do the necessary work.

Dear Stan,

When a story is a sequel to an earlier work, you always print a note to that effect, telling what the earlier story or stories were and when they were run, all of which is certainly a good idea. However, the note is always at the *end* of the story. I like to know if a story is a sequel before I start reading it; for one thing, I might have neglected to read its predecessor(s), so I might need to go back and read them first. (I admit to being a little compulsive about not wanting to read a series out of order.) However, if I'm always flipping to the end of the story to check if it's a sequel, I run the risk of seeing the ending and maybe spoiling part of the story for myself. Is there any chance *Analog* could start running that notice at the beginning of the story?

Thanks for the great magazine!

Sincerely,
Michael E. Buckner
Decatur, GA

There's apparently no way to satisfy everybody on this. Our main reason for running those notices at the end is that we try to make sure every story can be read, and understood, and enjoyed by readers even if they've never seen the earlier stories. Putting the notice at the beginning might make some readers think the earlier stories were "prerequisites," and scare them off of reading the new one.

Dear Dr. Schmidt:

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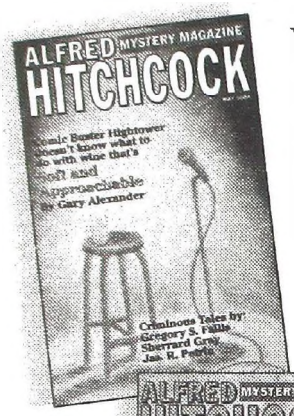

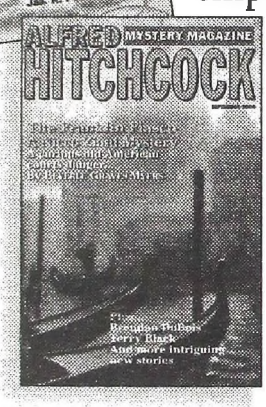

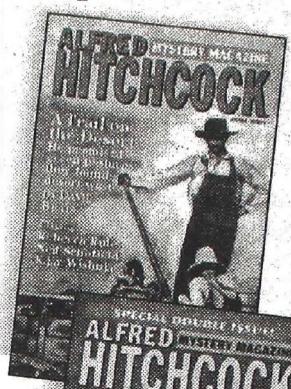

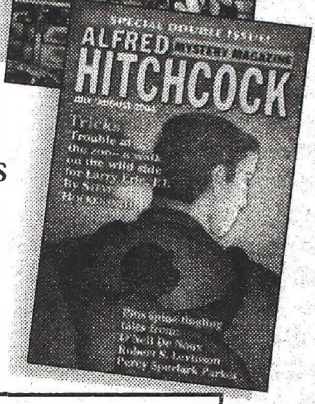

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UPCOMING EVENTS Anthony Lewis

1–3 July 2005
CONVERGENCE 2005 (Minnesota SF conference) at Sheraton South, Bloomington MN. Guests include: Mercedes Lackey, Marv Wolfman. Registration: $40 until 15 May 2005, $55 at the door. Info: info@convergence-con.org; www.convergence-con.org; CONvergence, 1437 Marshall Ave., Suite 203, St. Paul MN 55104; (651) 647-3487.

1–4 July 2005
GAYLAXICON 2005 (SF conference for gay fans and their friends) at Hyatt Regency Cambridge, Cambridge MA. Guest of Honor: Lois McMaster Bujold. Fan Guests of Honor: Cast & crew of Star Trek: Hidden Frontier. Registration: $50 to 31 May 2005, more at the door. Info: gsfs@gaylactic-network.org; www.gaylaxians.org/gaylaxicon2005; Gaylaxicon 2005, Box 1059, Boston MA 02103-1059.

1–4 July 2005
WESTERCON 58: "DUE NORTH" (Western Science Fantasy Conference) at Westin Calgary Hotel, Calgary, Alberta, Canada. Author Guest of Honor: S.M. Stirling. Canadian Author Guest of Honor: Dave Duncan. Artist Guest of Honor: Mark Ferrari. Fan Guests of Honor: Cliff Samuels, Eileen Capes. Publisher Guest of Honor: Tom Doherty. Editor Guest of Honor: David Hartwell. Science Guest: Phil Currie. Registration: USD65/CAD80 until 15 March 2005. Info: info@calgaryin2005.org; http://calgaryin2005.org; Calgary in 2005, Box 43078; DVPO, Calgary, Alberta T2J 7A7, Canada.

8–10 July 2005
READERCON 16 (literary-oriented SF conference) at Burlington Marriott, Burlington MA. Guests of Honor: Kate Wilhelm, Joe Haldeman. Registration: $35 until 1 July 2005, $45 at door. Info: info@readercon.org; www.readercon.org; Readercon, Box 38-1246, Cambridge MA 02238-1246.

15–17 July 2005
CONFLUENCE 2005 (Pittsburgh area SF conference) at Four Points by Sheraton Pittsburgh Airport, Pittsburgh PA. Guest of Honor: Tamora Pierce. Featured Filker: Escape Key. Registration: $40. Info: confluence@spellcaster.org; http://www.parsec-sff-.org/confluence; Confluence Box 3681, Pittsburgh PA 15230-3681; (412) 344-0456.

15–17 July 2005
TRINOCCON 2005 (Carolinas SF conference) at Durham Marriott and Civic Center, Durham NC. Literary Guest of Honor: Joe R. Lansdale. Artist Guest of Honor: Charles Keegan. Registration: $30 until 18 June 2005, $35 at the door. Info: info@trinoc-con.org; www.trinoc-con.org; TrinoccoN Corp., Box 10633, Raleigh NC 27605 0633.

Attending a convention? When calling conventions for information, do not call collect and do not call too late in the evening. It is best to include a S.A.S.E. when requesting information; include an International Reply Coupon if the convention is in a different country. ■