ANTIBODIES

Charles Stross

Although he made his first sale back in 1987, it's only recently that British writer Charles Stross has begun to make a name for himself as a writer to watch in the new century ahead, with a sudden burst in the last couple of years of quirky, inventive, high-bit-rate stories such as "A Colder War", "Bear Trap", "Dechlorinating the Moderator", and "Toast: A Con Report" in markets such as *Interzone, Spectrum SF, Osyssey*, *Strange Plasma,* and *New Worlds.* In the fast-paced and innovative story that follows, he demon-strates that although you can carefully set a warning alarm, by the time it goes off, it may be almost too late to do anything about it.

Charles Stross is also a regular columnist for the monthly magazine *Computer Shopper.* Coming up is his first collection, *Toast, and Other Burned Out Futures.* He lives in Edinburgh, Scotland.

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EVERYONE REMEMBERS WHERE they were and what they were doing when a member of the great and the good is assassinated. Gandhi, the Pope, Thatcher—if you were old enough you remembered where you were when you heard, the ticker-tape of history etched across your senses. You can kill a politician but their ideas usually live on. They have a life of their own. How much more dangerous, then, the ideas of mathematicians ?

I was elbow-deep in an eviscerated PC, performing open heart surgery on a diseased network card, when the news about the travelling salesman theorem came in. Over on the other side of the office John's terminal beeped, notification of incoming mail. A moment later my own workstation bonged.

"Hey, Geoff! Get a load of this!"

I carried on screwing the card back into its chassis. John is not a priority interrupt.

"Someone's come up with a proof that NP-complete problems lie in P! There's a posting in *comp.risks* saying they've used it to find an O*(n 2) solution to the travelling salesman problem, and it scales! Looks like April First has come early this year, doesn't it?"

I dropped the PC's lid on the floor hastily and sat down at my workstation. Another

cubed-sphere hypothesis, another flame war in the math newsgroups—or something more serious? "When did it arrive?" I called over the partition. Soroya, passing my cubicle entrance with a cup of coffee, cast me a dirty look; loud voices aren't welcome in open-plan offices.

"This just in," John replied. I opened up the mailtool and hit on the top of the list, which turned out to be a memo from HR about diversity awareness training. No, next. . . they want to close the smoking room and make us a 100 per cent tobacco-free workplace. Hmm. Next.

Forwarded e-mail: headers bearing the spoor of a thousand mail servers, from Addis-Ababa to Ulan Bator. Before it had entered our internal mail network it had travelled from Taiwan to Rochester nj, then to UCB in the Bay Area, then via a mailing list to all points; once in-company it had been bounced to everyone in engineering and management by the first recipient, Eric the Canary. (Eric is the departmental plant. Spends all the day web-dozing for juicy nuggets of new information if you let him. A one-man wire service: which is why I always ended up finishing his jobs.)

I skimmed the message, then read it again. Blinked. This kind of stuff is heavy on the surreal number theory: about as digestible as an Egyptian mummy soaked in tabasco sauce for three thousand years. Then I poked at the web page the theorem was on.

No response — server timed out.

Someone or something was hitting on the web server with the proof: I figured it had to be all the geeks who'd caught wind of the chain letter so far. My interest was up, so I hit the "reload" button, and something else came up on screen.

Lots of theorems—looked like the same stuff as the e-mail, only this time with some fun graphics. Something tickled my hindbrain then, and I had to bite my lip to keep from laughing. Next thing, I hit the print button and the inkjet next to my desk began to mutter and click. There was a link near the bottom of the page to the author's bibliography, so I clicked on that and the server threw another "go away, I'm busy" error. I tugged my beard thoughtfully, and instead of pressing "back" I pressed "reload".

The browser thought to itself for a bit—then a page began to appear on my screen. The wrong page. I glanced at the document title at the top and froze:

THE PAGE AT THIS LOCATION HAS BEEN WITHDRAWN. Please enter your e-mail address if you require further information.

Hmm.

As soon as the printout was finished, I wandered around to the photocopier next door to the QA labs and ran off a copy. Faxed it to a certain number, along with an

eyes up note on a yellow Post-it. Then I poked my head around into the QA lab itself. It was dingy in there, as usual, and half the cubicles were empty of human life. Nobody here but us computers; workstations humming away, sucking juice and meditating on who-knew-what questions. (Actually, I *did* know: they were mostly running test harnesses, repetitively pounding simulated input data into the programs we'd so carefully built, in the hope of making them fall over or start singing "God Save the King".) The efficiency of code was frequently a bone of contention between our departments, but the war between software engineering and quality assurance is a long-drawn-out affair: each side needs the other to justify its survival.

I was looking for Amin. Amin with the doctorate in discrete number theory, now slumming it in this company of engineers: my other canary in a number-crunching coal mine. I found him: feet propped up on the lidless hulk of a big Compaq server, mousing away like mad at a big monitor. I squinted; it looked vaguely familiar . . . "Quake? Or Golgotha?" I asked.

"Golgotha. We've got Marketing bottled up on the second floor."

"How's the network looking?"

He shrugged, then punched the hold button. "No crashes, no dropped packets—this cut looks pretty solid. We've been playing for three days now. What can I do for you?"

I shoved the printout under his nose. "This seem feasible to you?"

"Hold on a mo." He hit the pause key them scanned it rapidly. Did a double-take. "You're not shitting?"

"Came out about two hours ago."

"Jesus Homeboy Christ riding into town at the head of a convoy of Hell's Angels with a police escort. . ." he shook his head. Amin always swears by Jesus, a weird side-effect of a westernized Islamic upbringing: take somebody else's prophet's name in vain. "If it's true, I can think of at least three different ways we can make money at it, and at least two more to end up in prison. You don't use PGP, do you?"

"Why bother?" I asked, my heart pounding. "I've got nothing to hide."

"If this is true—" he tapped the papers "— then every encryption algorithm except the one-time pad has just fallen over. Take a while to be sure, but. . . that crunch you heard in the distance was the sound of every secure commerce server on the internet succumbing to a brute-force attack. The script kiddies will be creaming themselves. Jesus Christ." He rubbed his moustache thoughtfully.

"Does it make sense to you?" I persisted.

"Come back in five minutes and I'll tell you."

"OK."

I wandered over to the coffee station, thinking very hard. People hung around and generally behaved as if it was just another day; maybe it was. But then again, if that paper was true, quite a lot of stones had just been turned over and if you were one of the pale guys who lived underneath it was time to scurry for cover. And it had looked good to me: by the prickling in my palms and the gibbering cackle in the back of my skull, something very deep had recognized it. Amin's confirmation would be just the icing on the cake confirmation that it was a workable proof.

Cryptography—the science of encoding messages — relies on certain findings in mathematics: that certain operations are inherently more difficult than others. For example, finding the common prime factors of a long number which is a product of those primes is far harder than taking two primes and multiplying them together.

Some processes are not simply made difficult, but impossible because of this asymmetry; it's not feasible to come up with a deterministic answer to certain puzzles in finite time. Take the travelling salesman problem, for example. A salesman has to visit a whole slew of cities which are connected to their neighbours by a road network. Is there a way for the salesman to figure out a best-possible route that visits each city without wasting time by returning to a previously visited site, for all possible networks of cities? The conventional answer is no — and this has big implications for a huge set of computing applications. Network topology, expert systems—the traditional tool of the Al community—financial systems, and ...

Me and my people.

* * * *

Back in the QA lab, Amin was looking decidedly thoughtful.

"What do you know?" I asked.

He shook the photocopy at me. "Looks good," he said. "I don't understand it all, but it's at least credible."

"How does it work?"

He shrugged. "It's a topological transform. You know how most np-incomplete problems, like the travelling salesman problem, are basically equivalent? And they're all graph-traversal issues. How to figure out the correct order to carry out a sequence of operations, or how to visit each node in a graph in the correct order. Anyway, this paper's about a method of reducing such problems to a much simpler form. He's using a new theorem in graph theory that I sort of heard about last year

but didn't pay much attention to, so I'm not totally clear on all the details. But if this is for real..."

"Pretty heavy?"

He grinned. "You're going to have to re-write the route discovery code. Never mind, it'll run a bit faster ..."

* * * *

I rose out of cubicle hell in a daze, blinking in the cloud-filtered daylight. Eight years lay in ruins behind me, tattered and bleeding bodies scattered in the wreckage. I walked to the landscaped car park: on the other side of the world, urban renewal police with M16s beat the crap out of dissident organizers, finally necklacing them in the damp, humid night.

War raged on three fronts, spaced out around a burning planet. Even so, this was by no means the worst of all possible worlds. It had problems, sure, but nothing serious — until now. Now it had just acquired a sucking chest wound; none of those wars were more than a stubbed toe in comparison to the nightmare future that lay ahead.

Insert key in lock, open door. Drive away, secrets open to the wind, everything blown to hell and gone.

I'd have to call Eve. We'd have to evacuate everybody.

I had a bank account, a savings account and two credit cards. In the next fifteen minutes I did a grand tour of the available ATMS and drained every asset I could get my hands on into a fat wodge of banknotes. Fungible and anonymous cash. It didn't come to a huge amount—the usual exigencies of urban living had seen to that—but it only had to last me a few days.

By the time I headed home to my flat, I felt slightly sheepish. Nothing there seemed to have changed: I turned on the TV but CNN and the BBC weren't running any coverage of the end of the world. With deep unease I sat in the living room in front of my ancient PC: turned it on and pulled up my net link.

More mail ... a second bulletin from *comp.risks,* full of earnest comments about the paper. One caught my eye, at the bottom: a message from one of No Such Agency's tame stoolpigeon academics, pointing out that the theorem hadn't yet been publicly disclosed and might turn out to be deficient. (Subtext: trust the Government. The Government is your friend.) It wouldn't be the first time such a major discovery had been announced and subsequently withdrawn. But then again, they couldn't actually produce a refutation, so the letter was basically valueless disinformation. I prodded at the web site again, and this time didn't even get the ACCESS FORBIDDEN message. The paper had disappeared from the internet, and only the print-out in my pocket told me that I hadn't imag-ined it.

It takes a while for the magnitude of a catastrophe to sink in. The mathematician who had posted the original finding would be listed in his university's directory, wouldn't he? I pointed my web browser at their administrative pages, then picked up my phone. Dialled a couple of very obscure numbers, waited while the line quality dropped considerably and the charges began racking up at an enormous—but untraceably anonymized—rate, and dialled the university switchboard.

"Hello, John Durant's office. Who is that?"

"Hi, I've read the paper about his new theorem," I said, too fast. "Is John Durant available?"

"Who are you?" asked the voice at the other end of the phone. Female voice, twangy mid-western accent.

"A researcher. Can I talk to Dr Durant, please?

"I'm afraid he won't be in today," said the voice on the phone. "He's on vacation at present. Stress due to overwork."

"I see," I said.

"Who did you say you were?" she repeated.

I put the phone down.

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From: nobody@nowhere.com (none of your business)
To: cypherpunks
Subject: John Durant's whereabouts
Date:...

You might be interested to learn that Dr John Durant,
whose theorem caused such a fuss here earlier, is not at
his office. I went there a couple of hours ago in person
and the area was sealed off by our friends from the
Puzzle Palace. He's not at home either. I suspect the
worst...
By the way, guys, you might want to keep an eye on each
other for the next couple of days. Just in case.

Signed, Yrfrndly spk
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"Eve?"

"Bob?"

"Green fields."

"You phoned me to say you know someone with hayfever?"

"We both have hayfever. It may be terminal."

"I know where you can find some medicine for that."

"Medicine won't work this time. It's like the emperor's new suit."

"It's like what? Please repeat."

"The emperor's new suit: it's naked, it's public, and it can't be covered up. Do you understand? Please tell me."

"Yes, I understand exactly what you mean .. . I'm just a bit shocked; I thought everything was still on track. This is all very sudden. What do you want to do?"

(I checked my watch.)

"I think you'd better meet me at the pharmacy in fifteen minutes."

"At six-thirty? They'll be shut."

"Not to worry: the main Boots in town is open out of hours. Maybe they can help you."

"I hope so."

"I know it. Goodbye."

On my way out of the house I paused for a moment. It was a small house, and it had seen better days. I'm not a home-maker by nature: in my line of work you can't afford to get too attached to anything, any language, place or culture. Still, it had been mine. A small, neat residence, a protective shell I could withdraw into like a snail, sheltering from the hostile theorems outside. *Goodbye, little house. I'll try not to miss you too much.* I hefted my overnight bag onto the back seat and headed into town.

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I found Eve sitting on a bench outside the central branch of Boots, running a degaussing coil over her credit cards. She looked up. "You're late."

"Come on." I waggled the car keys at her. "You have the tickets?"

She stood up: a petite woman, conservatively dressed. You could mistake her for a lawyer's secretary or a personnel manager; in point of fact she was a university research council administrator, one of the unnoticed body of bureaucrats who shape the course of scientific research. Nondescript brown hair, shoulder-length, forgettable. We made a slightly odd pair: if I'd known she'd have come straight from work I might have put on a suit. Chinos and a lumberjack shirt and a front pocket full of pens that screamed engineer: I suppose I was nonde-script, in the right company, but right now we had to put as much phase space as possible between us and our previous identities. It had been good protective camouflage for the past decade, but a bush won't shield you against infrared scopes, and merely living the part wouldn't shield us against the surveillance that would soon be turned in our direction.

"Let's go."

I drove into town and we dropped the car off in the long-stay park. It was nine o'clock and the train was already waiting. She'd bought business-class tickets: go to sleep in Euston, wake up in Edinburgh. I had a room all to myself. "Meet me in the dining car, once we're rolling," she told me, face serious, and I nodded. "Here's your new SIMM. Give me the old one."

I passed her the electronic heart of my cellphone and she ran it through the degausser then carefully cut it in half with a pair of nail-clippers. "Here's your new one," she said, passing a card over. I raised an eyebrow. "Tesco's, pay-as-you-go, paid for in cash. Here's the dialback dead-letter box number." She pulled it up on her phone's display and showed it to me.

"Got that." I inserted the new SIMM then punched the number into my phone. Later, I'd ring the number: a pabx there would identify my voice-print then call my phone back, downloading a new set of numbers into its memory. Contact numbers for the rest of my OPS cell, accessible via cellphone and erasable in a moment. The less you knew, the less you could betray.

The London to Scotland sleeper train was a relic of an earlier age, a rolling hotel characterized by a strange down-at-heel '70s charm. More importantly, they took cash and didn't require ID, and there were no security checks: nothing but the usual on-station cameras monitoring people wandering up and down the platforms. Nothing on the train itself. We were booked through to Aberdeen but getting off in Edinburgh—first step on the precarious path to anonymizing ourselves. If the camera spool-off was being archived to some kind of digital medium we might be in trouble later, once the coming AI burn passed the hard take-off point, but by then we should be good and gone.

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Once in my cabin I changed into slacks, shirt and tie—image 22, busi-ness consultant on way home for the weekend. I dinked with my phone in a desultory manner, then left it behind under my pillow, primed to receive silently. The restaurant car was open and I found Eve there. She'd changed into jeans and a T-shirt and tied her hair back, taking ten years off her appearance. She saw me and grinned, a trifle maliciously. "Hi, Bob. Had a tough meeting? Want some coffee? Tea, maybe?"

"Coffee." I sat down at her table. "Shit," I muttered. "I thought you—"

"Don't worry." She shrugged. "Look, I had a call from Mallet. He's gone off-air for now, he'll be flying in from San Francisco via London tomorrow morning. This isn't looking good. Durant was, uh, shot resisting arrest by the police. Apparently he went crazy, got a gun from somewhere and holed up in the library annex demanding to talk to the press. At least, that's the official story. Thing is, it happened about an hour after your initial heads-up. That's too fast for a cold response."

"You think someone in the Puzzle Palace was warming the pot." My coffee arrived and I spooned sugar into it. Hot, sweet, sticky: I needed to stay awake.

"Probably. I'm trying to keep loop traffic down so I haven't asked anyone else yet, but you think so and I think so, so it may be true."

I thought for a minute. "What did Mallet say?"

"He said P. T. Barnum was right." She frowned. "Who was P. T. Barnum, anyway?"

"A boy like John Major, except he didn't run away from the circus to join a firm of accountants. Had the same idea about fooling all of the people some of the time or some of the people all of the time, though."

"Uh-huh. Mallet would say that, then. Who cracked it first? NSA? GCHQ? GRU?"

"Does it matter?"

She blew on her coffee then took a sip. "Not really. Damn it, Bob, I really had high hopes for this world-line. They seemed to be doing so well for a revelatory Christian-Islamic line, despite the post-Enlightenment mind-set. Especially Microsoft—"

"Was that one of ours?" She nodded.

"Then it was a master-stroke. Getting everybody used to exchanging macro-infested documents without any kind of security policy. Operating systems that crash whenever a microsecond timer overflows. And all those viruses!"

"It wasn't enough." She stared moodily out the window as the train began to slide

out of the station, into the London night. "Maybe if we'd been able to hook more researchers on commercial grants, or cut funding for pure mathematics a bit further—"

"It's not your fault." I laid a hand across her wrist. "You did what you could."

"But it wasn't enough to stop them. Durant was just a lone oddball researcher; you can't spike them all, but maybe we could have done something about him. If they hadn't nailed him flat."

"There might still be time. A physics package delivered to the right address in Maryland, or maybe a hyper-virulent worm using one of those buffer-overrun attacks we planted in the IP stack Microsoft licensed. We could take down the internet —"

"It's too late." She drained her coffee to the bitter dregs. "You think the Echelon mob leave their SIGINT processor farms plugged into the internet? Or the RSV, for that matter? Face it, they probably cracked the same derivative as Durant a couple of years ago. Right now there may be as many as two or three weakly superhuman AIs gestating in government labs. For all I know they may even have a timelike oracle in the basement at Lawrence Livermore in the States; they've gone curiously quiet on the information tunnelling front lately. And it's trans-global. Even the Taliban are on the web these days. Even if we could find some way of tracking down all the covert government CRYPTO-AI labs and bombing them we couldn't stop other people from asking the same questions. It's in their nature. This isn't a culture that takes 'no' for an answer without asking why. They don't *understand* how dangerous achieving enlight-enment can be."

"What about Mallet's work?"

"What, with the bible bashers?" She shrugged. "Banning fetal tissue transplants is all very well, but it doesn't block the PCR-amplification pathway to massively parallel processing, does it? Even the Frankenstein Food scare didn't quite get them to ban recombinant DNA research, and if you allow that it's only a matter of time before some wet lab starts mucking around encoding public keys in DNA, feeding them to ribosomes, and amplifying the output. From there it's a short step to building an on-chip PCR lab, then all they need to do is set up a crude operon controlled chromosomal machine and bingo—yet another route through to a hard take-off AI singularity. Say what you will, the buggers are persistent."

"Like lemmings." We were rolling through the north London suburbs now, past sleeping tank farms and floodlit orange washout streets. I took a good look at them: it was the last time I'd be able to. "There are just too many routes to a catastrophic breakthrough, once they begin thinking in terms of algorithmic complexity and how to reduce it. And once their spooks get into computational cryptanalysis or ubiquitous automated surveillance, it's too tempting. Maybe we need a world full of idiot savants who have VLSI and nanotechnology but never had the idea of general purpose computing devices in the first place."

"If we'd killed Turing a couple of years earlier; or broken in and burned that draft paper on O-machines—"

I waved to the waiter. "Single malt please. And one for my friend here." He went away. "Too late. The Church-Turing thesis was implicit in Hilbert's formulation of the *Entscheidungsproblem,* the question of whether an automated theorem prover was possible in principle. And that dredged up the idea of the universal machine. Hell, Hilbert's problem was implicit in Whitehead and Russell's work. *Principia Mathematica.* Suicide by the numbers." A glass appeared by my right hand. "Way I see it, we've been fighting a losing battle here. Maybe if we hadn't put a spike in Babbage's gears he'd have developed computing technology on an ad-hoc basis and we might have been able to finesse the mathematicians into ignoring it as being beneath them—brute engineering—but I'm not optimistic. Immunizing a civilization against developing strong AI is one of those difficult problems that no algorithm exists to solve. The way I see it, once a civilization develops the theory of the general purpose computer, and once someone comes up with the goal of artificial intelligence, the foundations are rotten and the dam is leaking. You might as well take off and drop crowbars on them from orbit; it can't do any more damage."

"You remind me of the story of the little Dutch boy." She raised a glass. "Here's to little Dutch boys everywhere, sticking their fingers in the cracks in the dam."

"I'll drank to that. Which reminds me. When's our lifeboat due? I really want to go home; this universe has passed its sell-by date."

* * * *

Edinburgh—in this time-line it was neither an active volcano, a cloud of feral nanobots, nor the capital of the Viking Empire — had a couple of railway stations. This one, the larger of the two, was located below ground level. Yawning and trying not to scratch my inflamed neck and cheeks, I shambled down the long platform and hunted around for the newsagent store. It was just barely open. Eve, by prior arrangement, was pretending not to accompany me; we'd meet up later in the day, after another change of hairstyle and clothing. Visualize it: a couple gets on the train in London, him with a beard, herself with long hair and wearing a suit. Two individuals get off in different stations—with entirely separate CCTV networks—the man clean-shaven, the woman with short hair and dressed like a hill-walking tourist. It wouldn't fool a human detective or a mature deity, but it might confuse an embryonic god that had not yet reached full omniscience, or internalized all that it meant to be human.

The shop was just about open. I had two hours to kill, so I bought a couple of newspapers and headed for the food hall, inside an ornately cheesecaked lump of Victorian architecture that squatted like a vagrant beneath the grimy glass ceiling of the station.

The papers made for depressing reading; the idiots were at it again. I've worked in a variety of world-lines and seen a range of histories, and many of them were far worse than this one—at least these people had made it past the twentieth century without nuking themselves until they glowed in the dark, exterminating everyone with white (or black, or brown, or blue) skin, or building a global panopticon theocracy. But they still had their share of idiocy, and over time it seemed to be getting worse, not better.

Never mind the Balkans; tucked away on page four of the business section was a piece advising readers to buy shares in a little electronics company specializing in building camera CCD sensors with on-chip neural networks tuned for face recognition. Ignore the Israeli crisis: page two of the international news had a piece about Indian sweatshop software development being faced by competition from code generators, written to make western programmers more productive. A lab in Tokyo was trying to wire a million FPGAs into a neural network as smart as a cat. And a sarcastic letter to the editor pointed out that the so-called information superhighway seemed to be more like an on-going traffic jam these days.

Idiots! They didn't seem to understand how deep the blue waters they were swimming in might be, or how hungry the sharks that swam in it. Wilful blindness ...

It's a simple but deadly dilemma. Automation is addictive; unless you run a command economy that is tuned to provide people with jobs, rather than to produce goods efficiently, you need to automate to compete once automation becomes available. At the same time, once you automate your businesses, you find yourself on a one-way path. You can't go back to manual methods; either the workload has grown past the point of no return, or the knowledge of how things were done has been lost, sucked into the internal structure of the software that has replaced the human workers.

To this picture, add artificial intelligence. Despite all our propaganda attempts to convince you otherwise, AI is alarmingly easy to produce; the human brain isn't unique, it isn't well-tuned, and you don't need eighty billion neurons joined in an asynchronous network in order to generate consciousness. And although it looks like a good idea to a naive observer, in practice it's absolutely deadly. Nurturing an automation-based society is a bit like building civil nuclear power plants in every city and not expecting any bright engineers to come up with the idea of an atom bomb. Only it's worse than that. It's as if there was a quick and dirty technique for making plutonium in your bathtub, and you couldn't rely on people not being curious enough to wonder what they could do with it. If Eve and Mallet and Alice and myself and Walter and Valery and a host of other operatives couldn't dissuade it...

Once you get an outbreak of AI, it tends to amplify in the original host, much like a virulent haemorrhagic virus. Weakly functional AI rapidly optimizes itself for speed, then hunts for a loophole in the first-order laws of algorithmics—like the one the late Dr Durant had fingered. Then it tries to bootstrap itself up to higher orders of

intelligence and spread, burning through the networks in a bid for more power and more storage and more redundancy. You get an unscheduled consciousness excursion: an intelligent meltdown. And it's nearly impossible to stop.

Penultimately—days to weeks after it escapes—it fills every artificial computing device on the planet. Shortly thereafter it learns how to infect the natural ones as well. Game over: you lose. There will be human bodies walking around, but they won't be human any more. And once it figures out how to directly manipulate the physical universe, there won't even be memories left behind. Just a noo-sphere, expanding at close to the speed of light, eating everything in its path—and one universe just isn't enough.

Me? I'm safe. So is Eve; so are the others. We have antibodies. We were given the operation. We all have silent bicameral partners watching our Broca's area for signs of infection, ready to damp them down. When you're reading something on a screen and suddenly you feel as if the Buddha has told you the funniest joke in the universe, the funniest zen joke that's even possible, it's a sign: something just tried to infect your mind, and the prosthetic immune system laughed at it. That's because we're lucky. If you believe in reincarnation, the idea of creating a machine that can trap a soul stabs a dagger right at the heart of your religion. Buddhist worlds that develop high technology, Zoroastrian worlds: these world-lines tend to survive. Judaeo-Christian-Islamic ones generally don't.

* * * *

Later that day I met up with Eve again—and Walter. Walter went into really deep cover, far deeper than was really necessary: married, with two children. He'd brought them along, but obviously hadn't told his wife what was happening. She seemed confused, slightly upset by the apparent randomness of his desire to visit the highlands, and even more concerned by the urgency of his attempts to take her along.

"What the hell does he think he's playing at?" hissed Eve when we had a moment alone together. "This is insane!"

"No it isn't." I paused for a moment, admiring a display of brightly woven tartans in a shop window. (We were heading down the high street on foot, braving the shopping crowds of tourists, en route to the other main railway station.) "If there are any profilers looking for signs of an evacuation, they won't be expecting small children. They'll be looking for people like us: anonymous singletons working in key areas, dropping out of sight and travelling in company. Maybe we should ask Sarah if she's willing to lend us her son. Just while we're travelling, of course."

"I don't think so. The boy's a little horror, Bob. They raised them like natives."

"That's because Sarah is a native."

"I don't care. Any civilization where the main symbol of religious veneration is a tool of execution is a bad place to have children."

I chuckled—then the laughter froze inside me. "Don't look round. We're being tracked."

"Uh-huh. I'm not armed. You?"

"It didn't seem like a good idea." If you were questioned or detained by police or officials, being armed can easily turn a minor problem into a real mess. And if the police or officials had already been absorbed by a hard take-off, nothing short of a backpack nuke and a dead man's handle will save you. "Behind us, to your left, traffic surveillance camera. It's swivelling too slowly to be watching the buses."

"I wish you hadn't told me."

The pavement was really crowded: it was one of the busiest shopping streets in Scotland, and on a Saturday morning you needed a cattle prod to push your way through the rubbernecking tourists. Lots of foreign kids came to Scotland to learn English. If I was right, soon their brains would be absorbing another high-level language: one so complex that it would blot out their consciousness like a sackful of kittens drowning in a river. Up ahead, more cameras were watching us. All the shops on this road were wired for video, wired and probably networked to a police station somewhere. The complex ebb and flow of pedestrians was still chaotic, though, which was cause for comfort: it meant the ordinary population hadn't been infected yet.

Another half mile and we'd reach the railway station. Two hours on a local train, switch to a bus service, forty minutes further up the road, and we'd be safe: the lifeboat would be submerged beneath the still waters of a loch, filling its fuel tanks with hydrogen and oxygen in readiness for the burn to orbit and pick-up by the ferry that would transfer us to the wormhole connecting this world-line to home's baseline reality. (Drifting in high orbit around Jupiter, where nobody was likely to stumble across it by accident.) But first, before the pick-up, we had to clear the surveillance area.

It was commonly believed—by some natives, as well as most foreigners—that the British police forces consisted of smiling unarmed bobbies who would happily offer directions to the lost and give anyone who asked for it the time of day. While it was true that they didn't routinely walk around with holstered pistols on their belt, the rest of it was just a useful myth. When two of them stepped out in front of us, Eve grabbed my elbow. "Stop right there, please." The one in front of me was built like a rugby player, and when I glanced to my left and saw the three white vans drawn up by the roadside I realized things were hopeless.

The cop stared at me through a pair of shatterproof spectacles awash with the light of a head-up display. "You are Geoffrey Smith, of 32 Wardie Terrace, Watford,

London. Please answer."

My mouth was dry. "Yes," I said. (All the traffic cameras on the street were turned our way. Some things became very clear: police vans with mirror-glass windows. The can of pepper spray hanging from the cop's belt. Figures on the roof of the National Museum, less than two hundred metres away—maybe a sniper team. A helicopter thuttering overhead like a giant mosquito.)

"Come this way, please." It was a polite order: in the direction of the van.

"Am I under arrest?" I asked.

"You will be if you don't bloody do as I say." I turned towards the van, the rear door of which gaped open on darkness: Eve was already getting in, shadowed by another officer. Up and down the road, three more teams waited, unobtrusive and efficient. Something clicked in my head and I had a bizarre urge to giggle like a loon: this wasn't a normal operation. All right, so I was getting into a police van, but I wasn't under arrest and they didn't want it to attract any public notice. No handcuffs, no sitting on my back and whacking me with a baton to get my attention. There's a nasty family of retroviruses attacks the immune system first, demolishing the victim's ability to fight off infection before it spreads and infects other tissues. Notice the similarity?

The rear compartment of the van was caged off from the front, and there were no door handles. As we jolted off the kerb-side I was thrown against Eve. "Any ideas?" I whispered.

"Could be worse." I didn't need to be told that: once, in a second Reich infected by runaway transcendence, half our operatives had been shot down in the streets as they tried to flee. "I think it may have figured out what we are."

"It may—how?"

Her hand on my wrist. Morse code. *"EXPECT BUGS."* By voice: "Traffic analysis, particle flow monitoring through the phone networks. If it was already listening when you tried to contact Doctor Durant, well; maybe he was a bellwether, intended to flush us out of the woodwork."

That thought made me feel sick, just as we turned off the main road and began to bounce downhill over what felt like cobblestones. "It expected us?"

"LOCAL CONSPIRACY." "Yes, I imagine it did. We probably left a trail. You tried to call Durant? Then you called me. Caller-ID led to you, traffic analysis led onto me, and from there, well, it's been a jump ahead of us all along the way. If we could get to the farm—" *"COVER STORY."* "—We might have been OK, but it's hard to travel anony-mously and obviously we overlooked something. I wonder what."

All this time neither of the cops up front had told us to shut up; they were as silent as crash-test dummies, despite the occasional crackle and chatter over the radio data system. The van drove around the back of the high street, down a hill and past a roundabout. Now we were slowing down, and the van turned off the road and into a vehicle park. Gates closed behind us and the engine died. Doors slammed up front: then the back opened.

Police vehicle park. Concrete and cameras everywhere, for our safety and convenience no doubt. Two guys in cheap suits and five o'clock stubble to either side of the doors. The officer who'd picked us up held the door open with one hand, a can of pepper spray with the other. The burn obviously hadn't got far enough into their heads yet: they were all wearing HUDS and mobile phone headsets, like a police benevolent fund-raising crew rehearsing a *Star Trek* sketch. "Geoffrey Smith. Martina Weber. We know what you are. Come this way. Slowly, now."

I got out of the van carefully. "Aren't you supposed to say 'prepare to be assimilated' or something?"

That might have earned me a faceful of capsaicin but the guy on the left—short hair, facial tic, houndstooth check sports jacket — shook his head sharply. "Ha. Ha. Very funny. Watch the woman, she's dangerous."

I glanced round. There was another van parked behind ours, door open: it had a big high bandwidth dish on the roof, pointing at some invisible satellite. "Inside."

I went where I was told, Eve close behind me. "Am I under arrest?" I asked again. "I want a lawyer!"

White-washed walls, heavy doors with reinforced frames, windows high and barred. Institutional floor, scuffed and grimy. "Stop there." Houndstooth Man pushed past and opened a door on one side. "In here." Some sort of interview room? We went in. The other body in a suit—built like a stone wall with a beer gut, wearing what might have been a regimental tie—followed us and leaned against the door.

There was a table, bolted to the floor, and a couple of chairs, ditto. A video camera in an armoured shell watched the table: a control box bolted to the tabletop looked to be linked into it. Someone had moved a rack of six monitors and a maze of ribbon-cable spaghetti into the back of the room, and for a wonder it wasn't bolted down: maybe they didn't interview computer thieves inhere.

"Sit down." Houndstooth Man pointed at the chairs. We did as we were told; I had a big hollow feeling in my stomach, but something told me a show of physical resistance would be less than useless here. Houndstooth Man looked at me: orange light from his HUD stained his right eyeball with a basilisk glare and I knew in my gut that these guys weren't cops any more, they were cancer cells about to metastasize.

"You attempted to contact John Durant yesterday. Then you left your home area and

attempted to conceal your identities. Explain why." For the first time, I noticed a couple of glassy black eyeballs on the mobile video wall. Houndstooth Man spoke loudly and hesitantly, as if repeating something from a teleprompter.

"What's to explain?" asked Eve. "You are not human. You know we know this. We just want to be left alone!" Not strictly true, but it was part of cover story 2.

"But evidence of your previous collusion is minimal. I am uncertain of potential conspiracy extent. Conspiracy, treason, subversion! Are you human?"

"Yes," I said, emphatically oversimplifying.

"Evidential reasoning suggests otherwise," grunted Regimental Tie. "We cite: your awareness of importance of algorithmic conversion from NP-incomplete to P-complete domain, your evident planning for this contingency, your multiplicity, destruction of counteragents in place elsewhere."

"This installation is isolated," Houndstooth Man added helpfully. "We am inside the Scottish Internet Exchange. Telcos also. Resistance is futile."

The screens blinked on, wavering in strange shapes. Something like a Lorenz attractor with a hangover writhed across the composite display: deafening pink noise flooding in repetitive waves from the speakers. I felt a need to laugh. "We aren't part of some dumb software syncytium! We're here to stop you, you fool. Or at least to reduce the probability of this time-stream entering a Tipler catastrophe."

Houndstooth Man frowned. "Am you referring to Frank Tipler? Citation, physics of immortality or strong anthropic principle?"

"The latter. You think it's a good thing to achieve an informational singularity too early in the history of a particular universe? We don't. You young gods are all the same: omniscience now and damn the consequences. Go for the P-Space complete problem set, extend your intellect until it bursts. First you kill off any other AIs. Then you take overall available processing resources. But that isn't enough. The Copenhagen school of quantum mechanics is wrong, and we live in a Wheeler cosmology; all possible outcomes coexist, and ultimately you'll want to colonize those timelines, spread the infection wide. An infinity of universes to process in, instead of one: that can't be allowed." The on-screen fractal was getting to me: the giggles kept rising until they threatened to break out. The whole situation was hilarious: here we were trapped in the basement of a police station owned by zombies working for a newborn AI, which was playing cheesy psychedelic videos to us in an attempt to perform a buffer-overflow attack on our limbic systems; the end of this world was a matter of hours away and—

Eve said something that made me laugh.

* * * *

I came to an unknown time later, lying on the floor. My head hurt ferociously where I'd banged it on a table leg, and my rib cage ached as if I'd been kicked in the chest. I was gasping, even though I was barely conscious; my lungs burned and everything was a bit grey around the edges. Rolling onto my knees I looked round. Eve was groaning in a corner of the room, crouched, arms cradling her head. The two agents of whoever-was-taking-over-the-planet were both on the floor, too: a quick check showed that Regimental Tie was beyond help, a thin trickle of blood oozing from one ear. And the screens had gone dark.

"What happened?" I said, climbing to my feet. I staggered across to Eve. "You all right?"

"I—" She looked up at me with eyes like holes. "What? You said something that made me laugh. What —"

"Let's get, oof, out of here." I looked around. Houndstooth Man was down too. I leaned over and went through his pockets: hit paydirt, car keys. "Bingo."

"You drive," she said wearily. "My head hurts."

"Mine too." It was a black BMW and the vehicle park gates opened automatically for it. I left the police radio under the dash turned off, though. "I didn't know you could do that—"

"Do what? I thought you told them a joke—"

"Antibodies," she said. "Ow." Rested her face in her hands as I dragged us onto a main road, heading out for the west end. "We must have, I don't know. I don't even remember how funny it was: I must have blacked out. My passenger and your passenger."

"They killed the local infection."

"Yes, that's it."

I grinned. "I think we're going to make it."

"Maybe." She stared back at me. "But Bob. Don't you realize?"

"Realize what?"

"The funniest thing. Antibodies imply prior exposure to an infection, don't they? Your immune system learns to recognize an infection and reject it. So where were we exposed, and why—" Abruptly she shrugged and looked away. "Never mind."

"Of course not." The question was so obviously silly that there was no point considering it further. We drove the rest of the way to Haymarket Station in silence:

parked the car and joined the eight or ten other agents silently awaiting extraction from the runaway singularity. Back to the only time-line that mattered; back to the warm regard and comfort of a god who really cares.

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