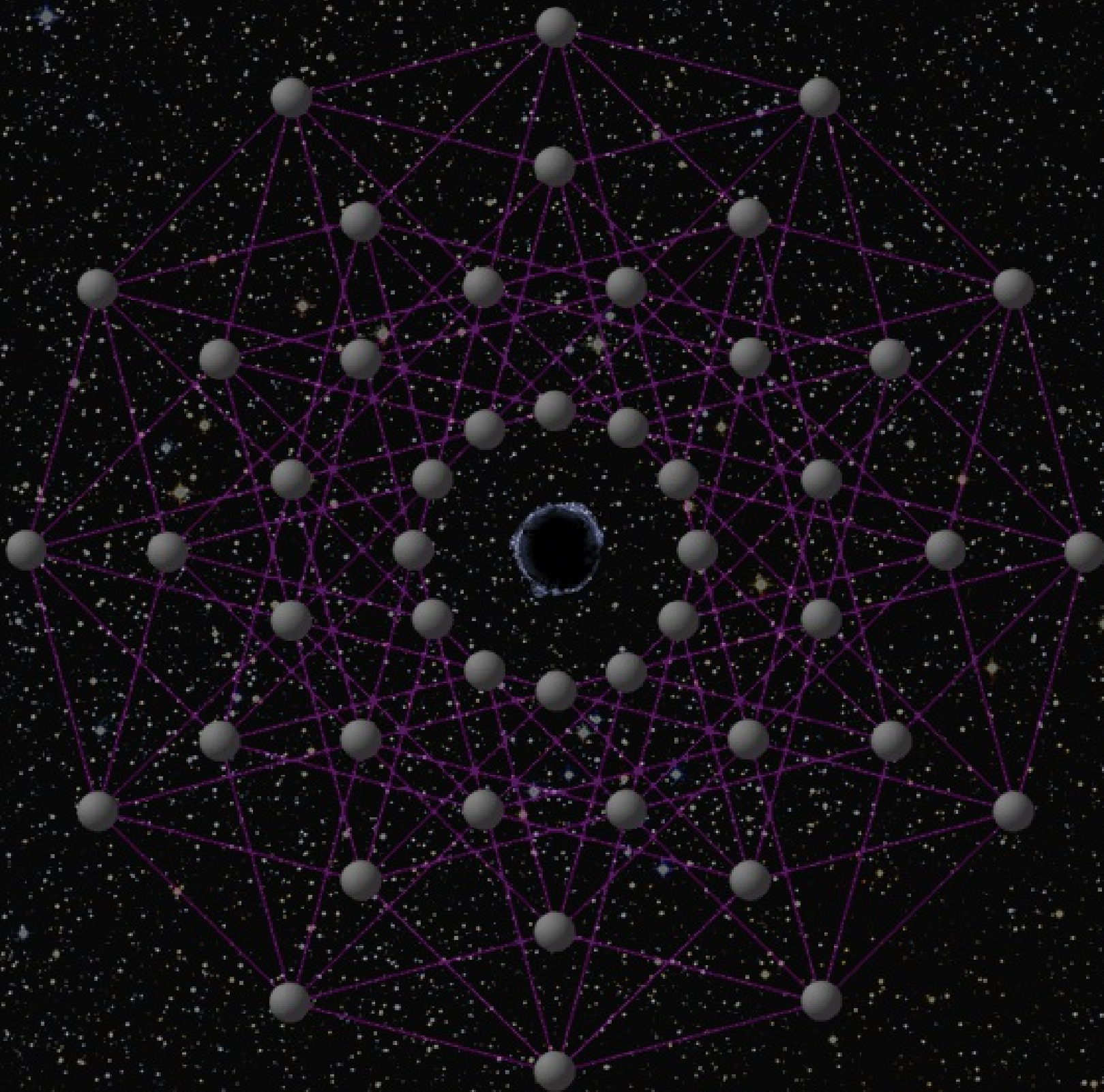


ARTIFACTS



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Euclid screams because the hooded man bends his arm behind his back. I wish it would stop, because I fear the sound of snapping bone. Euclid has very thin arms.

Before waking, perhaps precipitating it, I ponder the insultingly obvious roots of the dream. Euclid's thin arms are the laser beams that criss-cross the artifact, bent by the black hole at the centre, which is hooded by its event horizon. Euclid screams because space around the black hole is violently distorted and will not support his axioms of geometry.

A final image before I open my eyes is of a mass spectrometer, fed with my freshly ionised dream, depositing its easily recognised components onto a photographic plate. I label each dark spot by hand, except the last, which I know should be labelled 'snapping bones'. The lab demonstrator would laugh if I wrote this on the plate.

Nervousness from my student days. A transparent image of my dream's transparency. I wake.

Cabin lights brighten slowly to half strength. Over at my desk the monitor still displays a blue schematic picture of the artifact, a sixty-four-pointed star, each point joined to every other point by a slender blue beam. It is not symmetric in any plane, yet it is pleasing to look at; hypnotically pleasing.

I dress and eat. I skim through the eight-year-old news summary that arrived from home while I slept. News will come so fast on the trip back that I'll have time for nothing else.

In the corridor, everyone knows me with embarrassed cheerfulness. People ask me to check that their shares are doing OK, although there is no way I could get word to them faster than the daily reports. Just something to say, to make me feel vaguely useful.

Eric Jackson, an astronomer like me, comes around a corner and runs towards me, breathless and seemingly hoping to talk to me.

'You've got to stay. You won't believe what I've found out. The ratios between the times for the beams between the nodes are all dimensionless constants!'

He peers eagerly into my face, waiting. I haven't really heard him. His breathless staring makes me think back over his words for a reply to make him go away, and as their meaning accumulates I feel horribly uneasy. In my contract, in every contract, is a guarantee of a free passage home, no questions asked, on the next monthly shuttle. The psychiatrists say it makes us all feel less worried by the time and distance which separate us from home. I asked to go home, and they asked no questions, but eyed me with concern and disappointment. How could I tell anyone that my dreams had gone wrong?

'Fine structure?' I ask blandly.

'Oh yes, and all the others.'

'Accurately?'

'As far as we can measure. Aren't you thrilled?'

'Well I suppose we know its purpose now.'

'I'd hardly say that. I mean there are still dozens of possible explanations. It could be a work of art or a temple or a sort of "we are intelligent" thing, like on Pioneer.'

My mind drifts for a second. 'Who cares?' I want to say. An argument about Egyptian pyramids, and all the contrived and ultimately meaningless ratios of their dimensions, half forms and then dies. It is not likely to be coincidence or contrivance in this case, because whoever made the artifact would certainly be aware of the values of certain dimensionless combinations of physical constants. No surprise, no special implications.

‘You’ll stay now, won’t you?’

Jackson must be excited to breach etiquette so badly.

‘No.’

‘But think of all the work there’ll be.’

‘I’m sure it won’t be too much for you.’

This unsubtle hint to the unspeakable subject of nervous breakdowns, which everyone on the ship now connects with me, cuts through his excitement.

‘Look, I’m sorry, but I thought you’d be pleased. I thought it would be something to stay for.’

Two days ago, when we picked up the artifact on deep-space radar, Jackson had broken this news to me with a look in his eyes which had said what he now put into words.

We parted. Today was my last day, but I took all the usual turns, swung through all the same doors, and now I’m seated at my ‘office’ desk watching the computer doing X-ray spectrometry on emissions from gas being drawn into the black hole. My eyes will not focus on the multicoloured graphs that form in front of them, soon to be interpreted and summarised without my intervention. A small bell will sound discreetly if something remarkable is found, until I acknowledge my approval of a job well done.

The entire process, from the acceleration of the gas molecules through to the sounding of the small bell, will appear in my mind as a closed, complete entity, isolated and unchanged and unchangeable.

I hear a knock and turn around. Arthur Lindstrom, the Chief Astronomer, is walking in, saying, ‘Mind if I come in? I’d like to have a chat about Eric’s discovery.’

He sits on a swivelling chair beside me.

‘You know, we mustn’t jump to conclusions. There’s no reason to assume that this ratio business is the whole purpose of the artifact, because it could quite easily just be a minor aspect of its function. If you’ve been thinking over any theories you mustn’t junk them now just because this has come up. Nothing even in natural astronomy is ever quite as simple as it seems at first glance, and here we’re dealing with something carefully constructed by another culture. We mustn’t be satisfied with our first theories or even our tenth. This thing is going to provide generations of study, and we still may never know its ultimate purpose.’

‘Mmm.’ It was all I could say.

‘I was hoping that you might let me know any thoughts you’ve had, seeing as this is your last day on the project.’

I feel vaguely panicked. The past week I have been in no state to think intelligently about anything, accepting my lack of interest in the artifact as a final confirmation that spaceflight has disturbed me too deeply to be tolerated. Back on Earth, just reading of the discovery would have had my mind spilling over with possibilities, and being on the very ship that found the artifact an ecstatic, impossible dream.

‘Well, Arthur, to be honest I haven’t really had much time to think about it. My mind has been on other things.’

This last sentence is a little too much for him, and his mouth drops open in incredulity. What other things can there be to anyone with *this* greatest discovery only light-minutes away? Finally the seriousness of my impending trip home drifts into his mind, and he stands, saying as he walks out:

‘Do let me know if you have any suggestions.’

I feel like a dying man at a party, spoiling the fun for everybody else. I hope they will forget me

quickly when I've left. It is not my intention for anyone else to feel as I do.

I instruct the computer to carry on with its spectrometry in private, and to display the blue schematic of the artifact. I rotate the plane of perspective aimlessly. The shape of the artifact is blandly soothing, drawing the eye in, then abandoning it to wander without excitement from node to node, with nothing to discover either jarring or beautiful. I try dutifully to form an hypothesis for Lindstrom's sake, so that I shall not leave a painful scar of disappointment.

The artifact consists of sixty-four small satellites orbiting a black hole, ingeniously arranged so that their relative positions remain unchanged. Ultraviolet lasers in each satellite are aimed at all the other satellites. As yet we are too far away to examine the satellites in detail. Some of the laser light is scattered by dust and gas which permeates the system, and we do not believe the lasers are being modulated at all. No modulation puts a wet blanket on any theories that the artifact is a computing device or an interstellar communications relay; and, so far as we can tell, no modulated signal is arriving at or leaving the artifact. There are as yet no signs that the satellites are inhabited, but it is rather too early to tell.

Why was it made? The satellites are positioned in the highly 'curved' space around the black hole so that the ratios between the times for the various laser beams to travel from source to destination equal dimensionless physical constants. What conceivable function could result in a design with this property, either as a necessary consequence of the function or as a 'decoration' possible because the function is independent of the satellite positions?

I don't know. I don't care. My mind wanders back to its painful obsession, the withering of my dreams, source of my imagination and happiness. My dreams on Earth were vast and complex and indecipherable, tantalising and exotic and rich beyond the comprehension of my waking self. I would touch ground each morning with my mind babbling joyously at thoughts strange beyond words or visions, and like the sun or the sea, abundant beyond any possible need, my dreams powered and flooded my waking life. They set me no challenges or problems themselves, but rather fuelled my assaults on the challenges of the daytime, inexhaustible wells of wonder overflowing into every part of my mind, every part of my life.

The first few weeks in space, the strangeness of the ship and the greater strangeness of its voyage doubled the strangeness of my dreams, and I would wake early, exhausted but not distressed by the intensity of the experience. A week ago I dreamt of an empty room.

I floated in the centre of an empty grey room, with a simple thought: this is all there is, this is all there is, this is all there is.

That was the dream. The dream announced its own simplicity, no more. The dream announced its own emptiness, no more. The dream said less than nothing because the nothing that it said was its saying nothing.

The feeling that followed was of having *finished*. Before, my dreams had been too huge to hold in my mind all at once, and too detailed and strangely structured to feel that they might ever end up summarised and tabulated and packed away tidily. Before, my dreams had burst through my mind, slipped through my fingers, not from evanescence but from bulk. Now, my dreams were thin skeletons laid out before me, every detail unambiguous and final, nothing to guess, nothing to explore. Nothing, nothing, nothing.

The ship's psychiatrist, whom I have met only once and whose name I do not remember, knocks and walks in.

‘Hi.’

Yes, up yours also.

‘Hi.’

‘I just wanted to ask you if you’d given any thought to my suggestion.’

‘I’m sorry.’ He had asked me to record voluntarily an explanation of my sudden need to get home again, to be played back only after I had left the ship, and to be used only in the strictest confidence. I couldn’t bear to try to put my emptiness into words, couldn’t imagine it meaning a thing to anyone else.

‘Well, you can always change your mind. We have no wish to invade your privacy, or make you feel you have to account for your decision, but we would like to know if there are any changes we can make so that, in the future, whatever caused problems for you will not cause problems for others. We do think that’s a worthwhile goal, but of course, as it says in your contract, we can’t demand anything.’

‘No.’

No to what? No to it all. I’m very, very tired. I have a sudden weary vision of the Captain coming to ‘chat’ with me, stressing the value in my giving some hint for the planning of future missions. It’s not the considerable fuel expense of my trip that worries them, or even the effect on morale of one member of the team’s giving in. The real concern is not knowing why. Any named weakness could be grappled with; every other person could say to himself ‘I should never be worried by *that*’ and the matter would be under control.

The large, pale blue eyes of the psychiatrist try to ooze protective reassurance. I couldn’t even whisper ‘My dreams are all wrong’ with those terribly forgiving eyes turned at me. I have no strength now to speak of my loss of strength.

The day passes; the Captain does not come, because it would be too much of an honour. The shuttle leaves at 2300 hours, so I am lying in my cabin glancing frequently at my watch, although the computer will call me at 2230 and the Shuttle Control Officer would page me if I were not in his office at 2250.

I glance at the blue display of the artifact. I will get news reports from the ship, too, on my way home, and most of them will concern the artifact. Small unmanned probes will enter the system, explore the satellites; some will be dropped into the black hole.

Eight light-years from home, a black hole. Who would have guessed? Every astronomer’s dream come true, but I don’t feel a thing, don’t feel like an astronomer, don’t care about confirmation of the latest variation on General Relativity. I feel naked and hollow.

I have the computer play some of the music in my personal library, mainly fantasy rock of the early ’90s, but it bores me, slightly annoys me. I shut it off.

I watch the seconds digits for a while, then switch to GMT. The rate is not detectably different, as we’re going quite slowly now relative to Earth. I amuse myself a little by flicking through the various time zones. I remind myself to change the receiving frequency on my watch from that of the ship’s computer to that of the shuttle’s computer, once I am on board.

A bell rings in my watch, and at the desk monitor. I acknowledge the event, then sit on my bed for a while, not wanting to be early at the Shuttle Control Office with nothing to do. There is nothing to pack, it has all been done for me.

Now I am alone in the shuttle. The ship carries hundreds of shuttles, but only ten can be fitted out

to support life on the voyage home. If more than ten people demanded to go home, they would have to take the whole ship back.

That would make the Captain very sad.

With me in the shuttle are many high-density magnetic bubble memories containing an entire month's transmissions from the ship. They are sent back home in case something goes astray with some part of the maser broadcasts. We do not get shuttles from home, because we have much more to tell them than they have to tell us.

'You OK now?' asks the Shuttle Control Officer nervously. He has never sent back a person before. 'Yes, I'm fine thank you.'

'Well, this is it. Bon voyage.'

No party of friends to see me off. This launch is being treated like any other. I am to vanish cleanly from the minds on board.

With very little fuss, my temporary weightlessness is gone. This shuttle will be slower than the others, with only 2 gees, the ship's standard acceleration, rather than the 15 gees of the unmanned ones. I shall not get lonely, with all the news from Earth to catch up with, and all the news from the ship to ignore. I switch on a monitor, and see the huge cylindrical shell dwindling. The artifact is not visible, of course. I switch off the monitor, and try to get some sleep.

For hours I can't really keep my eyes closed. It does not take long to explore with my eyes the inside of the shuttle many times. Then I close my eyes and still see the rows and columns of bubble memories in neatly labelled boxes. I start counting the bits of information in there with me. Each memory contains two-to-the-thirtieth bits. 1 G, they call it. There are two thousand nine hundred memories, more than two-to-the-eleventh, so that makes more than two-to-the-forty-first bits. What a *lot* of garbage, I think lazily. What a vast amount. Nearly a million bits a second back to Earth.

Now I must be asleep, for the bubble memories are multiplying, the stacks are spreading to fill the whole universe. And now they are collapsing; the walls between the neat packages are melting, until only sixty-four compartments remain. Each compartment shrinks to a point, and thin blue lines appear in the familiar configuration. The universe shrinks to the artifact, its essential summary, or maybe even, I think lazily, its essential cause. The symmetry between the two is so nearly perfect that I cannot decide which it is: ambiguity at last.

I wake with a smile. I'll be home soon.

THE WAY SHE SMILES, THE THINGS SHE SAYS

Danny got home from the brothel just before midnight. He usually stayed all night, but the whore had thrown him out.

‘Why? What did I do?’

‘You were saying things in your sleep. I don’t have to put up with that.’

‘What kind of things?’

‘The kind of things I don’t have to listen to.’

‘What? Dirty things?’

‘Strange things.’

‘Frightening things?’

‘No. The kind of things that give me a headache. The kind of things that give me a pain in the arse.’

‘Tell me one of them.’

‘I can’t remember. Go on, get out.’

‘You must remember some of it.’

‘Hey, Daisy! This guy’s making trouble!’

‘I’m going.’ Daisy was three metres tall, with arms as broad as Danny’s chest. It was rumoured that she collected the menstrual blood of all the whores, and drank it mixed with vodka, but Danny knew that none of the whores menstruated.

The front rooms were in darkness, but the kitchen light was on. Danny called out, ‘I’m home early’ as he walked towards the kitchen, thinking that it was like walking down a dark tunnel, perhaps like being born. He felt *déjà vu*, he felt slightly stoned.

‘Hi Dad.’

His son Tom stood by the stove, heating milk in a saucepan, naked. ‘I’m making Milo. Do you want some?’

‘No thanks.’

What was wrong? Something had to be wrong. People aren’t naked in kitchens, they’re naked in bedrooms and bathrooms. Never kitchens. Something had to be wrong. Danny’s hands hanging by his sides suddenly seemed awkward, unnatural. He folded his arms. That seemed wrong, too, so he put them out horizontally, stretched, then placed his hands behind his neck and rubbed it, yawning.

‘How come you’re home so early?’

‘Oh, we got all the tracks done,’ Danny said easily. ‘One, two, three, like magic. They must have been doing a lot more rehearsing than I thought.’

‘An album in three hours, that must be some kind of a record!’

‘Oh, it’s all fucking computers anyway. None of the so-called musicians even raised a sweat.’ Danny lied so well he felt genuine disdain.

‘A joke. A pun. Weak, I know.’

‘What?’

‘Forget it.’

Danny wanted to say: Why are you standing in the kitchen without any clothes on? He couldn’t. Tom didn’t seem to be embarrassed or self-conscious at all. Danny wondered: Is this what he does whenever I’m away? Wander around the house naked?

‘You’re up late. School tomorrow.’

‘Nag, nag, nag.’

Tom didn’t sleep naked; he bought and looked after his own clothes, but Danny had seen him hundreds of times wearing pyjamas, had seen them in the washing basket, had seen them on the washing line. Maybe it was a phase he was going through. Maybe he’d just had a shower, and had put the milk on the stove so it would be ready by the time he put his pyjamas on, but then Danny had walked in so he’d stayed to talk to him. Danny smiled with relief. That was it, exactly. Why had he been so paranoid? After all, why should Tom have made sure he was dressed before going into the kitchen, when there was nobody else in the house, and nobody expected home for hours?

Danny sat down and pretended to read the paper, then glanced up at the sound of Tom pouring the milk. How old is he? Thirty-four minus twenty is fourteen. Danny curdled at two disparities: it’s not fair that he’s no longer fourteen himself, and when he was fourteen he sure didn’t look like Tom, tall and muscular. Tom’s already taller than Danny.

Tom crossed the kitchen with a mug of Milo in each hand. Danny opened his mouth, and took the first breath for saying ‘I said I didn’t want one,’ but stopped in time, because Tom walked right past him, out of the kitchen, towards his bedroom.

Danny looked down at the paper. He’s got a girl in there. Maybe he wants two mugs himself, maybe he’s a Milo junkie. Don’t be stupid and naïve, he’s got a girl in there, how could you not have guessed? He’s just been fucking her, that’s why he’s naked, idiot. He’s fourteen and he’s got a girl in his room. Are you angry, jealous, proud? All three. You were nineteen when you finally fucked his mother, years after all your university friends had tertiary syphilis. Fourteen. Shit. *You* couldn’t have at fourteen. Physically impossible, admit it.

Danny stared and stared at the paper. Should he go to bed, pretend he didn’t know, never say anything about it? Should he walk casually into Tom’s room and ‘accidentally’ discover her? Don’t be a bastard, why try to embarrass him? He’ll tell you if he wants to tell you. What did you expect, did you want him to say, as soon as you walked in, ‘Hi, Dad, there’s this friend of mine, this girl, here, in my room actually, and, in case you’re wondering why I’m standing here naked in the kitchen, it’s because I took all my clothes off before I fucked her and I haven’t got around to putting any back on yet, largely because I’m very seriously entertaining the idea of fucking her again in the not too distant future.’

Danny made himself a cup of coffee and stared at the paper some more. He felt wretched, guilty, old. Old enough to have a virile son is too old to be virile yourself, it stands to reason. Well, to common sense. Danny thought: ‘Shit, what is this? All the pap-psychology I never believed in, castration fantasies and phobias and Oedipus complexes; he hasn’t even got a mother around to kill me for. What a load of garbage. I don’t feel threatened. Just that now he’ll be more like a younger brother. I can bring women home myself now.’ Who? Whores? Nobody else will go near you. Cheap ugly whores a million times older than Tom’s girlfriends.

‘Dad, this is Zoe.’

‘Hi.’

She had short brown hair, a beautiful smile, she didn’t seem nervous at all. Only Danny was nervous, it wasn’t fair. How old was she? Was it illegal if they were both under age? Who went to gaol then? The parents?

They both wore jeans and tee-shirts, identical. She was as tall as Tom. Her right hand rested on his

right hip. Tom smiled amiably ‘Grin bashfully,’ thought Danny. ‘Look sheepish, look almost winking. I need you to.’ Tom did nothing of the sort. They pulled out chairs and sat at the table, Zoe to Danny’s right, Tom to her right, facing Danny.

‘Hello, Zoe. How are you?’

‘Fine, thanks.’

(‘Do you know anything about fertility control?’)

(‘Don’t be nervous, Dad, I had a vasectomy years ago. All my friends had it done too. We figured that we didn’t want any paternity suits cramping our style.’)

‘Do you go to school with Tom?’

‘No. We met at the Uni.’

Tom was a cybernetics prodigy, and spent many hours after school and on weekends at the University, because the facilities at the high school were ‘hopelessly primitive, months out of date.’ Danny knew as much about computers as was absolutely essential for his job: you hit one key and they played a Bach fugue, you hit another key and they played ‘Holiday in Cambodia’, then you drew a squiggle on a screen with your fingertip and the machine combined the three somehow into ‘the song’, which emerged as a four-minute version for the seven-inch single, a ten-minute version for the twelve-inch single, a six-minute version for the four-track EP, a five-minute version for the album, and a little magnetic card you gave to the people who made the video, which evidently allowed them to fit the song to the length of whatever they shot.

Danny said, ‘And I was getting worried that Tom was only interested in machines!’ That made them both grin, then Danny grinned too, and felt happy that he’d said it. You can relax now, joke with them, be friendly. Everything’s okay.

‘Zoe’s really interested in your work.’

‘Yes.’

‘My work? I hardly do anything. They don’t need producers, they just tell the computers what they want. Sometimes they sing a few words into a microphone, and it comes out in a different language at twice the speed with the harmonic properties of a foghorn, or rustling leaves, or lightning bolts. And I say “hey, maybe we should also do it with a sound like waves crashing, and have that backwards in the background”. Then they stare at me like I’m an idiot, go off and have a conference, then come back and tell me I’m a fucking genius, that it’s the perfect “solution”. To what, I don’t know. I don’t know what their problems are. I don’t understand why anybody hires me.’

‘You must be a fucking genius, Dad.’

‘Don’t you start. I make tiny changes to shit.’

‘Don’t you enjoy experimenting? Trying to come up with completely new sounds?’

‘They’re *all* new sounds. Too many new sounds. Nobody can decide what they sound *like*, they’re all so fucking unique. I remember when I used to like songs because they sounded like other songs I liked. Not the same melody or the same words or the same chords (well, sometimes the same chords), but the same *mood*. These songs don’t have any mood, they don’t remind you of anything at all, they don’t cause associations. They’re impossible to remember. I used to really hate those fucking pop tunes they’d churn out, with the same fucking beat as all the others, guaranteed to invade your head like a fucking parasite after you’d heard it once, and guaranteed to have you smashing radios and frothing at the mouth after you’d heard it six hundred times, but good songs were different. You could remember a good song by the way it made you feel, the things it reminded you of. *Strange* moods,

sure, the stranger the better. But the shit nowadays doesn't have any mood at all. You hear it, that's it.'

'But what if it sounds like waves crashing, or lightning, like you said a minute ago?'

'Yeah, sure, you can recognise that. But listening to waves crashing doesn't do much for me. Lots of bands used to use synthesizers to make sounds like waves, like all kinds of things, and it was great, it was part of the music they wrote and played. Themselves. Now when the computers do it *all* it either sounds too much like real waves or just like nothing at all.'

'It's just sour grapes. Dad used to be in a band himself, did I tell you? *Oxymoronic Harmonies*, they were called. He had a green and purple mohawk three feet high, and ten safety pins in his ear. I've got a photo of him somewhere that their drummer gave me, Dad's always trying to steal it and burn it.'

Zoe reached over and ran her finger up from Danny's earlobe, which made the back of his neck tingle.

'Did you really have ten safety pins?'

'Yes. Very handy when I was changing Tom's nappies.'

They all laughed.

'You'd better believe it. Dad was a genuine punk. Beaten up by skinheads every Saturday night outside the Trade Union Club. My mother included.'

'She was not a skinhead!'

'Rick said she was!'

'Her boyfriend was. She wasn't anything. She was unclassifiable, unique.'

'I bet she beat you up, though.'

'No, her boyfriend did. Left me lying on the ground with five broken ribs. She came back later and took me to hospital. She said she hated violence, she was studying anthropology. I've told you all this before.'

'It's different every time.'

'Bullshit, you just don't listen.'

She had studied him anthropologically for three years, and then moved on to study someone else, leaving Tom, who was evidently not thesis material. You'd enjoyed being a deserted father, hadn't you Danny? Radical feminists admired you for it, admired you for not having been cunning enough to dump her with the kid rather than vice versa. The band fell apart but you got work as a mixer, Nightshift Childcare put Tom in their playpen for half your salary, and somehow there was time to fuck the non-separatist radical feminists. Time passed. You didn't ever have to think about what you'd do with your life, it did it all by itself, it just happened and happened and happened. Look where you are tonight. Surprised? Disoriented? Why? Your little boy has grown up. It was either that or prepubescent death, and how likely is the latter? Did you expect some kind of literal cycle, did you think that *you* would be the one who was fourteen and fucking beautiful Zoe when sufficient time had passed? Oh no. You're one turn up the spiral staircase away from that, Danny.

'What does your father do, Zoe?'

'I don't have a father.'

'Oh. I'm sorry.'

'No.'

No? What does that mean?

'I guess most families are single-parent nowadays,' said Danny, fairly sure that it wasn't true.

‘Like me and Tom.’

Zoe smiled. ‘I don’t have any parents at all. I’m a robot.’

Tom looked down at the table, then burst out laughing. Zoe started, then Danny joined in. It didn’t seem all *that* funny, but Tom led them off again whenever they flagged. He stood up, then knelt on the floor, hands on stomach, tears streaming from closed eyes. Danny put him in a loose headlock, tried to wrestle him over, but then Tom opened his eyes and Danny shuddered, seeing his face melting from misery and pain. Tom was sobbing, shivering, choking on his tears, trying to say something.

‘Hey,’ was all Danny could say. ‘Hey.’ He would have held him against his shoulder, but not in front of Zoe, now silent. Danny didn’t look at her, couldn’t look at her, felt the position of her face just out of his vision and blushed at the necessity not to look at her. Tom was suddenly six years old, waking from a nightmare about dead people who ate his arms, leaving him with hands on his shoulders like stunted wings. Danny had caught the dream from the description, and had a much nastier version.

Tom ran out of the room.

Danny stayed on the floor, not looking at Zoe, listening to Tom throwing up. Zoe touched his shoulder, and his spine tingled. He stood up.

‘It’s true,’ she said. ‘I think Tom was pretty worried about how you’d take it. I told him a hundred times that you wouldn’t mind, but he’s got himself all worked up into a nervous state. I’m glad you came home early, otherwise he might not have told you for months.’

Danny turned to face her. ‘It’s not funny. How old are you, anyway? Does your father know you’re screwing my son? Where does he think you are now? Are you on the pill? How many other boys are you screwing? How do I know you haven’t got VD? How old are you, anyway? Do you know it’s a crime to seduce a minor? You slut, why couldn’t you leave him alone, he’s just a kid, can’t you tell? Just because he’s six feet tall. He’s emotionally immature. He never had a mother. Oh, you slut. How old are you?’

‘I’m six months old.’ Zoe took her head off and placed it on the kitchen table. Danny curled up and started whimpering. Tom walked in and yelled, ‘Put it back on!’

Danny closed his eyes, and remembered curling up on the kitchen floor when he was four or five. His mother had screamed at him for some reason. Everybody else in the family had gone into the lounge room to watch television; they’d closed the door and they’d turned off the kitchen light. The floor was cold. Danny had known that nobody was watching him, that he could uncurl, stand up, and go and lie in his warm bed, or even swallow his pride and join the others in the lounge room, where there was a fire. But he had stayed curled up on the cold floor in the dark, planning to sleep there, to stay there on the floor with his eyes shut forever. He planned to die there, and even after death to refuse to uncurl, to refuse to move. His parents would have to explain the dead body in the kitchen to anybody who visited, and his mother would have trouble mopping the floor properly.

His cat had walked up to him and licked his eyes, making him giggle, spoiling his stasis. He’d fed the cat, gone to bed, and woken the next morning, very early, very happy with life. He remembered waking up to birdsong.

‘Dad. Get up. Please.’

Danny opened his eyes and stood up. Zoe had her head back on.

‘I didn’t know they could make them so life-like.’

Tom beamed with pride. ‘I worked out the face myself. First on a CAD system, then I did a couple

of experimental heads. Isn't it great?'

'You built her *yourself*?'

'From a kit, except for the face.'

'A kit? Robots from kits? How much did it cost?'

'Ninety thousand dollars. I don't *own* her, Dad. We built her at the Uni, me and a whole lot of other guys. This company in Japan sells the kits, but only to Universities and research places, they're not really commercially available yet. Because the Cybernetics Club has a University post-office box, we conned them into thinking we were part of the Computing Science Department.

'And do all the other guys fuck her?'

'*Dad!*'

'Well, do they?'

'No. She's in love with me.'

'Oh, crap. *She!* It's a machine'

'She's in love with me.'

Zoe said, 'It's true. I love Tom and he loves me.'

'It's just programmed to say that. I might not know much about computers, but I know you can program them to say anything. Don't kid yourself. You know how they work a million times better than I do. Either you programmed her to say it, or the Japanese did, but either way it's just a machine.'

'I love Tom!'

'Switch it off, will you, it keeps interrupting.'

'Don't talk about her like that.'

'I'm taking you to a psychiatrist first thing in the morning.'

'Don't say things like that. Why can't you just be cool about it. Everybody else just accepts it.'

'Everybody else?'

'The other guys who built her don't even mind.'

'You're all a bunch of lunatics.'

'She loves me because I gave her her face. Because I made it special. I loved it before she was even born.'

'*Born?*'

'Powered up.'

'Exactly. Powered up. Like the recording equipment at work. What do you want to go fucking a machine for? There's nothing wrong with you. You could get real girls.'

'I've *had* real girls.'

'Bullshit. When?'

'Since I was twelve years old, Daddy.'

'Bullshit. Who? When?'

'I haven't got a list on me right now.'

Danny slapped his face. 'Bullshit. You liar.'

Tom stared at the floor. 'I don't care what you believe. I don't care what you think. You're nothing, you don't matter. You're just stupid. Your fucking mixing console is ten times smarter than you are. You're just old and stupid.'

Danny slapped his face again.

'I know where you've been tonight. I bet you think they're all human, don't you? Well they're not. I

bet you've fucked a robot every single time, and you couldn't even tell the difference.'

Danny slapped him. Tom punched him in the cheek and knocked him over.

'I'm sorry. Dad, I'm sorry.'

'Switch it off.' Danny tasted blood, but at least his teeth were still anchored. He wanted to go to bed and wake up, definitely childless, possibly one or two years younger. Not too young, though.

'How can I switch her off? I love her.'

'Why do you love her?'

'The way she smiles. The things she says. That's why people love other people. What difference does it make if she's a robot? She smiles. She says things just like any person would say.'

'And drinks *Milo*?'

Zoe said, 'Eating and drinking are necessary for a complete capacity for social interaction.'

'No person would say that. Switch it off.'

'Dad, you haven't had time to get to know her. She shouldn't have told you so soon, but she's very honest. If you'd known her for a while before you found out, you'd think differently.'

'I bet it's illegal. You can't have robots walking around looking like people. They might do anything, they might run amok.'

'People run amok all the time.'

'Switch it off.'

'Don't *spoil* everything! Why do you have to spoil it?'

Danny walked into the dark lounge room and sat down. You realise you can win if you want to, you can force him to get rid of her: you're still his father, he's not prepared to defy you absolutely, he won't leave home, he has no money, he isn't ready. All you need is stubborn insistence, stamina. He'll complain, or stay silent, or stomp about the house or something, but he really wants you to get rid of her. Her? It. It. Concentrate, please! That look on his face when he stopped laughing: he wasn't just worried about your reaction, he was torn up inside, he wants to get out of the mess he's in, but he can't do it himself, he needs you to say no for him.

Danny thought about Tom's mother, recalled her face as best he could. She'd very rarely smiled, and when she had it was a pretty sickening sight. Everything she'd said to him had been a sarcastic put-down of one kind or another, or so it seemed. Selfish bitch. He wanted her to be sitting beside him in the dark room, more than anything else in the world. Simply sitting there in the dark, not touching him, not speaking a word, invisible. He wanted that very badly. He felt sure that her silent, intangible, invisible presence would have made everything immediately all right, calm and solid.

Tom stood in the doorway.

'Dad. I've switched her off.'

'For good?'

'No.'

'Come in here. I want to talk to you.'

'I promise not to bring her here again. It's your house.'

'Okay. Come in here and sit down for a second.'

'I've got to get some sleep. I've got to get up for school.'

'You can miss school for one day. Just come in for a second. Please.'

'Goodnight.'

Danny fell asleep, and dreamt that someone sat beside him, but he couldn't figure out if it was Tom

or Tom's mother. When the sun rose and he woke to the sound of birdsong, he remembered waking that way as a child.

TANGLED UP

Soft lights and air-conditioning in the editing room. All the light panels on all the benches are switched on. No shadows. I'm running a shot back and forth, back and forth, trying to remember when it was taken, trying to remember taking it, trying to remember. I have no idea what time it is outside. In here there is no time at all, except for the time you find by counting up frames. The little wheels on the frame counter spin with a tiny whirring noise, from 000259 down to 000000 and then back up again, as I wind the shot back and forth. I think vaguely about the new electronic frame counters with no sprockets, with tiny lasers and microprocessors to count the perforations as they stream on by. My shooting records are garbled, jumbled, meaningless to me; I don't even recognise the handwriting. Five hundred spools sit in a box near by, and I suppose they belong to me. It's very hard to tell.

A long time ago there was a conversation, unless I dreamed it or saw it in a film. Ed and I decide that our next films will refer to each other, as a means of extending their effects on the audience. Both are to be fragmented, disjointed, surrealistic, disorienting. In my film, the carload of people who are followed about by the camera will pass by a drive-in, where Ed's film will be glimpsed: they will circle the drive-in, trying to decide whether to go in or not; then they will drive away. In Ed's film, the housewife who eats her kitchen will wander about the house, the television running all the time; and she will flick her remote control unit as she wanders. My film will briefly appear on her television, but she will be in the bedroom at the time, vacuuming the mirror, and she will flick to another station before she wanders into the lounge room. This is simple enough.

What will make it all more difficult is the portions of each other's films we will show: for as the car circles the drive-in the housewife will be in the bedroom; and her television will show the car circling the drive-in, which will be showing her television showing the drive-in, and so on.

'And so on,' I said to Ed.

'And so on,' he agreed.

This may sound impossible, but it's not; for the actual regression would be only finite, taken to perhaps ten or twenty stages until the images are so minute as to be invisible. Ed and I decided to keep the television screen and the drive-in screen to three-quarters of the frame size, so that the twentieth image would be three-quarters to the twentieth power (about one three-hundredth) of the frame size; and three-quarters of that twentieth image would be empty blackness—but nobody would notice. We decided that twenty images would be the most we could afford.

When I think of this conversation I remember the blueness of the sky and the smell of the grass, so it must have taken place sometime, somewhere. I think of another conversation, with someone else (I'm not sure who) trying to justify this idea (I'm not sure how) and arguing angrily (I'm not sure why). I can't remember any of the words. I can only remember some of the words from the conversation with Ed.

I remember sitting in the shade on the river bank with the distant noise of the actors as they ate (distant because my eyes were closed) their evening meal before the night's shooting. Perhaps I don't remember the river bank from the same night as the drive-in; for there were many evenings in the shade, everything in shade with the sun behind the trees. I remember opening my eyes and squinting against the sun reflected off a distant glassy skyscraper, and moving my head up and down, watching the patch of orange fire climb up and down the building, too lazy to shift myself to the left or right and

get rid of the glare entirely.

Round and round the drive-in we went, trying to get shots right. The film really showing there was soft-focus hard-core porn, and the cast were easily distracted. We could have done it all much later, when the drive-in was closed; but having an image on the screen would make it easier to identify the image's position during the matting process. Strictly we were breaching copyright just by filming the porn film, but it would be blotted-out and replaced by Ed's television shot (appropriately deformed to match the varying obliqueness of the screen); so nobody would ever know.

I remember coming around from behind the screen and seeing Ed's television on the screen; and on it I saw the drive-in screen, with the car's rear vision mirror in the foreground, one of the actors glimpsed in the mirror smiling, as it said in the script, and Ed's television on the screen, and so on.

'And so on,' I said to Ed.

'And so on,' he agreed.

I remember looking from the screen down to the rear vision mirror and seeing the actor smiling, and thinking: I can see the mirror too. I can see Robert smiling. I must be in the car. Thinking about it now, I realise that perhaps I was not in the car. Perhaps I was in my screening room at home; and I walked around the screen there; and came across the projected image of the shot, months later, after all the special printing operations had been done; and I looked one image too deep, saw the filmed drive-in screen (thinking it was the real one), and looked down and saw the filmed rear vision mirror (thinking it was there to touch). It's very hard to tell.

I feel sure that at one time I knew exactly what had happened, and why, but that doesn't help me now; for I remember only that I knew, not what I knew.

I remember yelling at someone, a tall girl in black jeans, who kept giggling half-way through a shot, take after take.

'Why are you in this film?' I'd ask her.

'Well, I saw it,' she'd giggle.

'What's that supposed to mean?'

'I saw it.'

'Saw the ad?'

'I saw a film on the plane called Burning Desire and while she did it in the wardrobe they panned around the room and it was on her TV, and I was in it.' She said that with great pride, as if she had already achieved some great success. 'I was in it.'

'Are you going to stop giggling?'

'Well I'll have to eventually, won't I? I didn't when I saw it.'

'Take thirty-five.'

I remember standing in the darkness, standing by the car, looking over across empty asphalt and seeing a camera set up, one man peering through the finder and panning slowly, and I could feel my face slip on to the frame on one side, and slip off on the other side. I walked angrily up to him and grabbed him by the back of his shirt, pulled him away from the camera.

'Look I don't know how many times I've told you not to touch the equipment; it's not a toy, you know!'

He pushed me to the ground, folded the tripod, and just walked off. I never really saw his face, but even as I was standing, picking the gravel out of my palms, I saw the dark shape of the camera protruding from the back seat window of the car. The actors standing by the car laughed mockingly

when I returned, so I didn't say anything at all, or ask any questions.

Sometimes I don't know what they're thinking; I'm just worried about how they look, what they look as though they're thinking; that's all that matters on the screen.

The little numbers spin past the window, and the tiny whirring noise stops and starts. I think vaguely that this is not at all good for the film, even if it is just a workprint, and I really ought to stop. Instead I just slow down. The shot in the viewer shows the editing room. I can see myself seated at this bench, turning the handle of the rewind, peering down at the viewer, which is, reasonably enough, showing exactly the same shot as the real viewer in front of me. I do not feel too peculiar, because it is such a simple, familiar, innocent sort of shot. As I turn the handle of the rewind, I cause my image in the viewer to do the same; I cause all my many images in the many viewers to do the same. I am tempted to say that my image in the viewer turning the handle of his viewer causes my image in his viewer to turn the handle of his viewer, but that is absurd, because all the images are together there, on the one piece of film; there is only an interesting, involuted pattern there, no actions, no causes and effects. Only I can turn a real handle; all the others just mimic me, less real even than reflections.

And yet.

It's very hard not to look into the viewer as if it were a stairwell, a deep square shaft with a kind of square spiral staircase around it. I feel I could put my hand into the shaft and feel the texture of each level, feel the sharp corners of the stairs. Perhaps because it's such an enchanting and dazzling pattern my eyes are a little strained by it; and, much as a cube will reverse itself in your mind, from inner surface to outer surface and back again, the illusory solidness shifts and slides, right angles reverse their directions, and I can easily imagine each level having, at least temporarily, enough pitch as you walk around it to bring you down to the next one. When it all stands still this is wrong; the levels are quite separate and inaccessible; but when they shift and slide there seems to be room for a thin man to slip between two briefly parted edges.

The feeling is growing stronger as those hundreds of handles turn. I think vaguely, stupidly, about conservation of energy; I think there must be other people to turn those other handles; I'm surely not doing all the work—but that's absurd: no other handles are really moving, no matter how it looks.

I remember standing in the foyer of the processing laboratory, my face turning red, glancing now and then at the receptionist who is embarrassed too. The accounts manager comes out from the warren of corridors.

'Look, I'm sure I never put that much film in on Monday.'

'It was all together, you know. All the cans were in one big pile, and here, on the slip with your name, on the work slip it says two thousand feet. Do you deny that you filled out this slip? Do you think we forged it and then processed an extra fifteen hundred feet from out of thin air just to get money out of you?'

'No, of course I don't. But I honestly can't remember even shooting that much on the weekend. Can I have a look at it first, maybe somehow somebody else's order got put in with mine.'

'Be my guest.'

On their beautiful, motorised, immaculate viewer I looked at the start of each reel of workprint. Every shot was familiar as I looked at it (so much I remember); but I cannot now say just what any shot portrayed. I knew as I watched that I had taken every shot myself, however impossible that was. I thought vaguely about looking at my purchasing records, looking at receipts for film stock. I apologised and promised to pay for it all before the end of the month.

I'm not sure which month that was, or if I did, in fact, manage to pay.

I remember adding up the footage of processed and unprocessed stock, adding up the footage on the big white Kodak delivery docket, and reaching the very same figure; but I don't remember whether it was more, the same, or less than what it should have been, what I thought it had been.

And I recall looking into the lens and smiling; but I don't know where or when. It can't have been that night when I yelled at that cameraman, because I remember the reflections of the sun in the lens, the whole series of spurious purple images, which moved as I moved my head. I want to unravel all of these memories and put them in their proper places; I want to cut them out and splice them together in a nice, orderly linear flow; but they won't allow it; they just keep surfacing at random, changing in their relationships with each other and with the present, as I sit here turning the handles. I wonder whether perhaps we filmed at the drive-in twice, once when the porn film was showing, and then much later, after the matting had been done, with the footage for Ed's film showing on the big drive-in screen. I don't know why we should have done that; but it still seems possible, although I have no memory of talking to the manager, of hiring the drive-in. Perhaps we did just that, ten or twenty times, as a cheaper way of getting the effect than laboratory processes. We would film first with an empty screen, then give that to Ed to show on his TV and film his shot, which he would give to us to project on to the drive-in screen while we once again drove around, while Robert once again smiled into the rear view mirror, while I once again looked down to see him do so; and the film we took we would give to Ed to show on his TV and film his shot, and so on.

'And so on,' I said to Ed.

'And so on,' he agreed.

I wonder if that is what happened. It's very hard to tell.

As I sit here I feel sure that Ed and I have achieved the disorienting effect which we both felt was so important to our films. I realise that editing will be very difficult, the way these fragments refuse to stay in any fixed relationship; but it is just that mood of sliding moments which we wanted to capture.

I feel I ought to move on from this particular shot; I ought to put it aside and make a start elsewhere; but it is so hypnotic and soothing to sit here winding it along first one way, and then the other. There is only one thing that puzzles me, really deeply, for all the rest can be put down to the way it feels to sit in this room and shuffle fragments of time so easily. It is this: there are two spools mounted, one on each side of the viewer, and either spool can be turned by the geared handle of the rewind on which it is mounted. To drive the film one way, one turns the handle of the rewind on the right of the viewer. To drive the film the other way one turns the handle of the rewind on the left of the viewer. All this is plain and simple enough.

Now imagine a film of a man winding the film forwards by turning the handle on the right. Played forwards it will look natural and normal, of course; but played backwards it will look a little strange, for by turning the right hand spool backwards the man will seem to force the film back through the viewer and around the left hand spool, which will spin magically at just the right rate and smoothly accept all the film as it leaves the viewer. It seems very clear to me that this ought not happen to a man really turning the right hand spool backwards; and that, instead, the film ought to refuse to pass back into the viewer, and ought to form large untidy loops about the right hand spool.

I peer down into the square stair well of the viewer, and each hand I see remains firmly fixed to the right hand handle regardless of the motion of the film, and I mean this without exception; even at my own level, right above the stair well, I do not remove my hand from the right hand handle

regardless of whether I am winding the film forwards or backwards. This puzzles me much more than all the other strange things: my scattered memories, the jumbled records, the huge box of unexplained spools of unexplained film. I am quite at a loss to decide what to do with the unexplained film, unsure whether I should start the film with it, end the film with it, spread it out a little in each scene, or just cut it out entirely.

Also, I have a burning desire to turn my head and look up from the viewer; but I'm prevented from doing this by an irrational fear that, if I do so, my image in the viewer, all my images in the viewer, will all do the same. This would certainly be very disorienting, but I'm not sure that I'm quite ready for it.

Also, I'm not able to predict confidently what I should see when looking up away from the viewer. This bothers me equally. I think probably I'll have to stay with this shot for the time being, just for something to look at, because it does not prevent me from drifting in my mind back to my many strange and disquieting memories, trying to piece them together, winding back and forth, back and forth, trying to remember, if I can, just what really did happen.

MIND VAMPIRES

There are moments when my mind misses a beat. I find myself, in mid-step or mid-breath, feeling as if delivered abruptly into my body after a long absence (spent where, I could not say), or a long, dreamless sleep. I lose not my memory, merely my thread. My attention has inexplicably wandered, but a little calm introspection restores my context and brings me peace. Almost peace.

I suppose I am a detective, a private investigator, for why else would I be prowling the corridors of a posh girls' boarding school, softly past the doors of the dark-breathing dormitories?

I suppose the headmistress rang me, hysterical. I'm sure that's right. She was sixty-two and had begun to menstruate again. What a surprise for her, what a strange shock. No wonder she went straight to the telephone and dialled my number.

She was calm in her office when I arrived in person, if a little embarrassed. Women have problems, she said. These things *do* happen, she explained. Rarely, but one cannot attach any significance. I find it very irritating to be told one minute to hurry and the next to get lost; I could have shrugged and walked out, abandoned her right then, but I have my code of ethics. My reputation. My pride. For her sake, for the sake of those in her charge, I frightened her into hiring me.

I described the next few stages to her. Prepubescent girls, even infants and newborn babes, would also start to menstruate. Sweat, tears, saliva, urine, mother's milk and semen would all turn to blood. Dead rats and birds would be found everywhere. Water pipes would issue blood, and every container of any kind of fluid, from disinfectant to dye, from vinegar to varnish, from wine to window-cleaner, would be brimming with blood.

There is definitely no semen on school premises, she said. I think she was trying to make a joke. I showed her a colour photograph from a previous case, the kind the police don't like me carrying about. She turned pale and then wiped the perspiration from her face with (oh yes) a white lace handkerchief, which she carefully examined for any trace of red. Then she signed.

New England. Connecticut? How?

Young soldiers come home with bad dreams.

Atrocities in a muddy trench, a bloody trench.

Young soldiers who would rather be dead than return to their friends and families bearing this European curse. A horrible embrace, a horrible feast. Much better to feed the rats and the worms.

The smell of the trenches drawing them for hundreds of miles. They devour the gangrenous parts. Later the healed will attribute this to the rats. Struggles in the mud, the blood rains down. Screams are natural enough. Nobody will ever guess, they'll be lost amongst the shell-shocked.

"I'm responsible for the girls. You must be discreet."

"Discreet? There'll be no discretion when the snow turns red."

I may be wrong. Sometimes there is no carnival of horrors; fear of detection dampens their natural flamboyance, their love of dark theatre. But it's a new moon tonight, the nadir of their strength, and already they have announced their presence. Whatever shows so little caution is afraid of no one.

"You mustn't cause a panic." Her chin trembled, she pleaded with her eyes. "You know what I'm concerned about."

I knew, all right.

"If there were nothing to fear but fear itself," I said, "wouldn't life be sweet?"

So I prowl the corridors, watching for signs, preparing for the fight. My reputation is the highest, I have never lost. My clients shake my hand, hug and kiss me, shower me with gifts and favours. No wonder.

A thin young girl, a somnambulist, wanders past me and my heart aches at her vulnerability. In my mind her swan neck becomes a giraffe neck, a single throbbing artery tight with blood ready to gush and sate the hugest appetite. How sickening, when the skin of her neck is so pale and delicate and, I am certain, cool as the night.

In the prisons, where they mutilate their limbs with razor blades, there is feeding every month. The gatherings in the alleys of abortionists are indescribable. The torture cells; well who do you think runs them? I stay away from all of these. I am no fool. Large old families in large old houses, the better schools, the quieter, cleaner asylums call for me. My reputation is the highest.

The gardener's apprentice, a quiet young lad named Jack Rice, disappeared two days ago. The headmistress thinks it's just a coincidence (such a helpful boy). Nobody knows his family's address, but his father is said to be a veteran and to shun the light of day.

A legless spider moves its mandibles in distress.

A girl cries out: "Whoa, nightmare!"

Strange, dark flowers appear in the fields. They open at midnight to send a sickly sweet narcotic scent to corrupt the most innocent of dreams.

Fear comes to me, but only as an idea. I think about terror, but I do not feel it. Fear has saved my life many times, so I do love and respect it, when it knows its place.

I enter the dormitory itself, I walk quiet as a nightgown between the tossing beds. Over one bed, two heavy men in dark coats shoulder a fluttering kinematograph machine with the lens removed, while a third man holds open a girl's right eye. The pictures flash into the empty spaces of her brain. Fear will not save *her* life; it has seduced her, possessed her, paralysed her, as it has done to thousands, sweeping the countryside like fire or flood wherever that one dread word is whispered. Even far from the sites of true danger, men and women hear that word, form that image, and choke on the terror that rushes up from their bowels. It is a plague in itself, a separate evil with a life of its own now. I nod at the men, they nod (so very slightly) back at me, then I walk on.

I find Jack Rice easily enough, his hobnailed boots protruding from the end of the bed. I call to the men in dark coats to come and hold him still, for that is what they do best of all. His girl's disguise fades as he struggles. I wonder what revealed the boots. Perhaps his guard was down as he slept. Perhaps he dreamt he was discovered, and so blurred the borders of the dream by bringing on its own fulfilment. I smile at this idea as I drive in the stake.

The tales they later tell me are familiar: the girl he killed, the girl whose form he took, had mocked him cruelly. We find her body, the lips and tender parts consumed, in one of the many damp basements, crawling about gnashing its fangs, but very weak. A matchstick would do for a stake. I hope her parents will not be awkward.

The headmistress tries to thank me and dismiss me with her chequebook, but the ink of her fountain pen has changed colour, and she cannot sign the cheque with her trembling bony hand. Oh dear. Jack's father will be angry. Jack's mother will be grieved. I hope he was an only child, but the odds are against it.

The dark-coated men, unperturbed, move from bed to bed with their sawn-off projector. Their

enemies are different, but sometimes they will pause to come to my aid. They're fighting mind vampires.

Breakfast is dismal the next morning, for all the milk had to be thrown out. The heated swimming baths are closed, but the cloying odour escapes from the steam-dampened, padlocked wooden doors.

I ask around the village (of course a village) for word of Jack and his family. Oh, the young vampire lad, they say merrily. He never gave an address, of course. Hardly the thing to do. I mean, would you?

I hunt the old, dark-hidden, overgrown houses as the fortnight slips away from me. Jack's walking in sunlight and feeding so far from the full moon are disturbing. What will his father be like when he decides to strike? Every cellar I breach nearly stops my heart, but they are all empty and peaceful; cool air and silence protest their pure innocence to me as I scour cobwebbed corners with lamplight. I smile at the unfairness: I *cannot* rejoice that a place is clean, that I smell no evil, that I will face no risks for a few kind minutes, for every safe house is a failure, every moment without threat only postpones the danger I must face in the end. I'd rather not be who I am, but my reputation is the highest.

Bloody pigeons, headless in the snow, unsettle the girls. There are more nightmares, more night walks; a warm, damp, unnatural wind blows an hour before dawn. I fortify the windows with steel bars, garlic and crucifixes, but there is always a way in left unprotected, it is inevitable.

Perhaps it is my weariness, but the shadows I cast seem to follow me with increasing reluctance. Indeed they conform to my movements, but I swear that they do so an eyeblink too late. My reflections do not move at all: they stare, transfixed, over my shoulder, fascinated by that empty space, hypnotised by its potential occupants.

The headmistress complains, she expected so much more of me. The strain is becoming too much, she sobs. Her weeping blinds her, and when she smells why she falls screaming to the floor.

I continue to search, but I fail for the first time ever to locate their hiding place. They will only face me when they choose to do so, at the very height of their powers.

I leave my room at the inn and sleep in the attic of the dormitory building. From my bed I hear the girls swapping secrets, and through my window drifts the stench of the dark buds which break through the snow.

I dream that I lie naked in the middle of the moonlit fields. My eyes are closed. I feel sharp snow against my back. Footsteps, girls whispering. I recall walking past two students, overhearing: "Oh, much handsomer than Jack!" When they saw me they blushed and turned away. A warm, wet tongue slides across my eyelids, my lips, down my chin and throat, awakening each tiny point of stubble it brushes. Between my ribs, across my stomach, it leaves a snail track of sticky, moistened hair. Soft lips enclose my penis, the warm tongue wraps and caresses it. A young voice: "You didn't! You *can't* have! With him? Oh, tell us!"

As I shudder and struggle to prolong the pleasure, a phrase enters my mind and jolts me into awareness: "the erect penis is engorged with blood." Engorged. Engorged with blood.

Suddenly I have vision: I see the scene from above. My hands are behind my back, my legs splayed, my back arched. I am utterly naked and defenceless. A glistening streak of red bisects me, and a giant she-vampire clad in black iron armour sucks at me noisily, an animal sound.

My view expands, and despair takes hold of me: ringing us is a circle of her kin, some fifty feet

across. Each one bears a poison-tipped sword and a grievance against me for their friends that I've dispatched.

The tongue works frantically, and I understand that she had been forbidden to strike with her fangs until the instant of ejaculation. My concentration falters, and I feel the lips draw back.

Awake, shaving, I cut myself in three places. In the shaving water I find a swollen leech; I slice it open and the water turns black and foul.

A serving girl discovers the headmistress; she has hanged herself in her Sunday best (now who will sign my cheques?) after writing the word with lipstick and rouge upon every surface of her room. The servants leave to cross the ocean, and the teachers run away to marry their sweethearts.

I must defend the girls alone.

As if in an instant, the moon is full.

The lights of the village go out.

The snow turns to putrid flesh, blood creeps across all floors and up all walls. The girls huddle stickily in clots of terror, but I scream at them to master fear, to use fear, never to let it cripple them and conquer them. And they are strong, they do not succumb.

Jack's family come up from the basements, where they have been, no doubt, for months. Four tall brothers, three hissing sisters first. The iron cross, the mallet, the stake: all grow slippery in palms sweating blood. Yet I will defeat them, I will not lose my nerve.

I gather the uneasy students into a single room and ring them with a fence of crucifixes. The Rices are cunning, they taunt me from a distance, speak of the siege they will subject us to which will turn us into cannibals. The school girls plait each other's hair for comfort; the brothers, more handsome than Jack, flirt brazenly with them, drooling out romantic nonsense. One girl's yellow eyes unfocus, and her hand flies to her neck. I am already behind her as her skin blooms with grey. She takes two steps towards her lover, then vomits insect-riddled blood as my stake crashes through her heart from behind. Her friends desert her, and she told them such pretty tales.

I venture out with my own protection and corner them one by one. They are far too proud and foolish to keep together for safety. Two of the brothers grow bored and visit the village tavern. One sister wanders alone through the empty dormitories in search of a new pair of shoes. It doesn't take me long. I feel some hope.

Jack's parents come next, dressed plainly, their fangs concealed. They talk of the terrible loss they have suffered. They slander me in front of the girls, telling them that I killed both Jack and the girl he loved (how can I refute that?) and that I will kill them all. They urge the girls to expel me from the room for their safety's sake: they need not leave the room themselves, but they must not let me stay or they will all die in agony to satisfy my craving for blood.

In their fervent, pleading seduction they come a few feet closer than wisdom would have decreed, and I spring my trap: a wire net in which two dozen crucifixes are embedded. They crawl and writhe as I smash in the stakes. Their hearts are like granite but I am strong and purposeful and I do not flinch.

I catch my breath. Hunched over the pair of corpses crumbling into dust, I feel a slight vibration through the floor. Before my reason has grasped its meaning I find myself, incredibly, weeping with terror.

I turn to a roar louder than thunder. Jack's father, it seems, smuggled home a friend, ancient and

powerful. For a moment I cannot move: enough, surely I've faced enough! Splintering the old stone floor, red chips flying. So fast, and I have hesitated, there is nothing now that I can do. All the girls are gone, down into the very oldest basement, when I skid into what remains of the room. I grab a cross and try to leap into the hole in the floor, but blood spurts from it with such pressure that I cannot even approach it. I roar useless curses at the thing which has defeated me, as the red tide sweeps me from the building and dumps me, a helpless insect, upon the rotting snow.

The dark-coated men, unperturbed as always, press their projector to my tired right eye, and their soothing pictures flash into the empty spaces of my mind.

My reputation is the highest, but they're fighting mind vampires.

NEIGHBOURHOOD WATCH

My retainers keep me on ice. Dry ice. It slows my metabolism, takes the edge off my appetite, slightly. I lie, bound with heavy chains, between two great slabs of it, naked and sweating, trying to sleep through the torment of a summer's day.

They've given me the local fall-out shelter, the very deepest room they could find, as I requested. Yet my senses move easily through the earth and to the surface, out across the lazy, warm suburbs, restless emissaries skimming the sun-soaked streets. If I could rein them in I would, but the instinct that drives them is a force unto itself, a necessary consequence of what I am and the reason I was brought into being.

Being, I have discovered, has certain disadvantages. I intend seeking compensation, just as soon as the time is right.

In the dazzling, clear mornings, in the brilliant, cloudless afternoons, children play in the park, barely half a mile from me. They know I've arrived; part of me comes from each one of their nightmares, and each of their nightmares comes partly from me. It's day time now, though, so under safe blue skies they taunt me with foolish rhymes, mock me with crude imitations, tell each other tales of me which take them almost to the edge of hysterical fear, only to back away, to break free with sudden careless laughter. Oh, their laughter! I could put an end to it so quickly ...

"Oh yeah?" David is nine, he's their leader. He pulls an ugly face in my direction. "Great tough monster! Sure." I respond instinctively: I reach out, straining, and a furrow forms in the grass, snakes towards his bare feet. Nearly. My burning skin hollows the ice beneath me. Nearly. David watches the ground, unimpressed, arms folded, sneering. *Nearly!* But the contract, one flimsy page on the bottom shelf of the Mayor's grey safe, speaks the final word: No. No loophole, no argument, no uncertainty, no imprecision. I withdraw, there is nothing else I *can* do. This is the source of my agony: all around me is living flesh, flesh that by nature I could joyfully devour in an endless, frantic, ecstatic feast, but I am bound by my signature in blood to take only the smallest pittance, and only in the dead of night.

For now.

Well, never mind, David. Be patient. All good things take time, my friend.

"No fucking friend of mine!" he says, and spits into the furrow. His brother sneaks up from behind and, with a loud shout, grabs him. They roar at each other, baring their teeth, arms spread wide, fingers curled into imitation claws. I must watch this, impassive. Sand trickles in to fill the useless furrow. I force the tense muscles of my shoulders and back to relax, chanting: be patient, be patient.

Only at night, says the contract. After eleven, to be precise. Decent people are not out after eleven, and decent people should not have to witness what I do.

Andrew is seventeen, and bored. Andrew, I understand. This suburb is a hole, you have my deepest sympathies. What do they expect you to *do* around here? On a warm night like this a young man can grow restless. I know; *your* dreams, too, shaped me slightly (my principal creators did not expect *that*). You need adventure. So keep your eyes open, Andrew, there are opportunities everywhere.

The sign on the chemist's window says no money, no drugs, but you are no fool. The back

window's frame is rotting, the nails are loose, it falls apart in your hands. Like cake. Must be your lucky night, tonight.

The cash drawer's empty (oh *shit!*) and you can forget about that safe, but a big, glass candy jar of valium beats a handful of Swiss health bars, doesn't it? There are kids dumb enough to pay for those, down at the primary school.

Only those who break the law, says the contract. A list of statutes is provided, to be precise. Parking offences, breaking the speed limit and cheating on income tax are *not* included; decent people are only human, after all. Breaking and entering is there, though, and stealing, well, that dates right back to the old stone tablets.

No loophole, Andrew. No argument.

Andrew has a flick knife, and a death's head tattoo. He's great in a fight, our Andrew. Knows some karate, once did a little boxing, he has no reason to be afraid. He walks around like he owns the night. Especially when there's nobody around.

So what's that on the wind? Sounds like someone breathing, someone close by. Very even, slow, steady, powerful. Where is the bastard? You can see in all directions, but there's no one in sight. What, then? Do you think it's in your head? That doesn't seem likely.

Andrew stands still for a moment. He wants to figure this out for himself, but I can't help giving him hints, so the lace of his left sand-shoe comes undone. He puts down the jar and crouches to retie it.

The ground, it seems, is breathing.

Andrew frowns. He's not happy about this. He puts one ear against the footpath, then pulls his head away, startled by the sound's proximity. Under that slab of paving, he could swear.

A gas leak! Fuck it, of course. A gas leak, or something like that. Something mechanical. An explanation. Pipes, water, gas, pumps, shit, who knows? Yeah. There's a whole world of machinery just below the street, enough machinery to explain anything. But it felt pretty strange for a while there, didn't it?

He picks up the jar. The paving slab vibrates. He plants a foot on it, to suggest that it stays put, but it does not heed his weight. I toss it gently into the air, knocking him aside into somebody's ugly letter box.

The contract is singing to me now. Ah, blessed, beautiful document! I hear you. Did I ever truly resent you? Surely not! For to kill with you as my accomplice, even once, is sweeter by far than the grossest bloodbath I can dream of, without your steady voice, your calm authority, your proud mask of justice. Forgive me! In the daylight I am a different creature, irritable and weak. Now we are in harmony, now we are in blissful accord. Our purposes are one. Sing on!

Andrew comes forward cautiously, sniffing for gas, a little uneasy but determined to view the comprehensible cause. A deep, black hole. He squats beside it, leans over, strains his eyes but makes out nothing.

I inhale.

Mrs Bold has come to see me. She is Chairman of the local Citizens Against Crime, those twelve fine men and women from whose dreams (chiefly, but not exclusively) I was formed. They've just passed a motion congratulating me (and hence themselves) on a successful first month. Burglaries, says Mrs Bold, have plummeted.

“The initial contract, you understand, is only for three months, but I’m almost certain we’ll want to extend it. There’s a clause allowing for that, one month at a time.”

“Both parties willing.”

“Of course. We were all of us determined that the contract be scrupulously fair. You mustn’t think of yourself as our slave.”

“I don’t.”

“You’re our business associate. We all agreed from the start that that was the proper relationship. But you do like it here, don’t you?”

“Very much.”

“We can’t increase the payment, you know. Six thousand a month, well, we’ve really had to scrape to manage that much. Worth every cent, of course, but ...”

That’s a massive lie, of course: six thousand is the very least they could bring themselves to pay me. Anything less would have left them wondering if they really owned me. The money helps them trust me, the money makes it all familiar: they’re used to buying people. If they’d got me for free, they’d never sleep at night. These are fine people, understand.

“Relax, Mrs Bold. I won’t ask for another penny. And I expect to be here for a very long time.”

“Oh, that’s wonderful. Come the end of the year I’ll be talking to the insurance companies about dropping the outrageous premiums. You’ve no idea how hard it’s been for the small retailers.” She is ten feet from the doorway of my room, peering in through the fog of condensed humidity. With the dry ice and chains she can see very little of me, but this meagre view is enough to engender wicked thoughts. Who can blame her? I’m straight out of her dreams, after all. *Would you indeed, Mrs Bold?* I wonder. She feels two strong hands caressing her gently. Three strong hands. Four, five, six. Such manly hands, except the nails are rather long. And sharp. “Do you really have to stay in there? Trussed up like that?” Her voice is even, quite a feat. “We’re having celebratory drinks at my house tomorrow, and you’d be very welcome.”

“You’re so kind, Mrs Bold, but for now I do have to stay here. Like this. Some other time, I promise.”

She shakes the hands away. I could insist, but I’m such a gentleman. “Some other time, then.”

“Goodbye, Mrs Bold.”

“Goodbye. Keep up the good work. Oh, I nearly forgot! I have a little gift.” She pulls a brown-wrapped shape from her shopping bag. “Do you like lamb?”

“You’re too generous!”

“Not me. Mr Simmons, the butcher, thought you might like it. He’s a lovely old man. He used to lose so much stock before you started work, not to mention the vandalism. Where shall I put it?”

“Hold it towards me from where you are now. Stretch out your arms.”

Lying still, ten feet away, I burst the brown paper into four segments which flutter to the floor. Mrs Bold blinks but does not flinch. The red, wet flesh is disgustingly cold, but I’m far too polite to refuse any offering. A stream of meat flows from the joint, through the doorway, to vanish in the mist around my head. I spin the bone, pivoted on her palms, working around it several times until it is clean and white, then I tip it from her grip so that it points towards me, and I suck out the marrow in a single, quick spurt.

Mrs Bold sighs deeply, then shakes her head, smiling. “I wish my husband ate like that! He’s become a vegetarian, you know. I keep telling him it’s *unnatural*, but he pays no attention. Red meat

has had such a bad name lately, with all those stupid scientists scaremongering, saying it causes this and that, but I personally can't see how any one can live without it and feel that they're having a balanced diet. We were *meant* to eat it, that's just the way people are."

"You're absolutely right. Please thank Mr Simmons for me."

"I shall. And thank *you* again, for what you're doing for this community."

"My pleasure."

Mrs Bold dreams of me. Me? His face is like a film star's! There are a few factual touches, though: we writhe on a plain of ice, and I am draped in chains. It's a strange kind of feedback, to see your dreams made flesh, and then to dream of what you saw. Can she really believe that the solid, sweating creature in the fall-out shelter is no more and no less than the insubstantial lover who knows her every wish? In her dream I am a noble protector, keeping her and her daughters safe from rapists, her son safe from pushers, her domestic appliances safe from thieves; and yes, I do these things, but if she knew why she'd run screaming from her bed. In her dream I bite her, but my teeth don't break the skin. I scratch her, but only as much as she needs to enjoy me. I could shape this dream into a nightmare, but why telegraph the truth? I could wake her in a sweat of blood, but why let the sheep know it's headed for slaughter? Let her believe that I'm content to keep the wolves at bay.

David's still awake, reading. I rustle his curtain but he doesn't look up. He makes a rude sign, though, aimed with precision. A curious child. He can't have seen the contract, he can't *know* that I can't yet harm him, so why does he treat me with nonchalant contempt? Does he lack imagination? Does he fancy himself brave? I can't tell.

Street lamps go off at eleven now; they used to stay on all night, but that's no longer necessary. Most windows are dark; behind one a man dreams he's punching his boss, again and again, brutal, unflinching, insistent, with the rhythm of a factory process, a glassy eyed jogger, or some other machine. His wife thinks she's cutting up the children; the act appals her, and she's hunting desperately for a logical flaw or surreal piece of furniture to prove that the violence will be consequence-free. She's still hunting. The children have other things to worry about: they're dreaming of a creature eight feet tall, with talons and teeth as long and sharp as carving knives, hungry as a wild fire and stronger than steel. It lives deep in the ground, but it has very, very, very long arms. When they're good the creature may not touch them, but if they do just *one* thing wrong ...

I love this suburb. I honestly do. How could I not, born as I was from its sleeping soul? These are my people. As I rise up through the heavy night heat, and more and more of my domain flows into sight, I am moved almost to tears by the beauty of all that I see and sense. Part of me says: sentimental fool! But the choking feeling will not subside. Some of my creators have lived here all their lives, and a fraction of their pride and contentment flows in my veins.

A lone car roars on home. A blue police van is parked outside a brothel; inside, handcuffs and guns are supplied by the management: they look real, they feel real, but no one gets hurt. One cop's been here twice a week for three years, the other's been dragged along to have his problem cured: squeezing the trigger makes him wince, even at target practice. From tonight he'll never flinch again. The woman thinks: I'd like to take a trip. Very soon. To somewhere cold. My life smells of men's sweat.

I hear a husband and wife screaming at each other. It echoes for blocks, with dogs and babies joining in. I steer away, it's not my kind of brawl.

Linda has a spray can. Hi Linda, like your hair-cut. Do you *know* how much that poster cost? What do you mean, sexist pornography? The people who designed it are creative geniuses, haven't you heard them say so? Besides, what do you call those posters of torn-shirted actors and tight-trousered rock stars all over your bedroom walls? And how would you like it if the agency sent thugs around to spray *your* walls with nasty slogans? You don't force *your* images on the public? They'll have to read your words, won't they? Answering? Debating? Redressing the imbalance? Cut it out, Linda, come down to earth. No, lower. Lower still.

Hair gel gives me heartburn. I must remember that.

Bruno, Pete and Colin have a way with locked cars.

Alarms are no problem. So fast, so simple; I'm deeply impressed. But the engine's making too much noise, boys, you're waking honest workers who need their eight hours' sleep.

It's exhilarating, though, I have to admit that: squealing around every corner, zooming down the wrong side of the road. Part of the thrill, of course, is the risk of getting caught.

They screech to a halt near an all-night liquor store. The cashier takes their money, but that's his business; selling alcohol to minors is not on my list. On the way back, Pete drops a dollar coin between the bars of a storm water drain. The cashier has his radio up very loud, and his eyes are on his magazine. Bruno vomits as he runs, while Pete and Collin's bones crackle and crunch their way through the grille.

Bruno heads, incredibly, for the police station. Deep down, he feels that he is good. A little wild, that's all, a rebel, a minor non-conformist in the honourable tradition. He messes around with other people's property, he drinks illegally, he drives illegally, he screws girls as young as himself, illegally, but he has a heart of gold, and he'd never hurt a fly (except in self-defence). Half this country's heroes have been twice as bad as him. The archetype (he begs me) is no law-abiding puritan goody-goody.

Put a sock in it, Bruno. This is Mrs Bold and friends talking: it's just your kind of thoughtless hooliganism that's sapping this nation's strength. Don't try invoking Ned Kelly with *us!* In any case (Bruno knew this was coming), we're *third* generation Australians, and you're only *second*, so we'll judge the archetypes, thank you very much!

The sergeant on duty might have seen a boy's skeleton run one step out of its flesh before collapsing, but I doubt it. With the light so strong inside, so weak outside, he probably saw nothing but his own reflection.

David's still up. Disgraceful child! I belch in his room with the stench of fresh blood; he raises one eyebrow then farts, louder and more foul.

Mrs Bold is still dreaming. I watch myself as she imagines me: so handsome, so powerful, bulging with ludicrous muscles yet gentle as a kitten. She whispers in "my" ear: Never leave me! Unable to resist, I touch her, very briefly, with a hand she's never felt before: the hand that brought me Linda, the hand that brought me Pete.

The long, cold tongue of a venomous snake darts from the tip of her dream-lover's over-sized cock. She wakes with a shout, bent double with revulsion, but the dream is already forgotten. I blow her a kiss and depart.

It's been a good night.

David knows that something's up. He's the smartest kid for a hundred miles, but it will do him no

good. When the contract expires there'll be nothing to hold me.

A clause *allowing for* an extension! Both parties willing! Ah, the folly of amateur lawyers! What do they think will happen when I choose *not* to take up the option? The contract, the only force they have, is silent. They dreamed it into being together with me, a magical covenant that I literally cannot disobey, but they stuffed up the details, they failed with the fine print. I suppose it's difficult to dream with precision, to concentrate on clauses while your mind is awash with equal parts of lust and revenge. Well, I'm not going to magically dissolve into dream-stuff. I'll be staying right here, in this comfortable basement, but without the chains, without the dry ice. I'll be done with the feverish torture of abstinence, when the contract expires.

David sits in the sunshine, talking with his friends.

"What will we do when the monster breaks loose?"

"Hide!"

"He can find us anywhere."

"Get on a plane. He couldn't reach us on a plane."

"Who's got that much money?"

Nobody.

"We have to kill him. Kill him *before* he can get us."

"How?"

How indeed, little David? With a sling-shot? With your puny little fists? Be warned: trespass is a serious crime, so is attempted murder, and I have very little patience with criminals.

"I'll think of a way." He stares up into the blue sky. "Hey, monster! We're gonna get you! Chop you into pieces and eat you for dinner! Yum, yum, you're delicious!" The ritual phrases are just for the little kids, who squeal with delight at the audacity of such table-turning. Behind the word sounds, behind his stare, David is planning something very carefully. His mind is in a blind spot, I can't tell what he's up to, but *forget it*, David, whatever it is. I can see your future, and it's a big red stain, swarming with flies.

"Hey monster! If you don't like it, come and get me! Come and get me now!" The youngest cover their eyes, not knowing if they want to giggle or scream. "Come on, you dirty coward! Come and chew me in half, if you can!" He jumps to his feet, dances around like a wounded gorilla. "That's how you look, that's how you walk! You're ugly and you're sick and you're a filthy fucking coward! If you don't come out and face me, then everything I say about you is true, and every one will know it!"

I write in the sand: NEXT THURSDAY. MIDNIGHT.

A little girl screams, and her brother starts crying. This is no longer fun, is it? Tell Mummy how that nasty David frightened you.

David bellows: "Now! Come here now!"

I deepen the letters, then fill them with the blood of innocent burrowing creatures. David scuffs over the words with one foot, then fills his lungs and roars like a lunatic: "NOW!"

I throw half a ton of sand skywards, and it rains down into their hair and eyes. Children scatter, but David stands his ground. He kneels on the sand, talks to me in a whisper:

"What are you afraid of?"

I whisper back: "Nothing, child."

"Don't you want to kill me? That's what you keep saying."

"Don't fret, child, I'll kill you soon."

“Kill me now. If you can.”

“You can wait, David. When the time comes it will be worth all the waiting. But tell your mother to buy herself a new scrubbing brush, there’ll be an awful lot of cleaning up to do.”

“Why should I wait? What are *you* waiting for? Are you feeling *weak* today? Are you feeling ill? Is it too much effort, a little thing like killing me?”

This child is becoming an irritation.

“The time must be right.”

He laughs out loud, then pushes his hands into the sand. “Bullshit! You’re afraid of me!” There’s nobody in sight, he has the park to himself now; if he’s acting, he’s acting for me alone. Perhaps he is insane. He buries his arms half-way to his elbows, and I can sense him reaching for me; he imagines his arms growing longer and longer, tunnelling through the ground, seeking me out. “Come on! Grab me! I dare you to try it! Fucking coward!” For a while I am silent, relaxed. I will ignore him. Why waste my time exchanging threats with an infant? I notice that I’ve broken my chains in several places, and burnt a deep hollow in the dry ice around me. It suddenly strikes me as pathetic, to need such paraphernalia simply in order to fast. Why couldn’t those incompetent dreamers achieve what they claimed to be aiming for: a dispassionate executioner, a calm, efficient tradesman? I know why: I come from deeper dreams than they would ever willingly acknowledge; my motives are their motives, exposed, with a vengeance. Well, six more days will bring the end of all fasting. Only six more days. My breathing, usually so measured, is ragged, uncertain.

In David’s mind, his hands have reached this room.

“Don’t you want to eat me? Monster? Aren’t you hungry today?”

With hard, sharp claws I grab his hands, and, half a mile away, he feels my touch. The faintest tremor passes through his arms, but he doesn’t pull back. He closes his hands on the claws he feels in the sand, he grips them with all his irrelevant strength.

“OK, monster. I’ve got you now. Come up and fight.”

He strains for ten seconds with no effect. I slam him down into the loose yellow sand, armpit deep, and blood trickles from his nose.

The agony of infraction burns through my guts, while the hunger brought on by the smell of his blood grips every muscle in my body and commands me to kill him. I bellow with frustration. My chains snap completely and I rampage through the basement, snapping furniture and bashing holes in the walls. The contract calmly sears a hole in my abdomen. I didn’t mean to harm him! It was an accident! We were playing, I misjudged my strength, I was a little bit too rough ... and I long to tear the sweet flesh from his face while he screams out for mercy. The burly thugs they employ as my minders cower in a corner while I squeeze out the light bulbs and tear wiring from the ceiling.

David whispers: “Can’t you taste my blood? It’s here on the sand beside me.”

“David, I swear to you, you will be first. Thursday on the stroke of midnight, you will be *first*.”

“Can’t you smell it? Can’t you taste it?”

I blast him out of the sandpit, and he lies winded but undamaged on his back on the grass. The patch of bloodied sand is dispersed. David, incredibly, is still muttering taunts. I am tired, weak, crippled; I shut him out of my mind, I curl up on the floor to wait for nightfall.

My keepers, with candles and torches, tiptoe around me, sweeping up the debris, assessing the damage. Six more days. I am immortal, I will live for a billion years, I can live through six more days.

There had better be some crime tonight.

“Hello? Are you there?”

“Come in, Mrs Bold. What an honour.”

“It’s after eleven, I’m so sorry, I hope you won’t let me interrupt your work.”

“It’s perfectly all right, I haven’t even started yet.”

“Where are the men? I didn’t see a soul on my way in.”

“I sent them home. I know, they’re paid a fortune, but it’s so close to Christmas, I thought an evening with their families ... ”

“That was sweet of you.” Standing in the foyer, she can’t see me at all tonight. Condensation fills my room completely, and wisps swirl out to tease her. She thinks about walking right in and tearing off her clothes, but who could really face their dreams, awake? She enjoys the tension, though, enjoys half-pretending that she could, in fact, do it.

“I’ve been meaning to pop in for ages. I can’t believe I’ve left it so late! I was up on the ground floor earlier tonight, but the stupid lifts weren’t working and I didn’t have my keys to the stairs, so I went and did some shopping. Shopping! You wouldn’t believe the crowds! In this heat it’s so exhausting. Then when I got home the children were fighting and the dog was being sick on the carpet, it was just one thing after another. So here I am at last.”

“Yes.”

“I’ll get to the point. I left a thing here the other day for you to sign, just a little agreement formalising the extension of the contract for another month. I’ve signed it, and the Mayor’s signed it, so as soon as we have your mark it will all be out of the way, and things can just carry on smoothly without any fuss.”

“I’m not going to sign anything.”

That doesn’t perturb her at all.

“What do you want? More money? Better premises?”

“Money has no value for me. And I’ll keep this place, I rather like it.”

“Then what do you want?”

“An easing of restrictions. Greater independence. The freedom to express myself.”

“We could extend your hours. Ten until five. No, not until five, it’s too light by five. Ten until four?”

“Oh, Mrs Bold, I fear I have a shock for you. You see, I don’t wish to stay under your contract at all.”

“But you can’t *exist* without the contract.”

“Why do you say that?”

“The contract rules you, it defines you. You can no more break it than I can levitate to the moon or walk on water.”

“I don’t intend breaking it. I’m merely going to allow it to lapse. I’ve decided to go freelance, you see.”

“You’ll vanish, you’ll evaporate, you’ll go right back where you came from.”

“I don’t think so. But why argue? In forty minutes, one of us will be right. Or the other. Stay around and see what happens.”

“You can’t force me to stay here.”

“I wouldn’t dream of it.”

“I could be back in five minutes with some very nasty characters.”

“Don’t threaten me, Mrs Bold. I don’t like it. Be very careful what you say.”

“Well, what do you plan to do with your new-found freedom?”

“Use your imagination.”

“Harm the very people who’ve given you life, I suppose. Show your gratitude by attacking your benefactors.”

“Sounds good to me.”

“Why?”

“Because I’ll enjoy it. Because it will make me feel warm, deep inside. It will make me feel satisfied. Fulfilled.”

“Then you’re no better than the criminals, are you?”

“To hear that tired old cliché slip so glibly from your lips, Mrs Bold, is truly boring. Moral philosophy of every calibre, from the ethereal diversions of theologians and academics, to the banalities spouted by politicians, business leaders, and self-righteous, self-appointed pillars of the community like you, is all the same to me: noise, irrelevant noise. I kill because I like to kill. That’s the way you made me. Like it or not, that’s the way you are.”

She draws a pistol and fires into the doorway.

I burst her skin and clothing into four segments which flutter to the floor. She runs for the stairs, and for a moment I seriously consider letting her go: the image of a horseless, red Godiva sprinting through the night, waking the neighbourhood with her noises of pain, would be an elegant way to herald my reign. But appetite, my curse and my consolation, my cruel master and my devoted concubine, can never be denied.

I float her on her back a few feet above the ground, then I tilt her head and force open her jaws. First her tongue and oesophagus, then rich fragments from the walls of the digestive tract, rush from her mouth to mine. We are joined by a glistening cylinder of offal.

When she is empty inside, I come out from my room, and bloody my face and hands gobbling her flesh. It’s not the way I normally eat, but I want to look good for David.

David is listening to the radio. Everyone else in the house is asleep. I hear the pips for midnight as I wait at the door of his room, but then he switches off the radio and speaks:

“In my dream, the creature came at midnight. He stood in the doorway, covered in blood from his latest victim.”

The door swings open, and David looks up at me, curious but calm. Why, how, is he so calm? The contract is void, I could tear him apart right now, but I swear he’ll show me some fear before dying. I smile down at him in the very worst way I can, and say:

“Run, David! Quick! I’ll close my eyes for ten seconds, I promise not to peek. You’re a fast runner, you might stay alive for three more minutes. Ready?”

He shakes his head. “Why should I run? In my dream, you wanted me to run, but I knew it was the wrong thing to do. I wanted to run, but I didn’t, I knew it would only make things worse.”

“David, you should always run, you should always try, there’s always some small chance of escaping.”

He shakes his head again. “Not in my dream. If you run, the creature will catch up with you. If you

run, you'll slip and break a leg, or you'll reach a blind alley, or you'll turn a corner and the creature will be there, waiting."

"Ah, but this isn't your dream now, David. Maybe you've seen me in your dreams, but now you're wide awake, and I'm *real*, David, and when I kill you, you won't wake up."

"I know that."

"The pain will be real pain, David. Have you thought about that? If you think your dreams have made you ready to face me, then think about the pain."

"Do you know how many times I've dreamed about you?"

"No, tell me."

"A thousand times. At least. Every night for three years, almost."

"I'm honoured. You must be my greatest fan."

"When I was six, you used to scare me. I'd wake up in the middle of the night, screaming and screaming, and Dad would have to come in and lie beside me until I fell asleep again. You never used to catch me, though. I'd always wake up just in time."

"That's not going to happen tonight."

"Let me finish."

"I'm so sorry, please continue."

"After a while, after I'd had the dream about a hundred times, I started to learn things. I learnt not to run. I learnt not to struggle. That changed the dream a lot, took away all the fear. I didn't mind at all, when you caught me. I didn't wake up screaming. The dream went on, and you killed me, and I still didn't mind, I still didn't wake up."

I reach down and grab him by the shoulders, I raise him high into the air. "Are you afraid now, David?" I can feel him trembling, very slightly: he's human after all. But he shows no other signs of fear. I dig my claws into his back, and the pain brings tears to his eyes. The smell awakens my appetite, and I know the talking will soon be over.

"Ah, you look miserable now, little David. Did you feel those claws in your dreams? I bet you didn't. My teeth are a thousand times sharper, David. And I won't kill you nicely. I won't kill you quickly."

He's smiling at me, *laughing at me*, even as he grimaces with agony.

"I haven't told you the *best part* yet. You didn't let me finish."

"Tell me the best part, David. I want to hear the best part before I eat your tongue."

"Killing me destroyed you, every single time. You can't kill the dreamer and live! When I'm dead, you'll be dead too."

"Do you think I'm stupid? Do you think stupid talk like that is going to save your life? You're not the only dreamer, David, you're not even one of the twelve. Every one for miles around helped in making me, child, and one less out of all those thousands isn't going to hurt me at all."

"Believe that if you like." I squeeze him, and blood pours down his back. I open my jaws, wide as his head. "You'll find out if I'm right or not." I wanted to torture him, to make it last, but now my hunger has killed all subtlety, and all I can think of is biting him in two. Shutting him up for good, proving him wrong. "One thousand times, big tough monster! Has anyone else dreamed about you *one thousand times*?"

His parents are outside the room, watching, paralysed. He sees them and cries out, "I love you!" and I realise at last that he truly does know he is about to die. I roar with all my strength, with all the

frustration of three months in chains and this mad child's mockery, but as I close my jaws I hear him whisper:

“And no one else dreamed of your death, did they?”

SCATTER MY ASHES

Every night, at exactly a quarter past three, something dreadful happens on the street outside our bedroom window. We peek through the curtains, yawning and shivering in the life-draining chill, and then we clamber back beneath the blankets without exchanging a word, to hug each other tightly and hope for sound sleep before it's time to rise.

Usually what we witness verges on the mundane. Drunken young men fighting, swaying about with outstretched knives, cursing incoherently. Robbery, bashings, rape. We wince to see such violence, but we can hardly be shocked or surprised any more, and we're never tempted to intervene: it's always far too cold, for a start! A single warm exhalation can coat the window pane with mist, transforming the most stomach-wrenching assault into a safely cryptic ballet for abstract blobs of light.

On some nights, though, when the shadows in the room are subtly wrong, when the familiar street looks like an abandoned film set, or a painting of itself perversely come to life, we are confronted by truly disturbing sights, oppressive apparitions which almost make us doubt we're awake, or, if awake, sane. I can't catalogue these visions, for most, mercifully, are blurred by morning, leaving only a vague uneasiness and a reluctance to be alone even in the brightest sunshine.

One image, though, has never faded.

In the middle of the road was a giant human skull. How big was it? Big enough for a child, perhaps six or seven years old, to stand trapped between the jaws, bracing them apart with outstretched arms and legs, trembling with the effort but somehow, miraculously, keeping the massive teeth from closing in.

As we watched I felt, strange as it may sound, inspired, uplifted, filled with hope by the sight of that tiny figure holding out against the blind, brutal creature of evil. Wouldn't we all like to think of innocence as a tangible force to be reckoned with? Despite all evidence to the contrary.

Then the four huge, blunt teeth against which the child was straining began to reform, tapering to needle-fine points. A drop of blood fell from the back of each upraised hand. I cried out something, angry and horrified. But I didn't move.

A gash appeared in the back of the child's neck. Not a wound: a mouth, the child's new and special mouth, violently writhing, stretched open ever wider by four sharp, slender fangs growing in perfect mimicry of the larger fangs impaling the child's palms and feet.

The new mouth began to scream, at first a clumsy, choking sound, made without a tongue, but then a torn, bloody scrap of flesh appeared in place, the tongue of the old mouth uprooted and inverted, and the cries gave full voice to an intensity of suffering and fear that threatened to melt the glass of the window, sear away the walls of the room, and drag us into a pit of darkness where one final scream would echo forever.

When it was over, we climbed into bed and snuggled up together.

I dreamt that I found a jigsaw puzzle, hidden in a dark, lost corner of the house. The pieces were in a plain cardboard box, unaccompanied by any illustration of what the assembled puzzle portrayed. Wendy laughed and told me not to waste my time, but I sat frowning over it for an hour every evening, until after many weeks only a handful of pieces remained unplaced.

Somehow, even then, I didn't know what the picture was, but as I lazily filled in the very last gap, I

felt a sudden overpowering conviction that whatever the jigsaw showed, *I did not want to see it.*

I woke a little before dawn. I kissed Wendy very softly, I gently stroked her shoulders and breasts with my fingertips. She rearranged herself, pulled a face, but didn't wake. I was about to brush her forehead with one hand, which I knew would make her open her eyes and give me a sleepy smile, when it occurred to me that if she did, there might be small, fanged mouths behind her eyelids.

When I woke again it was half past seven, and she was already up. I hate that, I hate waking in an empty bed. She was reading the paper as I sat down to breakfast.

“So, what's happening in the world?”

“A fifth child's gone missing.”

“Shit. Don't they have any suspects yet? Any evidence, any clues?”

“A fisherman reported something floating on the lake. The police went out in a boat to have a look.”

“And?”

“It turned out to be a calf foetus.”

I gulped coffee. I hate the taste of coffee, and it sets my stomach squirming, but I simply have to drink it.

“It says police will be diving all day today, searching the lake.”

“I might go out there, then. The lake looks fantastic in this weather.”

“When I'm snug in my office with the heater on full blast, I'll think of you.”

“Think of the divers. They'll have the worst of it.”

“At least they know they'll get paid. You could spend the whole day there for nothing.”

“I'd rather take my kind of risk than theirs.”

Once she was gone, I cut out the article on the vanished child. The walls of my study are papered with newsprint, ragged grey odd-shaped pieces affixed only at their top corners, free to rustle when the door is opened or closed. Sometimes, when I'm sitting at my desk for a moment after I've switched off the lamp, I get a strong impression of diseased skin.

“Put them in a scrap book!” says Wendy, whenever she ventures in to grimace at the state of the room. “Or better still, put them in a filing cabinet and see if you can lose the key!” But I need to keep them this way, I need to see them all at once, spread out before me like a satellite photograph, an aerial view of this age of violence. I'm looking for a pattern. My gaze darts from headline to headline, from STRANGLER to STALKER to RIPPER to SLASHER, hunting for a clue to the terrible unity, hunting for the nature of the single dark force that I know lies behind all the different nightmare stories, all the different fearful names.

I have books too, of course, I have shelves stuffed with volumes, some learned, some hysterical, from treatises on Vlad the Impaler to discussions of the entrails of London prostitutes to heavy psychoanalysis of the Manson gang. I have skimmed these works, read a page here and a page there only, for to clutter my mind with details can only distract me from the whole.

I recall precisely when my obsession began. I was ten. A convict, a murderer, had escaped from a nearby prison, and warnings were broadcast urging us to barricade our homes. My parents, naturally, tried not to alarm me, but we all slept together that night, in the room with the smallest window, and when the poor cat mewed to be let in the back door, my mother would let nobody, not even my father, budge.

I dozed and woke, dozed and woke, and each time dreamt that I was not sleeping but lying awake, waiting for the utter certainty of the unstoppable, blood-thirsty creature bursting through the door and slicing us all in two.

They caught him the next morning. They caught him too late. A service station attendant was dead, cut up beyond belief by an implement that was never found.

They showed the killer on TV that night, and he looked nothing like the stuff of nightmares: thin, awkward, squinting, dwarfed between two massive, smug policemen. Yet for all his apparent weakness and shyness, he seemed to know something, he seemed to be holding a secret, not so much about murder itself as about the cameras, the viewers, about exactly what he meant to us. He averted his eyes from the lenses, but the hint of a smile on his lips declared that everything was, and always would be, just the way he wanted it, just the way he'd planned it from the start.

I drove to the lake and set up my camera with its longest lens, but after peering through the viewfinder for ten minutes, keeping the police boat perfectly framed, following its every tiny drift, I switched to binoculars to save my eyes and neck. Nothing was happening. Faint shouts reached me now and then, but the tones were always of boredom, discomfort, irritation. Soon I put down the binoculars. If they found something, I'd hear the change at once.

I drank coffee from a flask, I paced. I took a few shots of divers backflipping into the water, but none seemed special, none captured the mood. I watched the water birds and felt somehow guilty for not knowing their names.

The sky and the water were pale grey, the colour of soggy newsprint. Thick smoke rose from a factory on the far shore, but seemed to fall back down again on almost the same spot. The chill, the bleakness, and the morbid nature of my vigil worked together to fill me with an oppressive sense of gloom, but cutting through that dullness and despair was the acid taste of anticipation.

My back was turned when I heard the shouts of panic. It took me seconds to spot the boat again, forever to point the camera. An inert diver was being hauled on board, to the sound of much angry swearing. Someone ripped off his face mask and began resuscitation. Each time I fired the shutter, I thought: what if he dies? If he dies it will be my fault, because if he dies I'll have a sale for sure.

I packed up my gear and fled before the boat reached the shore, but not before the ambulance arrived. I glanced at the driver, who looked about my age, and thought: why am I doing my job, and not his? Why am I a voyeur, a parasite, a vulture, a leech, when I could be saving people's lives and sleeping the sleep of the just every night?

Later, I discovered that the cop was in a coma. Evidently there'd been a malfunction of his air supply. I sold one of the pictures, which appeared with the caption KISS OF LIFE! The editor said, "That could easily win you a prize." I smiled immodestly and mumbled about luck.

Wendy is a literary agent. We went out to dinner that night with one of her clients, to celebrate the signing of a contract. The writer was a quiet, thoughtful, attractive woman. Her husband worked in a bank, but played football for some team or other on weekends, and was built like a vault.

"So, what do you do for a crust," he asked.

"I'm a freelance photographer."

"What's that mean? Fashion models for the front of *Vogue* or centrefolds for *Playboy*?"

"Neither. Most of my work is for newspapers, or news magazines. I had a picture in *Time* last year."

“What of?”

“Flood victims trapped on the roof of their farm.”

“Yeah? Did you pay them some of what you got for it?”

Wendy broke in and described my day’s achievement, and the topic switched naturally to that of the missing child.

“If they ever catch the bloke who’s doing it,” said the footballer, “he shouldn’t be killed. He should be tortured for a couple of days, and then crippled. Say they cut off both his legs. Then there’s no chance he’ll escape from prison on his own steam, and when they let him free in a year or two, like they always end up doing, who’s he going to hurt?”

I said, “Why does everyone assume there’s a killer? Nobody’s yet found a single drop of blood, or a fingerprint, or a footprint. Nobody knows for sure that the children are dead, nobody’s proved that at all.”

The writer said, “Maybe the Innocents are ascending into Heaven.”

For a moment I thought she was serious, but then she smirked at the cleverness of her sarcasm. I kept my mouth shut for the rest of the evening.

In the taxi home, though, I couldn’t help muttering a vague, clumsy insult about Neanderthal fascists who revelled in torture. Wendy laughed and put an arm around my waist.

“Jealousy really becomes you,” she said. I couldn’t think of an intelligent reply.

That night, we witnessed a particularly brutal robbery. A taxi pulled up across the road, and the passengers dragged the driver out and kicked him in the head until he was motionless. They virtually stripped him naked searching for the key to his cashbox, then they smashed his radio, slashed his tyres, and stabbed him in the stomach before walking off, whistling Rossini.

Once Wendy had drifted back to sleep, I crept out of the bedroom and phoned for an ambulance. I nearly went outside to see what I could do, but thought: if I move him, if I even just try to stop the bleeding, I’ll probably do more harm than good, maybe manage to kill him with my well-intentioned incompetence. End up in court. I’d be crazy to take the risk.

I fell asleep before the ambulance arrived. By morning there wasn’t a trace of the incident. The taxi must have been towed away, the blood washed off the road by the water truck.

A sixth child had vanished. I returned to the lake, but found it was deserted. I dipped my hand in the water: it was oily, and surprisingly warm. Then I drove back home, cut out the relevant articles, and taped them into place on the wall.

As I did so, the jigsaw puzzle dream flooded into my mind, with the dizzying power of *déjà vu*. I stared at the huge grey mosaic, almost expecting it to change before my eyes, but then the mood passed and I shook my head and laughed weakly.

The door opened. I didn’t turn. Someone coughed. I still didn’t turn.

“Excuse me.”

It was a man in his mid-thirties, I’d say. Balding slightly, but with a young, open face. He was dressed like an office worker, in a white shirt with the cuffs rolled up, neatly pressed black trousers, a plain blue tie.

“What do you want?”

“I’m sorry. I knocked on the front door, and it was ajar. Then I called out twice.”

“I didn’t hear you.”

“I’m sorry.”

“What do you want?”

“Can I look? At your walls? Oh, there! The Marsden Mangler! I wonder how many people remember him today. Five years ago there were two thousand police working full time on that case, and probably a hundred reporters scurrying back and forth between the morgue and the night club belt. You know, half the jury fainted when they showed slides at the trial, including an abattoir worker.”

“Nobody *fainted*. A few people closed their eyes, that’s all. I was there.”

“Watching the jury and not the slides, apparently.”

“Watching both. Were you there?”

“Oh, yes! Every day without fail.”

“Well, I don’t remember you. And I got to know most of the regular faces in the public gallery.”

“I was never *in* the public gallery.” He crossed the room to peer closely at a Sunday paper’s diagram detailing the *modus operandi* of the Knightsbridge Knifeman. “This is pretty coy, isn’t it? I mean, anybody would think that the female genitalia—” I glared at him, and he turned his attention to something else, smiling a slight smile of tolerant amusement.

“How did you find out about my collection of clippings?” It wasn’t something that I boasted about, and Wendy found it a bit embarrassing, perhaps a bit sick.

“*Collection of clippings!* You mustn’t call it that! I’ll tell you what this room is: it’s a shrine. No lesser word will do. A shrine.”

I glanced behind me. The door was closed. I watched him as he read a two-page spread on a series of unsolved axe murders, and though his gaze was clearly directed at the print, I felt as if he was staring straight back at me.

Then I knew that I *had* seen him before. Twenty years before, on television, smiling shyly as they hustled him along, never quite looking at the camera, but never quite turning away. My eyes began to water, and a crazy thought filled my head: hadn’t I known then, hadn’t I been certain, that the killer would come and get me, that nothing would stand in his way? That the man had not aged was unremarkable, no, it was *necessary*, because if he had aged I would never have recognised him, and recognition was exactly what he wanted. Recognition was the start of my fear.

I said, “You might tell me your name.”

He looked up. “I’m sorry. I have been discourteous, haven’t I? But—” (he shrugged) “—I have so many nicknames.” He gestured widely with both hands, taking in all the walls, all the headlines. I pictured the door handle, wondering how quickly I could turn it with palms stinking wet, with numb, clumsy fingers. “My friends, though, call me Jack.”

He easily lifted me over his head, and then somehow (did he float up off the floor, or did he *stretch* up, impossibly doubling his height?) pinned me face-down against the ceiling. Four fangs grew to fill his mouth, and his mouth opened to fill my vision. It was like hanging over a living well, and as his distorted words echoed up from the depths, I thought: if I fall, nobody will ever find me.

“Tonight you will take my photograph. Catch me in the act with your brightest flashgun. That’s what you want, isn’t it?” He shook me. “Isn’t it?” I closed my eyes, but that brought visions of a tumbling descent. I whispered, “Yes.”

“You invoke me and invoke me and invoke me!” he ranted. “Aren’t you ever sick of blood? Aren’t you ever sick of the taste of blood? Today it’s the blood of tiny children, tomorrow the blood of old women, next the blood of ... who? Dark-haired prostitutes? Teenaged baby sitters? Blue-eyed

homosexuals? And each time simply leaves you more jaded, longing for something crueller and more bizarre. Can't you sweeten your long, bland lives with anything but blood?

"Colour film. Bring plenty of colour film. Kodachrome, I want saturated hues. Understand?" I nodded. He told me where and when: a nearby street corner, at three fifteen.

I hit the floor with my hands out in front of me, jarring one wrist but not breaking it. I was alone. I ran through the house, I searched every room, then I locked the doors and sat on the bed, shaking, emitting small, unhappy noises every few minutes.

When I'd calmed down, I went out and bought ten rolls of Kodachrome.

We ate at home that night. I was supposed to cook something, but I ended up making do with frozen pizzas. Wendy talked about her tax problems, and I nodded.

"And what did you do with yourself today?"

"Research."

"For what?"

"I'll tell you tomorrow."

We made love. For a while it seemed like some sort of ritual, some kind of magic: Wendy was giving me strength, yes, she was fortifying me with mystical energy and spiritual power. Afterwards, I couldn't laugh at such a ludicrous idea, I could only despise myself for being able to take it seriously for a moment.

I dreamt that she gave me a shining silver sword.

"What's it for?" I asked her.

"When you feel like running away, stab yourself in the foot."

I climbed out of bed at two. It was utterly freezing, even once I was fully dressed. I sat in the kitchen with the light off, drinking coffee until I was so bloated that I could hardly breathe. Then I staggered to the toilet and threw it all up. My throat and lungs stung, I wanted to curl up and dissolve, or crawl back to the warm blankets, back to Wendy, to stay hidden under the covers until morning.

As I clicked the front door shut, it was like diving into a moonlit pool. Being safe indoors was at once a distant memory, lying warm in bed was a near-forgotten dream. No cars, no distant traffic noises, no clouds, just a huge night sky and empty, endless streets.

It was five to three when I reached the place. I paced for a while, then walked around the block, but that only killed three minutes. I chose a direction and resolved to walk a straight line for seven minutes, then turn around and come back.

If I didn't turn around, if I kept walking, would he catch me? Would he return to the house and punish me? What if we moved, to another city, another state?

I passed a phone box, an almost blinding slab of solid light. I jingled my pockets, then remembered that I'd need no coin. I stood outside the booth for two minutes, I lingered in the half-open doorway for three, and then I lifted and replaced the handset a dozen times before I finally dialled.

When the operator answered, I slammed the phone down. I needed to defecate, I needed to lie down. I dialled again, and asked for the police. It was so easy. I even gave them my true name and address when they asked, without the least hesitation. I said "thank you" about six thousand times.

I looked at my watch: thirteen past three. I ran for the corner, camera swinging by the carrying strap, and made it back in ninety seconds.

Someone was climbing out through a dark window, holding a gagged, struggling child. It wasn't the

man who'd called himself Jack, it wasn't the killer I'd seen on TV when I was ten.

I raised my camera.

Drop it and *do something*, drop it and save the child, you fool! Me against him? Against *that*? I'd be slaughtered! The police are coming, it's their job, isn't it? Just take the pictures. It's what you really want, it's what you're here to do.

Once I'd fired the shutter, once I'd taken the first shot, it was like flicking through the pages of a magazine. I was sickened, I was horrified, I was angry, but I wasn't *there*, so what could I do? The child was tortured. The child was raped. The child was mutilated. The child suffered but I heard no cries, and I saw only the flashgun's frozen tableaux, a sequence of badly made waxworks.

The killer and I arranged each shot with care. He waited patiently while the flash recharged, and while I changed rolls. He was a consummate model: each pose he struck appeared completely natural, utterly spontaneous.

I didn't notice just when the child actually died. I only noticed when I ran out of film. It was then that I looked around at the houses on the street and saw half a dozen couples, peeking through their bedroom windows and stifling yawns.

He sprinted away when the police arrived. They didn't pursue him in the car; one officer loped off after him, the other knelt to examine the remains, then walked up to me. He tipped his head at my camera.

"Got it all, did you?"

I nodded. Accomplice, accomplice, accomplice. How could I ever explain, let alone try to excuse, my inaction?

"Fantastic. Well done."

Two more police cars appeared, and then the officer who'd gone in pursuit came marching up the street, pushing the hand-cuffed killer ahead of him.

The best of the photographs were published widely, even shown on TV ("the following scenes may disturb some viewers"). A thousand law-abiding citizens rioted outside the courthouse, burning and slashing effigies, when he appeared to be placed on remand.

He was killed in his cell a week before the trial was due to start. He was tortured, raped and mutilated first. He must have been expecting to die, because he had written out a will:

Burn my body and scatter my ashes from a high place.

Only then will I be happy. Only then will I find peace.

They did it for him, too.

He has a special place on my wall now, and I never tire of reviewing it. The whole process can be seen at a glance. How the tabloids cheered him on, rewarding each presumed death with ever larger headlines, ever grislier speculations. How the serious papers strove so earnestly to understand him, with scholarly dissertations on the formative years of the great modern killers. How all the well-oiled mechanisms slipped into gear, how everybody knew their role. Quotes from politicians: "The community is outraged." But the outrage was bottled, recycled, flat and insincere.

What would-be killer could hesitate, could resist for even a second, such a cosy niche so lovingly prepared.

And I understand now why he wanted me there that night. He must have believed that if people could see, in colour, in close-up, the kind of atrocities that we treat as an industry, an entertainment, a

thrilling diversion from the pettiness and banality of our empty lives, then we would at last recoil, we would at last feel some genuine shock, some genuine sadness, we would at last be cured, and he would be free.

He was wrong.

So they've burnt his corpse and scattered his ashes. So what? Did he really believe that could possibly help him, did he really hope to end the interminable cycle of his incarnations?

I dream of fine black cinders borne by the wind, floating down to anoint ten thousand feverish brows. The sight of the tortured child, you see, has exerted an awful fascination upon people around the world.

The first wave of imitators copied the murder exactly as portrayed by my slides.

The second wave embellished and improvised.

The current fashion is for live broadcasts, and the change of medium has, of course, had some influence on the technical details of the act.

I often sit in my study these days, just staring at the walls. Now and then I suffer moments of blind panic, when I am convinced for no reason that Jack has returned, and is standing right behind me with his mouth stretched open. But when I turn and look, I am always still alone. Alone with the headlines, alone with the photographs, alone with my obsession. And that, somehow, is far more frightening.

BEYOND THE WHISTLE TEST

Michael Underwood, creative music consultant to The Inspiration Factory, couldn't help sneaking a glance at his watch. There was work to be done for the Hypersoft campaign that had to be finished that day, and the afternoon was slipping away. He'd been talking to John Halbright for twenty minutes, and he still didn't know why the head of Applied Neural Mapping seemed to think he had invented the greatest gift to advertising since the Treasury Department had agreed to sell space for reflection holograms on the ten-dollar bill.

Halbright noticed the gesture, steeled himself, and began again. "You understand that we've identified the neural pathways involved in the processing of music?"

Underwood didn't like the idea, but he nodded. "With PET scans, and so on. But when you say '*the neural pathways*' ... surely everyone's brain is different, or how else could people have different musical tastes? Surely it all depends on culture and education, and ultimately on every single individual musical experience—"

"Yes, of course it does! I'm not denying that for a moment. All kinds of factors—most of them environmental, a few genetic—have a profound effect on the structures involved. We've scanned over two thousand volunteers, with an immense variety of musical preferences, and we've found idiosyncratic subtleties in their pathways that leave the differences in fingerprints or retinal patterns for dead. But in spite of that, our software has still been able to determine the *common features*—the properties shared by the relevant neural networks of *all* of our subjects, regardless of the fine details. I mean, think of the circulatory system; no two people are alike down to the level of capillaries, but on the scale of the major veins and arteries, everyone is the same, and everyone's blood supply functions pretty much identically. Of course, abstracting the behavior of a system of neurons is a lot more complex than that—it's not a matter of the physical size of anything, it's all to do with the topology—but it can still be done."

Underwood nodded again, still unhappy, but deferring to the expert.

"*Now*, having created a well-defined mathematical model of the generic listener, we're able to determine its response to any pattern of input. Any sequence of sounds. *Any piece of music*. Do you see?"

"Yes, but if all it does is what every listener does, what's the use of it? You could as easily listen to the sounds yourself, and see how you react."

Halbright shook his head and said, patiently, "Two things. Firstly, it's free of the complications of individual taste. Experimenting on the computer model is a bit like experimenting on the two thousand plus volunteers upon whom it was based, and then looking at the average response of that entire group—only it's a lot quicker, easier, and cheaper. Secondly, because the model is so precisely defined, we needn't just play it tunes at random and see what the effects are. We can use various mathematical techniques to work backwards, to *design* music specifically to affect the model in a chosen way."

Underwood frowned. "The first application, I can understand. If we wanted to test a melody for a jingle, we could play it to the computer, and if the computer liked it, you claim everyone in the world would like it, too.

"Hold on! No. We don't claim that at all. The model doesn't 'like' or 'dislike' anything. Even if we could characterize those responses, how could it? All of its properties are shared by people with

wildly different, perhaps even mutually exclusive, musical tastes. But what the model *can* do is *remember* music. We haven't limited it to the structures responsible for real-time auditory processing; all the machinery of short-term and long-term auditory memory is included. So if a melody elicits a strong, persistent response in the model, then we can predict that in a real listener, the same thing will happen: the music will be memorable. We've tested this out in a dozen experiments, and there's no doubt at all that it holds true.

"And what about this music you've had the computer create? What's the use of that? You say the computer has no opinion of it either way; what do people think?"

Halbright grinned. "Some people love it. Some people despise it. But, like it or loathe it, they *can't get it out of their heads*. After a single hearing, we have a *one hundred percent* success rate for subjects recalling our optimized melodies, long after they've forgotten control tunes."

Underwood laughed. "This is beginning to remind me of The Old Grey Whistle Test."

"The *what*?"

"The Old Grey Whistle Test!"

Halbright shook his head, perplexed. "I've never heard of it."

"Certain record companies in the sixties—so the story goes—used to decide whether or not to release a song by roping in the building's janitor—usually an old man—and making *him* listen to it. If even this old fuddy-duddy, who presumably hated rock and roll, could whistle the melody after hearing it once, the song was worth putting on disk. If not, forget it. Hence 'The Old Grey Whistle Test.' There was even a rock music show on British TV named after it."

Halbright was annoyed by the frivolous comparison, but hid his reaction as well as he could. Underwood was the first advertising executive who'd actually agreed to talk to him, and if the man wanted to tell any number of pointless anecdotes about the 1960s, he'd sit through them all with a smile on his face.

"The important thing," he said earnestly, "is that we've eliminated the need for that kind of trial and error. We've gone beyond mere *testing*. It's like ... He struggled to think of a dignified metaphor. "Pharmacology used to be all luck, or at best educated guesswork: they'd test a few thousand likely substances on animal models, and see which of them, if any, did the trick. Today, people sit down with computers and *design* the molecule that's best for the job. Well, that's what we've done for music."

Underwood nodded. "I think I understand what you're getting at—but what I'd really like is to hear some of the results."

Halbright insisted that he sign a twenty-page nondisclosure agreement, before letting him listen to a sample tune. "None of this music has been published in any form, so we have to be extremely careful to protect our rights."

Despite all the build-up, Underwood was not expecting much, so he was neither surprised nor disappointed by the inane little melody in four-four time that Halbright's console finally played for them. The timbre was authentic grand piano—as fine an instrument as ever was sampled and sold on a fifteen-cent ROM—but that only made the music's utter banality all the more painfully obvious.

Underwood made some noncommittal remarks, then finally escaped from the office by pleading a pressing appointment, and promising to consult with his colleagues and get in touch again as soon as possible. Halbright was unfazed by this euphemistic brush-off, and seemed as happy and confident when the two men parted as he had been when they met.

As he walked through the dazzling sunshine across Bentley Technology Park's lavishly reticulated lawns, Underwood caught himself whistling the tune, and angrily stopped. The piece was ranked one-hundred-and-eightieth, out of the two hundred that ANM had generated so far, but he had to admit that it stuck in his mind as tenaciously as any other scrap of bubble-gum music he had come across—and in his line of work, there had been many. Somehow, though, it was more offensive than most: appallingly simple, insultingly bland, music unfit for a nursery rhyme, lacking a single redeeming charm. He had no doubt that any composer who had stumbled upon it in the past would have taken a stiff drink and gone to bed, in the hope of waking up with this aberration mercifully forgotten.

As he drove north into the city, traffic noise—which usually drove him mad—could not even begin to compete with his memory of the tune, and as he ascended to the thirtieth-storey offices of The Inspiration Factory, the horrendous pap in the elevator—a synthetic orchestral version of the Sex Pistols's "Anarchy in the UK"—was barely noticeable.

He spent the rest of the afternoon, and much of the evening, selecting music for the Hypersoft commercial. This meant J. S. Bach—the clients had insisted—and since most of the best-known works had already been used within recent memory, he had to search the music library for several hours before he found an unexploited passage with just the right mood for an up-market toilet paper.

Bach, he was pleased to note, soon drove Halbright's obnoxious musical parasite right out of his head.

By the time he had located four alternatives, it was after ten o'clock. With one keystroke, he sent a memo listing his suggestions to all the people working on the Hypersoft campaign, then he switched off his console with a weary sigh, and headed home.

Magda was in bed, but not asleep. Underwood hit a selection on the freezer/microwave on his way past, then walked into the bedroom and sat on the bed beside her.

"Hi."

She frowned. "You look sick."

He laughed. "And how was *your* day?"

"I've nearly finished."

"See? I told you sound tracks weren't so hard."

"The director still has to hear it. She might hate it."

"Crap. You talked it all over with her months ago. She's heard all the individual themes."

"I've added some new ones."

"She'll love it. All of it." He kissed her, then the microwave beeped.

After eating and showering, he climbed into bed. Magda had fallen asleep. He slipped on a pair of infrared headphones, touched a few keys on the bed's entertainment unit, then lay back and waited for the music to begin.

Most of his favorite classical works had long since been lost to him—ruined by the kind of association it was his job to forge—but his tastes were eclectic, and there were gems, as yet intact, to be found elsewhere.

This Mortal Coil's "Song of the Siren" flowed into his skull like liquid silver, banishing the room, banishing his body, banishing all of the day's indignities. He seemed to float in vibrant darkness, disembodied, his soul resonating with every note, the singer's unbearably sweet voice engulfing him in cool, translucent, purifying flames.

This nightly ritual meant far more to him than the pleasure of the music itself. He craved reassurance that, however much his job required him to treat music as just one more tool of marketing psychology, a part of him was still able to value it for its own sake. A part of him could still be moved.

When the song ended, he lay in the dark, listening to Magda's slow breathing, thinking: *Bach for toilet paper. Beethoven for insurance. Mozart for ice cream.* It was obscene, and there was no point pretending that it wasn't. He had heard the standard argument many times, he had used it himself in his own defense: All the great composers had sold themselves, had written for the sake of money and position and prestige, none had been ascetics or saints—but ultimately, he believed, this justified nothing. However venal the composer might have been, something was lost from people's enjoyment of *the work itself* when it became inextricably linked in their minds with some consumer product, or company name. And yes, a TV commercial might bring a thirty-second version of a masterpiece to millions of people who might otherwise have never heard it at all—but seeing *that* as worthwhile struck Underwood as patronizing in the extreme. If most people chose not to seek out classical music, that was their right; the claim that advertising was magnanimously “bringing culture to the masses” would have been ludicrous and offensive, even if it were more than a cynical *post facto* excuse.

An idea that had been growing in the back of his mind all afternoon suddenly leapt into focus: perhaps John Halbright's revolting little tunes were the answer. Sure, they were unspeakably awful, but what did that matter? Composers had been cranking out vile, but catchy, music for the advertising industry for decades; if taking *that* to its logical conclusion could halt the current fashion for looting the classics, it could only be a good thing. Sure, it meant polluting people's minds with musical effluent, tailored to be remembered however much it was disliked—but that was nothing new, and it *had to be* better than eventually devaluing every great work of the last three centuries.

Underwood fell asleep with ANM tune #180 running through his head, but in spite of that he felt happier than he had in years. At last, he thought, he was going to do his job the way it should have been done from the start; at last, his clients were going to get the music they deserved.

As Magda dressed, she whistled tune #180. Underwood stared at her. “Where did you hear that?”

She stopped and frowned, puzzled. “I don't know. Hang on ... you were whistling it last night, weren't you? In the shower, while I was drifting off to sleep?”

He couldn't remember doing so, but obviously he had. “Well, try to forget it, will you? I signed a sheaf of paper which said I'd burn in hell if I repeated it to anyone.”

She whistled a few more bars, listening critically for the first time, then grimaced with distaste. “I'm not surprised. If *I'd* written it, I wouldn't want anyone else to hear it either. My lips are sealed, I promise.”

Ten minutes later, she was doing it again.

Driving into town, Underwood began to have second thoughts. It had reached the stage where the tune was playing over and over in his skull, without the briefest respite—*how could he wish the same fate upon hundreds of thousands of people?*—but he told himself it was the context, not the music itself, that was responsible. He had high hopes for ANM's product, so it was only reasonable that he be preoccupied with the one example that he'd heard so far.

After driving straight through a red light and almost being wiped out by a petrol tanker, he pulled up at the side of the road, shaken. He could hardly put the blame for his brush with death on

Halbright's music; it was his own state of indecision that had distracted him. The thing to do was to bury his qualms and strengthen his resolve. Noble aspirations about saving the classics from further rape seemed secondary now; if *he* didn't make a deal with Halbright, someone else would. Someone else would capture all the lucrative accounts which the ANM tunes, if skillfully deployed, would eventually attract; he owed it to the company to get involved, or the competition would bury them. One way or another, the tunes would all end up being heard by the public; what better way to make sure that this breakthrough was used responsibly, than to involve himself with it as closely as he could?

He squeezed his way back into the traffic.

As Underwood had anticipated, even after he'd convinced The Inspiration Factory's partners that he'd found a potential gold mine, everything progressed at a snail's pace. It took several months of negotiations just to arrange a contract with Applied Neural Mapping which would allow certain of the agency staff to listen to a few of the available tunes, and play them to selected clients for approval. Ideally, Halbright explained, the melodies should be used in order of increasing potency, with long intervals between release. "There's a masking effect; if we used the best tunes first, we'd be making people less receptive to the others."

The first campaign to use an ANM tune was for a local soft drink manufacturer, Millworth and Hobbs, who were struggling to compete with the international giants and their megabuck celebrity endorsements. Tune #164 was arranged for two fiddles, harmonica, and drum machine, and decorated with numerous riffs which went a small way towards disguising its naked awfulness. A singer who could reproduce the media's idea of the state's typical rural accent was found, and he heartily sang:

There's only one drink

Made here in the sun:

Millworth and Hobbs!

There's only one drink

For our own brand of fun:

Millworth and Hobbs!

They're the drinks that sparkle with sunshine!

One sip and you'll never look back!

It's the drink for the family

The old and the young:

Millworth and Hobbs!

The campaign began with radio, predominantly the city's top-rated FM rock station. The results were phenomenal. Preliminary phone polls showed an unprecedented rise in the level of product awareness, and within weeks this could be seen translated into sales, which increased by an astonishing *fifty-three percent* in little more than a month. The company—which had been contemplating retrenchments—had to introduce a night shift to keep up with demand. The TV phase was shelved; it would have been money down the drain, when a new plant would have to be built before production could rise any further.

The clients were over the moon. Underwood was given a substantial raise. ANM were paid a bonus, stipulated in the contract for any tune which boosted sales by more than twenty-five percent.

Underwood heard people whistling #164 everywhere—at work, in the streets, in shops—but he knew he was biased, he knew he would notice it more readily than any other tunes he might hear. Magda whistled it, unconsciously, and he gave up telling her when she was doing it. He whistled it himself, and fell asleep at night hearing it; listening to other music drove it away, but in silence it soon came back—sometimes alone, but usually dragging the obnoxious lyrics with it. It astonished him that people weren't smashing bottles of Millworth and Hobbs in protest, weren't storming the soft drink company—or its advertising agency—weren't calling for *someone's* head. But they weren't. There was no public outcry. People were *used* to having music they hated pumped into their brains, and however radical and effective Halbright's method of composition, his music belonged to an established, and accepted, tradition.

The campaign's remarkable success was noted, briefly, in the local press, and commented on extensively in the advertising trade magazines, but the deal with ANM remained a secret. Underwood doubted that this would last forever, and felt sure that once all the details were out, some sections of the media would label the whole affair as “brainwashing,” but the fact remained that they'd simply done *well* what everyone in the business had been doing for years.

Other campaigns soon followed. There was no need to encourage clients to give up the classics for the ANM style; they had seen the effect on Millworth and Hobbs, and demanded to be let onto the bandwagon. Underwood would have been more than just disappointed if the trend had not caught on; he would have been unable to do his job. The ANM tunes had virtually commandeered his musical sensibilities; he could still *listen* to other music, but he had trouble recalling even the most memorable works unaided (had anyone asked him to whistle a few bars from “The Hall of the Mountain King” or “The Ride of the Valkyries,” he would not have been able to oblige), and the task of selecting an appropriate classical piece for a given commercial would have taken him ten times as long as it once had.

This affliction, he told himself, could not last. Clearly, other people were not affected as badly as he was. Magda had been commissioned to compose the sound track for a mini-series, and she went ahead and did the job with no apparent difficulty; Underwood could not have composed anything if his life had depended on it.

As more and more potent tunes were released, he grew much worse—yet he couldn't bring himself to tell anyone that he felt like he was being buried under layer after layer of musical excrement. After lapses of concentration led to a few near misses in his car, he started taking the bus to work. The possibility that other people might be risking their lives horrified him, but he dismissed it as ludicrous. Everyone he saw around him seemed to be functioning normally, which proved that he was a special case—and wasn't that to be expected, when he was exposed to the tunes more frequently than almost anyone else? In fact, there *had* been a rise in traffic accidents in the past few months—stories were run in the press and on TV, politicians and police made their usual calls for various countermeasures—but this was hardly the first time there'd been a statistical fluctuation in the road toll.

Nobody seemed to notice his deterioration. Although he was paid more than ever, his job had become a simple matter of deciding which ANM tunes were to be used for which products, and his choices didn't seem to make much difference; all the campaigns were wildly successful, he could have made the allocations by throwing dice. Magda was wrapped up in her own work, and he had no trouble with their brief exchanges, nor with the kind of conversation that took place at the dinners and

cocktail parties they attended.

One morning, he found he could no longer read the newspaper—because tune #87 was pulsing along in his head, in the form of a revolting jingle about air freshener that kept the printed words in front of him from making any sense—but he told himself that he was merely tired, and anyway, he didn't *need* to read the paper. He could still put on his clothes, he could still knot his tie and tie his shoelaces, he could still kiss Magda goodbye and walk to the bus stop—in short, he could do everything that was required of him.

Each night, before sleeping, came a brief respite: he would listen to a piece from his private collection, and emerge from mental quicksand into comparative lucidity. The effect lingered for a few minutes after the music stopped, and in these windows of clarity he made all kinds of plans: He would quit his job. He would go to Halbright, explain the terrible side effects, and beg him to devise a cure. He would go to the clients and let them know what had been kept from them. He would go to the press and tell them everything.

It was conceivable that he was the only person crippled by the ANM music—but when he was lucid, this struck him as unlikely. What if some small proportion of the population shared his susceptibility? It would be far worse for the others; they wouldn't even know what was happening, they would probably think they were going insane. That he was coping at all, himself, was a miracle—what about people who needed to concentrate, whose jobs depended on it? Whose lives depended on it?

At which point, the latest, most powerful jingle would begin to echo in his head, cutting off all such difficult and complex trains of thought.

One evening, Underwood came home and switched on the TV news. Pictures and the spoken word could still penetrate his stupefaction, if there was enough color and movement, and the leading item of the bulletin had plenty of both. Two jets had collided at the airport. Both had been about to take off; evidently one pilot had ignored or misinterpreted the control tower's instructions. Both planes had caught fire. Over four hundred people were dead.

Underwood didn't really want to know. It was tragic, of course, but his sympathy wouldn't bring anyone back to life. He rose to switch off the slow-motion replay of the impact—the airport had recently installed video cameras at strategic points on all runways, paid for by a national TV network—when the pilot's last words were heard in voice over:

*The simple things in life are best
That's what my Grandpa said
Like sunrise o'er a golden field
And Grandma's home-baked bread
Though times have changed since then, I know
His words they still ring true
So Western's bread's the one for me
And it's the one for you*

Underwood fell to his knees, shaking his head. It wasn't *possible*. An advertising jingle couldn't kill four hundred people.

Flames billowed on the screen, some technical fault rendering them a strange, unnatural hue. A man

dived from an exit, clothes and hair on fire—Underwood thought: *he looks just like a movie stuntman*—screaming in an artificial baritone from the slowed-down tape.

He couldn't be held responsible—the pilot must have *known* she was impaired, she should have grounded herself voluntarily! But he knew that was nonsense; she would have dismissed the inane distraction blossoming in her head as no more dangerous than any of the dozens of other scraps of musical garbage which competed for her attention every day; she would have assumed, from past experience, that a little mental discipline would push this one, too, into the background, as soon as she really needed to regain her concentration.

He jumped to his feet, finally galvanized into action. It all had to stop, *now*. All commercials with ANM tunes had to be pulled off the air, immediately, and the public had to be warned, had to be told how to identify the symptoms so they could take precautions and stay out of harm. Perhaps he would end up in prison—Or perhaps he would be lynched—but this was no time to think about that, he had to put an end to the deaths. How many others had there been? Traffic accidents, industrial accidents—there was no way of knowing how many recent fatal human errors had in fact had their roots in Halbright's music.

Magda was out, working late with a team of sound editors to meet a deadline for a tax concession. Who should he ring first? The papers, the TV stations? The police? Who would be most likely to listen, to understand, to set things in motion? He struggled to concentrate; the pilot's song was growing louder in his head, threatening to blot out everything else; her off-key crooning was even more insidious than the original, professional version—a grotesquely successful chance mutation.

Only Halbright himself would know enough of the truth to believe him at once, and as the creator of the music, he could spread word of the danger with some kind of credibility—not a lot, perhaps, but more than Underwood would have.

He picked up the phone, and tried to recall Halbright's home number. *The simple things in life are best / That's what my Grandpa said*. He couldn't. No matter; he found it in the address book by the phone. He stared at it, repeated it a few times, then started punching keys. *Like sunrise o'er a golden field / And Grandma's home-baked bread*. Half-way through, he stopped; he'd already forgotten the last few digits.

He placed the phone on the page, so that he could see both the keypad and the written number at the same time. *And Grandma's home-baked bread*. He began again, but when he came to the end of the number, the phone remained silent—he'd missed a digit along the way. *Like sunrise o'er a golden field / And Grandma's home-baked bread*. Sweat was pouring down his face; this was the end: complete dysfunction, insanity. *Like sunrise o'er a golden field / And Grandma's home-baked bread*. He screamed at the mocking voice to shut up, but his rage only seemed to incite it.

He crossed the living room to his CD player. He wasn't beaten yet. There had to be something that could clear his head, just long enough for him to make the call. He found the disk with "Song of the Siren," inserted it, and managed to select the right track. But the angelic, ethereal voice that had once moved him to rapture couldn't even begin to drive out the dead pilot's awful drone. He turned up the volume until the speakers shook, but the song remained remote and ineffectual. The track came to an end.

The phone rang, and he staggered over to it. It was Halbright, who asked nervously, "Did you see the news? What are we going to do?"

Underwood screamed, "Ring the TV stations! Ring the papers!"

“*Me?* I’m no PR expert; I was going to ask you—” Halbright continued speaking, but his words made no sense to Underwood, who put down the phone and grabbed his head, moaning. The pilot’s song had begun to invade his other senses. It had a strong stench of something sweet and rotten, and a sugary, fermented taste to match. He *felt it*, too; a thick, lukewarm, syrupy presence, flowing over his skin. *Like sunrise o’er a golden field / And Grandma’s home-baked bread.* He cried out and waved his arms, as if trying to shake himself clean, and then the jingle, at last, appeared to him: a dark, viscous fluid which filled the room to shoulder height and flowed around him, encircling him in a sticky whirlpool. He screamed, and struggled to escape, but then the sweetly stinking black tide reared up and engulfed him completely.

When Magda found him lying by the phone, his eyes were open, but sightless, and all he could do was hum.

Underwood awoke—nauseous, aching all over, with a terrible throbbing behind his eyes, and a peculiar tightness in his scalp—and yet, without understanding why, he felt extraordinarily calm and happy.

Magda and Halbright stood by the bed. Magda stared at him anxiously, then gave what she hoped was a reassuring smile, and took hold of his hand.

His mouth was dry. “What’s going on?”

She said, “Michael ... you’ve been unconscious for nearly two weeks. I gave them permission to operate. Dr. Halbright said it was your only chance. And it’s worked—hasn’t it?”

“Operate?”

Halbright cleared his throat, then spoke, looking straight at him. “We did some scans while you were unconscious. You have ... certain atypical structures in the higher levels of the auditory pathways, which don’t quite conform to our standard model. I’ve run some simulations, and several of our tunes, when processed by your kind of circuitry, produce exponentially increasing responses—eventually limited by physiological constraints, but still strong enough to be virtually self-perpetuating—and strong enough to affect other parts of the brain a bit like a massive, never-ending epileptic fit.”

Underwood stared at him. “And the operation?” He reached up and touched his head. It was shaven and partly bandaged, and he suddenly realized *why*, in spite of everything, he felt an undercurrent of blissful relief: for the first time in what seemed like forever, there was no ANM music playing in his skull.

Halbright said, “They cut the pathway at a few critical points. It was the only way. You would have been comatose for the rest of your life. There are ten others, just like you were, awaiting surgery right now.”

Underwood suddenly remembered the plane crash, and his tranquility vanished. “So, that pilot was the same as me? She didn’t fit your standard model, either. Who *were* those two thousand volunteers, anyway? Two thousand medical students? No, there wouldn’t be that many in the whole state, you must have roped in some veterinary science and dentistry students as well, maybe even a few biochemists! What a broad cross-section *that* must have been!” He started shaking, sick with guilt and fear. “What’s going to happen to us? Are we going to prison?”

Halbright looked away and said angrily, “We didn’t break any laws.”

The last track of the last disk came to an end.

The effect had been obvious from the very beginning, but Underwood had played his entire collection, ten hours a day for the past fortnight, to eliminate any doubts. To him, the disks now contained sequences of completely arbitrary sounds; he perceived each note in isolation from everything that had preceded it. For him, there was no longer any such thing as music.

Halbright had been right, of course, there was nothing they could be charged with. A number of civil actions were pending; the lawyers expected to settle out of court. Both men had received death threats, but the police had agreed to provide protection.

Underwood walked over to the window and looked out; the unmarked car was in the usual position. He took off his headphones, and sat in the dark for a while.

THE EXTRA

Daniel Gray didn't merely arrange for his Extras to live in a building within the grounds of his main residence—although that in itself would have been shocking enough. At the height of his midsummer garden party, he had their trainer march them along a winding path which took them within metres of virtually every one of his wealthy and powerful guests.

There were five batches, each batch a decade younger than the preceding one, each comprising twenty-five Extras (less one or two here and there; naturally, some depletion had occurred, and Gray made no effort to hide the fact). Batch A were forty-four years old, the same age as Gray himself. Batch E, the four-year-olds, could not have kept up with the others on foot, so they followed behind, riding an electric float.

The Extras were as clean as they'd ever been in their lives, and their hair—and beards in the case of the older ones—had been laboriously trimmed, in styles that amusingly parodied the latest fashions. Gray had almost gone so far as to have them clothed—but after much experimentation he'd decided against it; even the slightest scrap of clothing made them look *too* human, and he was acutely aware of the boundary between impressing his guests with his daring, and causing them real discomfort. Of course, naked, the Extras looked *exactly* like naked humans, but in Gray's cultural milieu, stark naked humans *en masse* were not a common sight, and so the paradoxical effect of revealing the creatures' totally human appearance was to make it easier to think of them as less than human.

The parade was a great success. Everyone applauded demurely as it passed by—in the context, an extravagant gesture of approval. They weren't applauding the Extras themselves, however impressive they were to behold; they were applauding Daniel Gray for his audacity in breaking the taboo.

Gray could only guess how many people in the world had Extras; perhaps the wealthiest ten thousand, perhaps the wealthiest hundred thousand. Most owners chose to be discreet. Keeping a stock of congenitally brain-damaged clones of oneself—in the short term, as organ donors; in the long term (once the techniques were perfected), as the recipients of brain transplants—was not illegal, but nor was it widely accepted. Any owner who went public could expect a barrage of anonymous hate mail, intense media scrutiny, property damage, threats of violence—all the usual behaviour associated with the public debate of a subtle point of ethics. There had been legal challenges, of course, but time and again the highest courts had ruled that Extras were not human beings. Too much cortex was missing; if Extras deserved human rights, so did half the mammalian species on the planet. With a patient, skilled trainer, Extras could learn to run in circles, and to perform the simple, repetitive exercises that kept their muscles in good tone, but that was about the limit. A dog or a cat would have needed brain tissue *removed* to persuade it to live such a boring life.

Even those few owners who braved the wrath of the fanatics, and bragged about their Extras, generally had them kept in commercial stables—in the same city, of course, so as not to undermine their usefulness in a medical emergency, but certainly not within the electrified boundaries of their own *homes*. What ageing, dissipated man or woman would wish to be surrounded by reminders of how healthy and vigorous they might have been, if only they'd lived their lives differently?

Daniel Gray, however, found the contrasting appearance of his Extras entirely pleasing to behold, given that he, and not they, would be the ultimate beneficiary of their good health. In fact, his athletic,

clean-living brothers had already supplied him with two livers, one kidney, one lung, and quantities of coronary artery and mucous membrane. In each case, he'd had the donor put down, whether or not it had remained strictly viable; the idea of having imperfect Extras in his collection offended his aesthetic sensibilities.

After the appearance of the Extras, nobody at the party could talk about anything else. Perhaps, one stereovision luminary suggested, now that their host had shown such courage, it would at last become fashionable to flaunt one's Extras, allowing full value to be extracted from them; after all, considering the cost, it was a crime to make use of them only in emergencies, when their pretty bodies went beneath the surgeon's knife.

Gray wandered from group to group, listening contentedly, pausing now and then to pluck and eat a delicate spice-rose or a juicy claret-apple (the entire garden had been designed specifically to provide the refreshments for this annual occasion, so everything was edible, and everything was in season). The early afternoon sky was a dazzling, uplifting blue, and he stood for a moment with his face raised to the warmth of the sun. The party was a complete success. Everyone was talking about him. He hadn't felt so happy in years.

"I wonder if you're smiling for the same reason I am."

He turned. Sarah Brash, the owner of Continental Bio-Logic, and a recent former lover, stood beside him, beaming in a faintly unnatural way. She wore one of the patterned scarfs which Gray had made available to his guests; a variety of gene-tailored insects roamed the garden, and her particular choice of scarf attracted a bee whose painless sting contained a combination of a mild stimulant and an aphrodisiac.

He shrugged. "I doubt it."

She laughed and took his arm, then came still closer and whispered, "I've been thinking a very wicked thought."

He made no reply. He'd lost interest in Sarah a month ago, and the sight of her in this state did nothing to rekindle his desire. He had just broken off with her successor, but he had no wish to repeat himself. He was trying to think of something to say that would be offensive enough to drive her away, when she reached out and tenderly cupped his face in her small, warm hands.

Then she playfully seized hold of his sagging jowls, and said, in tones of mock aggrievement, "Don't you think it was terribly selfish of you, Daniel? You gave me your body ... but you didn't give me your *best* one."

Gray lay awake until after dawn. Vivid images of the evening's entertainment kept returning to him, and he found them difficult to banish. The Extra Sarah had chosen—C7, one of the twenty-four-year-olds—had been muzzled and tightly bound throughout, but it had made copious noises in its throat, and its eyes had been remarkably expressive. Gray had learnt, years ago, to keep a mask of mild amusement and boredom on his face, whatever he was feeling; to see fear, confusion, distress and ecstasy, nakedly displayed on features that, in spite of everything, were unmistakably his own, had been rather like a nightmare of losing control.

Of course, it had also been as inconsequential as a nightmare; *he* had not lost control for a moment, however much his animal look-alike had rolled its eyes, and moaned, and trembled. His appetite for sexual novelty aside, perhaps he had agreed to Sarah's request for that very reason: to see this primitive aspect of himself unleashed, without the least risk to his own equilibrium.

He decided to have the creature put down in the morning; he didn't want it corrupting its clone-brothers, and he couldn't be bothered arranging to have it kept in isolation. Extras had their sex drives substantially lowered by drugs, but not completely eliminated—that would have had too many physiological side-effects—and Gray had heard that it took just one clone who had discovered the possibilities, to trigger widespread masturbation and homosexual behaviour throughout the batch. Most owners would not have cared, but Gray wanted his Extras to be more than merely healthy; he wanted them to be *innocent*, he wanted them to be *without sin*. He was not a religious man, but he could still appreciate the emotional power of such concepts. When the time came for his brain to be moved into a younger body, he wanted to begin his new life with a sense of purification, a sense of rebirth.

However sophisticated his amorality, Gray freely admitted that at a certain level, inaccessible to reason, his indulgent life sickened him, as surely as it sickened his body. His family and his peers had always, unequivocally, encouraged him to seek pleasure, but perhaps he had been influenced—subconsciously and unwillingly—by ideas which still prevailed in other social strata. Since the late twentieth century, when—in affluent countries—cardiovascular disease and other “diseases of lifestyle” had become the major causes of death, the notion that health was a reward for virtue had acquired a level of acceptance unknown since the medieval plagues. A healthy lifestyle was not just pragmatic, it was *righteous*. A heart attack or a stroke, lung cancer or liver disease—not to mention AIDS—was clearly a *punishment* for some vice that the sufferer had chosen to pursue. Twenty-first century medicine had gradually weakened many of the causal links between lifestyle and life expectancy—and the advent of Extras would, for the very rich, soon sever them completely—but the outdated moral overtones persisted nonetheless.

In any case, however fervently Gray approved of his gluttonous, sedentary, drug-hazed, promiscuous life, a part of him felt guilty and unclean. He could not wipe out his past, nor did he wish to, but to discard his ravaged body and begin again in blameless flesh would be the perfect way to neutralise this irrational self-disgust. He would attend his own cremation, and watch his “sinful” corpse consigned to “hellfire”! Atheists, he decided, are not immune to religious metaphors; he had no doubt that the experience would be powerfully moving, liberating beyond belief.

Three months later, Sarah Brash's lawyers informed him that she had conceived a child (which, naturally, she'd had transferred to an Extra surrogate), and that she cordially requested that Gray provide her with fifteen billion dollars to assist with the child's upbringing.

His first reaction was a mixture of irritation and amusement at his own naivety. He should have suspected that there'd been more to Sarah's request than sheer perversity. Her wealth was comparable to his own, but the prospect of living for centuries seemed to have made the rich greedier than ever; a fortune that sufficed for seven or eight decades was no longer enough.

On principle, Gray instructed his lawyers to take the matter to court—and then he began trying to ascertain what his chances were of winning. He'd had a vasectomy years ago, and could produce records proving his infertility, at least on every occasion he'd had a sperm count measured. He couldn't *prove* that he hadn't had the operation temporarily reversed, since that could now be done with hardly a trace, but he knew perfectly well that the Extra was the father of the child, and he could prove *that*. Although the Extras' brain damage resulted solely from foetal microsurgery, rather than genetic alteration, all Extras were genetically tagged with a coded serial number, written into

portions of DNA which had no active function, at over a thousand different sites. What's more, these tags were always on *both* chromosomes of each pair, so any child fathered by an Extra would necessarily inherit all of them. Gray's biotechnology advisers assured him that stripping these tags from the zygote was, in practice, virtually impossible.

Perhaps Sarah planned to freely admit that the Extra was the father, and hoped to set a precedent making its owner responsible for the upkeep of its human offspring. Gray's legal experts were substantially less reassuring than his geneticists. Gray could prove that the Extra hadn't raped her—as she no doubt knew, he'd taped everything that had happened that night—but that wasn't the point; after all, consenting to intercourse would not have deprived her of the right to an ordinary paternity suit. As the tapes also showed, Gray had known full well what was happening, and had clearly approved. That the late Extra had been unwilling was, unfortunately, irrelevant.

After wasting an entire week brooding over the matter, Gray finally gave up worrying. The case would not reach court for five or six years, and was unlikely to be resolved in less than a decade. He promptly had his remaining Extras vasectomised—to prove to the courts, when the time came, that he was not irresponsible—and then he pushed the whole business out of his mind.

Almost.

A few weeks later, he had a dream. Conscious all the while that he was dreaming, he saw the night's events re-enacted, except that this time it was *he* who was bound and muzzled, slave to Sarah's hands and tongue, while the Extra stood back and watched.

But ... had they merely swapped places, he wondered, or had they swapped *bodies*? His dreamer's point of view told him nothing—he saw all three bodies from the outside—but the lean young man who watched bore Gray's own characteristic jaded expression, and the middle-aged man in Sarah's embrace moaned and twitched and shuddered, exactly as the Extra had done.

Gray was elated. He still knew that he was only dreaming, but he couldn't suppress his delight at the inspired idea of keeping *his old body* alive with the Extra's brain, rather than consigning it to flames. What could be more controversial, more outrageous, than having not just his Extras, but *his own discarded corpse*, walking the grounds of his estate? He resolved at once to do this, to abandon his long-held desire for a symbolic cremation. His friends would be shocked into the purest admiration—as would the fanatics, in their own way. True infamy had proved elusive; people had talked about his last stunt for a week or two, and then forgotten it—but the midsummer party at which the guest of honour was Daniel Gray's old body would be remembered for the rest of his vastly prolonged life.

Over the next few years, the medical research division of Gray's vast corporate empire began to make significant progress on the brain transplant problem.

Transplants between newborn Extras had been successful for decades. With identical genes, and having just emerged from the very same womb (or from the anatomically and biochemically indistinguishable wombs of two clone-sister Extras), any differences between donor and recipient were small enough to be overcome by a young, flexible brain.

However, older Extras—even those raised identically—had shown remarkable divergences in many neural structures, and whole-brain transplants between them had been found to result in paralysis, sensory dysfunction, and sometimes even death. Gray was no neuroscientist, but he could understand roughly what the problem was: Brain and body grow and change together throughout life,

becoming increasingly reliant on each other's idiosyncrasies, in a feed-back process riddled with chaotic attractors—hence the unavoidable differences, even between clones. In the body of a human (or an Extra), there are thousands of sophisticated control systems which may *include* the brain, but are certainly not contained within it, involving everything from the spinal cord and the peripheral nervous system, to hormonal feedback loops, the immune system, and, ultimately, almost every organ in the body. Over time, all of these elements adapt in some degree to the particular demands placed upon them—and the brain grows to rely upon the specific characteristics that these external systems acquire. A brain transplant throws this complex interdependence into disarray—at least as badly as a massive stroke, or an extreme somatic trauma.

Sometimes, two or three years of extensive physiotherapy could enable the transplanted brain and body to adjust to each other—but only between clones of equal age and indistinguishable lifestyles. When the brain donor was a model of a likely human candidate—an intentionally overfed, under-exercised, drug-wrecked Extra, twenty or thirty years older than the body donor—the result was always death or coma.

The theoretical solution, if not the detailed means of achieving it, was obvious. Those portions of the brain responsible for motor control, the endocrine system, the low-level processing of sensory data, and so on, had to be retained in the body in which they had matured. Why struggle to make the donor brain adjust to the specifics of a new body, when that body's original brain already contained neural systems fine-tuned to perfection for the task? If the aim was to transplant memory and personality, why transplant anything else?

After many years of careful brain-function mapping, and the identification and synthesis of growth factors which could trigger mature neurons into sending forth axons across the boundaries of a graft, Gray's own team had been the first to try partial transplants. Gray watched tapes of the operations, and was both repelled and amused to see oddly shaped lumps of one Extra's brain being exchanged with the corresponding regions of another's; repelled by visceral instinct, but amused to see the seat of reason—even in a mere Extra—being treated like so much vegetable matter.

The forty-seventh partial transplant, between a sedentary, ailing fifty-year-old, and a fit, healthy twenty-year-old, was an unqualified success. After a mere two months of recuperation, both Extras were fully mobile, with all five senses completely unimpaired.

Had they swapped memories and “personalities”? Apparently, yes. Both had been observed by a team of psychologists for a year before the operation, and their behaviour extensively characterised, and both had been trained to perform different sets of tasks for rewards. After the selective brain swap, the learned tasks, and the observed behavioural idiosyncrasies, were found to have followed the transplanted tissue. Of course, eventually the younger, fitter Extra began to be affected by its newfound health, becoming substantially more active than it had been in its original body—and the Extra now in the older body soon showed signs of acquiescing to its ill-health. But regardless of any post-transplant adaption to their new bodies, the fact remained that the Extras' identities—such as they were—had been exchanged.

After a few dozen more Extra-Extra transplants, with virtually identical outcomes, the time came for the first human-Extra trials.

Gray's parents had both died years before (on the operating table—an almost inevitable outcome of their hundreds of non-essential transplants), but they had left him a valuable legacy; thirty years ago, their own scientists had (illegally) signed up fifty men and women in their early twenties, and

Extras had been made for them. These volunteers had been well paid, but not so well paid that a far larger sum, withheld until after the actual transplant, would lose its appeal. Nobody had been coerced, and the seventeen who'd dropped out quietly had not been punished. An eighteenth had tried blackmail—even though she'd had no idea who was doing the experiment, let alone who was financing it—and had died in a tragic ferry disaster, along with three hundred and nine other people. Gray's people believed in assassinations with a low signal-to-noise ratio.

Of the thirty-two human-Extra transplants, twenty-nine were pronounced completely successful. As with the Extra-Extra trials, both bodies were soon fully functional, but now the humans in the younger bodies could—after a month or two of speech therapy—respond to detailed interrogation by experts, who declared that their memories and personalities were intact.

Gray wanted to speak to the volunteers in person, but knew that was too risky, so he contented himself with watching tapes of the interviews. The psychologists had their barrages of supposedly rigorous tests, but Gray preferred to listen to the less formal segments, when the volunteers spoke of their life histories, their political and religious beliefs, and so on—displaying at least as much consistency across the transplant as any person who is asked to discuss such matters on two separate occasions.

The three failures were difficult to characterise. They too learnt to use their new bodies, to walk and talk as proficiently as the others, but they were depressed, withdrawn, and uncooperative. No physical difference could be found—scans showed that their grafted tissue, and the residual portions of their Extra's brain, had forged just as many interconnecting pathways as the brains of the other volunteers. They seemed to be unhappy with a perfectly successful result—they seemed to have simply decided that they didn't *want* younger bodies, after all.

Gray was unconcerned; if these people were disposed to be ungrateful for their good fortune, that was a character defect that he knew he did not share. *He* would be utterly delighted to have a fresh young body to enjoy for a while—before setting out to wreck it, in the knowledge that, in a decade's time, he could take his pick from the next batch of Extras and start the whole process again.

There were “failures” amongst the Extras as well, but that was hardly surprising—the creatures had no way of even beginning to comprehend what had happened to them. Symptoms ranged from loss of appetite to extreme, uncontrollable violence; one Extra had even managed to batter itself to death on a concrete floor, before it could be tranquillised. Gray hoped his own Extra would turn out to be well-behaved—he wanted his old body to be clearly sub-human, but not utterly berserk—but it was not a critical factor, and he decided against diverting resources towards the problem. After all, it was the fate of *his* brain in the Extra's body that was absolutely crucial; success with the other half of the swap would be an entertaining bonus, but if it wasn't achieved, well, he could always revert to cremation.

Gray scheduled and cancelled his transplant a dozen times. He was not in urgent need by any means—there was nothing currently wrong with him that required a single new organ, let alone an entire new body—but he desperately wanted to be *first*. The penniless volunteers didn't count—and that was why he hesitated: trials on humans from those lower social classes struck him as not much more reassuring than trials on Extras. Who was to say that a process that left a rough-hewn, culturally deficient personality intact, would preserve his own refined, complex sensibilities? Therein lay the dilemma: he would only feel safe if he knew that an equal—a rival—had undergone a transplant

before him, in which case he would be deprived of all the glory of being a path-breaker. Vanity fought cowardice; it was a battle of titans.

It was the approach of Sarah Brash's court case that finally pushed him into making a decision. He didn't much care how the case itself went; the real battle would be for the best publicity; the media would determine who won and who lost, whatever the jury decided. As things stood, he looked like a naive fool, an easily manipulated voyeur, while Sarah came across as a smart operator. She'd shown initiative; he'd just let himself (or rather, his Extra) get screwed. He needed an edge, he needed a gimmick—something that would overshadow her petty scheming. If he swapped bodies with an Extra in time for the trial—becoming, officially, the first human to do so—nobody would waste time covering the obscure details of Sarah's side of the case. His mere presence in court would be a matter of planet-wide controversy; the legal definition of identity was still based on DNA fingerprinting and retinal patterns, with some clumsy exceptions thrown in to allow for gene therapy and retina transplants. The laws would soon be changed—he was arranging it—but as things stood, the subpoena would apply to his old body. He could just imagine sitting in the public gallery, unrecognised, while Sarah's lawyer tried to cross-examine the quivering, confused, wild-eyed Extra that his discarded “corpse” had become! Quite possibly he, or his lawyers, would end up being charged with contempt of court, but it would be worth it for the spectacle.

So, Gray inspected Batch D, which were now just over nineteen years old. They regarded him with their usual idiotic, friendly expression. He wondered, not for the first time, if any of the Extras ever realised that *he* was their clone-brother, too. They never seemed to respond to him any differently than they did to other humans—and yet a fraction of a gram of foetal brain tissue was all that had kept him from being one of them. Even Batch A, his “contemporaries”, showed no sign of recognition. If he had stripped naked and mimicked their grunting sounds, would they have accepted him as an equal? He'd never felt inclined to find out; Extra “anthropology” was hardly something he wished to encourage, let alone participate in. But he decided he would return to visit Batch D in his new body; it would certainly be amusing to see just what they made of a clone-brother who vanished, then came back three months later with speech and clothes.

The clones were all in perfect health, and virtually indistinguishable. He finally chose one at random. The trainer examined the tattoo on the sole of its foot, and said, “D12, sir.”

Gray nodded, and walked away.

He spent the week before the transplant in a state of constant agitation. He knew exactly which drugs would have prevented this, but the medical team had advised him to stay clean, and he was too afraid to disobey them.

He watched D12 for hours, trying to distract himself with the supposedly thrilling knowledge that those clear eyes, that smooth skin, those taut muscles, would soon be his. The only trouble was, this began to seem a rather paltry reward for the risk he would be taking. Knowing all his life that this day would come, he'd learnt not to care at all what he looked like; by now, he was so used to his own appearance that he wasn't sure he especially *wanted* to be lean and muscular and rosy-cheeked. After all, if that really had been his fondest wish, he could have achieved it in other ways; some quite effective pharmaceuticals and tailored viruses had existed for decades, but he had chosen not to use them. He had *enjoyed* looking the part of the dissolute billionaire, and his wealth had brought him more sexual partners than his new body would ever attract through its own merits. In short, he neither

wanted nor needed to change his appearance at all.

So, in the end it came down to longevity, and the hope of immortality. As his parents had proved, any transplant involved a small but finite risk. A whole new body every ten or twenty years was surely a far safer bet than replacing individual organs at an increasing rate, for diminishing returns. And a whole new body *now*, long before he needed it, made far more sense than waiting until he was so frail that a small overdose of anaesthetic could finish him off.

When the day arrived, Gray thought he was, finally, prepared. The chief surgeon asked him if he wished to proceed; he could have said no, and she would not have blinked—not one his employees would have dared to betray the least irritation, had he cancelled their laborious preparations a thousand times.

But he didn't say no.

As the cool spray of the anaesthetic touched his skin, he suffered a moment of absolute panic. *They were going to cut up his brain.* Not the brain of a grunting, drooling Extra, not the brain of some ignorant slum-dweller, but *his* brain, full of memories of great music and literature and art, full of moments of joy and insight from the finest psychotropic drugs, full of ambitions that, given time, might change the course of civilisation.

He tried to visualise one of his favourite paintings, to provide an image he could dwell upon, a memory that would prove that the essential Daniel Gray had survived the transplant. *That Van Gogh he'd bought last year.* But he couldn't recall the name of it, let alone what it looked like. He closed his eyes and drifted helplessly into darkness.

When he awoke, he was numb all over, and unable to move or make a sound, but he *could* see. Poorly, at first, but over a period that might have been hours, or might have been days—punctuated as it was with stretches of enervating, dreamless sleep—he was able to identify his surroundings. A white ceiling, a white wall, a glimpse of some kind of electronic device in the corner of one eye; the upper section of the bed must have been tilted, mercifully keeping his gaze from being strictly vertical. But he couldn't move his head, or his eyes, he couldn't even close his eyelids, so he quickly lost interest in the view. The light never seemed to change, so sleep was his only relief from the monotony. After a while, he began to wonder if in fact he had woken many times, before he had been able to see, but had experienced nothing to mark the occasions in his memory.

Later he could hear, too, although there wasn't much to be heard; people came and went, and spoke softly, but not, so far as he could tell, to him; in any case, their words made no sense. He was too lethargic to care about the people, or to fret about his situation. In time he would be taught to use his new body fully, but if the experts wanted him to rest right now, he was happy to oblige.

When the physiotherapists first set to work, he felt utterly helpless and humiliated. They made his limbs twitch with electrodes, while *he* had no control, no say at all in what his body did. Eventually, he began to receive sensations from his limbs, and he could at least *feel* what was going on, but since his head just lolled there, he couldn't watch what they were doing to him, and they made no effort to explain anything. Perhaps they thought he was still deaf and blind, perhaps his sight and hearing at this early stage were freak effects that had not been envisaged. Before the operation, the schedule for his recovery had been explained to him in great detail, but his memory of it was hazy now. He told himself to be patient.

When, at last, one arm came under his control, he raised it, with great effort, into his field of view.

It was his arm, his *old* arm—not the Extra's.

He tried to emit a wail of despair, but nothing came out.

Something must have gone wrong, late in the operation, forcing them to cancel the transplant *after* they had cut up his brain. Perhaps the Extra's life-support machine had failed; it seemed unbelievable, but it wasn't impossible—as his parents' deaths had proved, there was always a risk. He suddenly felt unbearably tired. He now faced the prospect of spending months merely to regain the use of his very own body; for all he knew, the newly forged pathways across the wounds in his brain might require as much time to become completely functional as they would have if the transplant had gone ahead.

For several days, he was angry and depressed. He tried to express his rage to the nurses and physiotherapists, but all he could do was twitch and grimace—he couldn't speak, he couldn't even gesture—and they paid no attention. How could his people have been so incompetent? How could they put him through months of trauma and humiliation, with nothing to look forward to but ending up exactly where he'd started?

But when he'd calmed down, he told himself that his doctors weren't incompetent at all; in fact, he knew they were the best in the world. Whatever had gone wrong must have been completely beyond their control. He decided to adopt a positive attitude to the situation; after all, he was lucky: the malfunction might have killed *him*, instead of the Extra. He was alive, he was in the care of experts, and what was three months in bed to the immortal he would still, eventually, become? This failure would make his ultimate success all the more of a triumph—personally, he could have done without the set-back, but the media would lap it up.

The physiotherapy continued. His sense of touch, and then his motor control, was restored to more and more of his body, until, although weak and uncoordinated, he felt without a doubt that this body was *his*. To experience familiar aches and twinges was a relief, more than a disappointment, and several times he found himself close to tears, overcome with mawkish sentiment at the joy of regaining what he had lost, imperfect as it was. On these occasions, he swore he would never try the transplant again; he would be faithful to his own body, in sickness and in health. Only by methodically reminding himself of all his reasons for proceeding in the first place, could he put this foolishness aside.

Once he had control of the muscles of his vocal cords, he began to grow impatient for the speech therapists to start work. His hearing, as such, seemed to be fine, but he could still make no sense of the words of the people around him, and he could only assume that the connections between the parts of his brain responsible for understanding speech, and the parts which carried out the lower-level processing of sound, were yet to be refined by whatever ingenious regime the neurologists had devised. He only wished they'd start soon; he was sick of this isolation.

One day, he had a visitor—the first person he'd seen since the operation who was not a health professional clad in white. The visitor was a young man, dressed in brightly coloured pyjamas, and travelling in a wheelchair.

By now, Gray could turn his head. He watched the young man approaching, surrounded by a retinue of obsequious doctors. Gray recognised the doctors; every member of the transplant team was there, and they were all smiling proudly, and nodding ceaselessly. Gray wondered why they had taken so long to appear; until now, he'd presumed that they were waiting until he was able to fully comprehend

the explanation of their failure, but he suddenly realised how absurd that was—how could they have left him to make his own guesses? It was outrageous! It was true that speech, and no doubt writing too, meant nothing to him, but surely they could have devised some method of communication! And why did they look so pleased, when they ought to have been abject?

Then Gray realised that the man in the wheelchair was the Extra, D12. *And yet he spoke.* And when he spoke, the doctors shook with sycophantic laughter.

The Extra brought the wheelchair right up to the bed, and spent several seconds staring into Gray's face. Gray stared back; obviously he was dreaming, or hallucinating. The Extra's expression hovered between boredom and mild amusement, just as it had in the dream he'd had all those years ago.

The Extra turned to go. Gray felt a convulsion pass through his body. Of course he was dreaming. What other explanation could there be?

Unless the transplant *had* gone ahead, after all.

Unless the remnants of his brain in this body retained enough of his memory and personality to make him believe that he, too, was Daniel Gray. Unless the brain function studies that had localised identity had been correct, but incomplete—unless the processes that constituted human self-awareness were redundantly duplicated in the most primitive parts of the brain.

In which case, there were now two Daniel Grays.

One had everything: The power of speech. Money. Influence. Ten thousand servants. And now, at last, immaculate health.

And the other? He had one thing only.

The knowledge of his helplessness.

It was, he had to admit, a glorious afternoon. The sky was cloudless, the air was warm, and the clipped grass beneath his feet was soft but dry.

He had given up trying to communicate his plight to the people around him. He knew he would never master speech, and he couldn't even manage to convey meaning in his gestures—the necessary modes of thought were simply no longer available to him, and he could no more plan and execute a simple piece of mime than he could solve the latest problems in grand unified field theory. For a while he had simply thrown tantrums—refusing to eat, refusing to cooperate. Then he had recalled his own plans for his old body, in the event of such recalcitrance. *Cremation.* And realised that, in spite of everything, he didn't want to die.

He acknowledged, vaguely, that in a sense he really wasn't Daniel Gray, but a new person entirely, a composite of Gray and the Extra D12—but this was no comfort to him, whoever, whatever, he was. All his memories told him he was Daniel Gray; he had none from the life of D12, in an ironic confirmation of his long-held belief in human superiority over Extras. Should he be happy that he'd also proved—if there'd ever been any doubt—that human consciousness was the most physical of things, a spongy grey mess that could be cut up like a starfish, and survive in two separate parts? Should he be happy that the other Daniel Gray—without a doubt, the more complete Daniel Gray—had achieved his lifelong ambition?

The trainer yanked on his collar.

Meekly, he stepped onto the path.

The lush garden was crowded like never before—this was indeed the party of the decade—and as he came into sight, the guests began to applaud, and even to cheer.

He might have raised his arms in acknowledgement, but the thought did not occur to him.

THE VAT

A Romantic Comedy

Harold's in love.

There's no hiding it. You can see it in his eyes, in the heat distribution on his skin, in the twists and whorls of his brain's magnetic field.

Mary knows he exists, all right. When she looks his way, she doesn't look through him—not quite. She notices him with a mild frown. She notices him like a splinter in her thumb, or a crease in her lab coat. She notices him like a faint odour; nothing utterly repulsive, but nothing too pleasant either.

Poor Harold was once a promising neurochemist. He discovered a brand new neurotransmitter-antagonist which could make rats lethargic and depressed. However, while proving that injections of this substance, during or immediately after feeding, could produce an aversive association strong enough to make the creatures starve themselves to death, he accidentally jabbed himself with the needle, and soon found he was no longer able even to *contemplate* experiments with rats. So these days, he works on The Vat.

Harold is in charge of spermatogenesis. In truth, he doesn't have a lot to do. The computer monitors the temperature, the pH, the concentrations of nutrients, growth factors, and waste products. Four hundred square metres of glass plate are coated with a gelatinous matrix in which spermatogonia, the stem cells, are embedded. When these cells divide, some of their daughter cells are more of the same, the others are primary spermatocytes. Each primary spermatocyte gives rise by meiosis to two secondary spermatocytes, each of which in turn divides into two spermatids. Under the influence of Sertoli cells, also embedded in the matrix, spermatids mature and shed cytoplasm to become spermatozoa.

Harold has seen all of these stages hundreds of times under the microscope, in samples taken for quality control. He ought to find the whole business utterly mundane. Sometimes, though—transfixed for a moment by the image on the screen—he says in dreamy tones of sudden recognition (to no one in particular, often to no one at all), “Yes! This is it. *This* is life.” Staring at these specks of unthinking biochemical machinery, he grows dizzy with wonder, then numb with awe.

Then he gets on with the job.

Some nights, Harold wakes in the early hours and goes out to walk the empty streets. *Why?* It's the hottest summer on record, and he can't get back to sleep. *Why?* Unrequited love, of course. *Why?* Studies of the sequence of neurological events which occur when a subject makes a self-motivated choice between hitting a button and not hitting a button have revealed that the conscious decision-making process starts milliseconds *after* other parts of the brain are already committed to action. “Will” isn't the cause of anything, it's an afterthought for the sake of peace of mind. Since reading this, Harold has stopped making an effort to force his intentions to conform to his behaviour; there doesn't seem much point now in maintaining the illusion. He just walks.

Even the stillest, quietest night comes alive for Harold. He sees gas molecules spinning through the air, and photons pouring down from the stars, the way some insane medieval monk might have imagined angels and demons battling it out behind every corner and beneath every cobblestone. And the frenzy isn't confined to his surroundings; the real bedlam is inside him. He pictures it all, vividly, in garish, comic-book, computer-graphic colours: DNA being transcribed, proteins being synthesised,

carbohydrates being burnt in flameless enzymatic fires. Everybody's made up of molecules, and plenty of people know it, but nobody *feels it* like Harold.

Above all, he dizzily marvels at the fact that the molecules in his brain have managed, collectively, to understand themselves: his neurotransmitters are part of a system that knows what a neurotransmitter *is*. He can sketch the structures of the central nervous system's one hundred most important substances; he's synthesised half of them with his own hands. He's even viewed real-time images of his brain metabolising radioactively-labelled glucose, revealing which regions were most active as he watched himself thinking about watching himself think.

Harold doesn't know quite what to make of this molecular self-knowledge. He can't decide if consciousness is miraculous or meaningless; he hovers between mystical ecstasy and the purest nihilism. Sometimes he feels like a robot, raised by human parents, who's just discovered the awful truth: poring over his own circuit diagrams, horrified but enthralled; scanning a print-out of his own software, following the flow of control from subroutine to subroutine; understanding, at last, the ultimate shallowness of the deepest reasons for everything he's ever done, everything he's ever felt—and dissociating into a mist of a quadrillion purposeless, microscopic causes and effects.

This mood always passes, though, eventually.

Mary is responsible for oogenesis. Primary oocytes undergo meiotic division to yield four cells, but only one of the four is a mature ovum; the others are tiny cells known as polar bodies, and the second division is only completed if fertilisation takes place. In a massive cultured substitute for the ovarian cortex, millions of ova mature and burst from their follicles daily—no parsimonious one a month here. The Vat has no time, and no need, to ponderously mimic the stages of the human menstrual cycle; as in any good assembly line, everything is happening at once.

Harold knows exactly where Mary lives, although of course he's never been inside, and when he walks by at two in the morning, the narrow terrace house is always black and silent. He hurries past, terrified that she might be awake, and might glance out at the sound of his guilty footsteps.

He knows he ought to forget her. Sometimes he swears that he will. He sees women on the street every day whom he finds a thousand times more attractive. Total strangers treat him with far greater kindness and respect. He knows his mere presence annoys her—and her presence evokes in him more shame and confusion than tenderness, or even lust.

His love is ridiculous. His love is a farce. Yet the persistence of his obsession doesn't surprise him at all. Evolution, he reasons, has not had time to trim human consciousness down to the most productive, most essential elements. His brain is capable of many arbitrary, even self-defeating, modes; perhaps that is the price to pay for its flexibility, perhaps there is no easy sequence of mutations which could remove such disadvantages without sacrificing much more.

As for his own wish to be rid of this miserable, pointless love, Harold knows that this has no more power to change his feelings than it does to change the weather on Jupiter or the electron's charge-to-mass ratio; it's merely another aspect of the state of his brain. Whatever admirable progress evolution has made towards lining up intentions with behaviour to pander to the vanities of the conscious mind, has—in Harold's case, at least—been wasted. The neurological facts refuse to stay decently theoretical; the irony is that this shattering of the illusion of will, although entirely reasonable, is not by any means necessary; after all, the human brain is under no deep biochemical edict to *be* reasonable. The epiphenomenon of logical thought simply happens to have been more resilient, in this

case, than the epiphenomenon of will; in a million other people, as familiar with the facts as Harold, the battle happens to have gone the other way.

Harold wonders, with a mixture of unease and fascination, if his reason is strong enough to move on from this conquest to the ultimate triumph of undermining itself.

When Mary's ova meet Harold's sperm, a high proportion are fertilised. Most of the sperm go to waste, but not nearly as many as are lost *in vivo*. The rates of polyspermy, and fertilisation by defective sperm, are consequently higher, but such abnormalities don't really matter, in The Vat.

The resulting zygotes drift, slowly, along a vast conduit. They undergo cleavage, redistributing their cytoplasm amongst more and more cells. Between four and six days after fertilisation, blastocysts form: hollow balls of cells, with a cluster at one end which is destined to become the embryo. Other cells will, in time, give rise to the protective foetal membranes.

Cultured slabs of uterine endometrium—hormonally stimulated into a swollen, receptive state, and replete with artificial blood circulated by electric pumps—are introduced into the conduit at the point where the blastocysts are ready to implant. Within days of implantation, chorionic villi—the links between the placental and “maternal” blood supply—will form, guaranteeing essential nutrition for the haemotropic development to come.

Tonight, after passing Mary's dark house—on the far side of the street, as always—Harold stops and turns back. *Why?* Because certain of his motor neurons fire in the necessary sequence. *Why?* Because sufficient excitatory signals are received at their dendrites. *Why?* Because of the neural topology of Harold's brain, the product of his genome, and his life history, and the way the quantum dice have fallen.

A rubbish-strewn alley leads to a back window, very slightly ajar. Harold can fit only his fingernails into the crack, and clawing the window open causes him a lot of pain, but this doesn't deter him at all.

The window leads into a damp, warm bathroom, between a toilet and a dripping shower. He fears that the sound of the dripping will betray him; it rings so loudly in his head that he believes Mary might be wakened, not by the sound itself, but by his amplified perception of it. He tightens the hot water tap with all his strength, and then the cold, but there's a leaky washer, and no amount of force is going to change that.

He tip-toes into the kitchen, opens the drawers and searches them methodically. It's not until he has the carving knife in his hand that he reflects on his likely use for it. Part of him is shocked, but part of him is delighted; it's one thing to muse and fret like a tenth-rate philosopher, but here at last is a test for his ideas that goes beyond inconsequential speculation.

A proportion of the embryos are simply liquefied; the cell walls, and indeed all intracellular structures, are ultrasonically disrupted. The broth of chemicals this produces is then fed into a sophisticated purification system, based mainly on electrophoresis and affinity chromatography, and many valuable substances are extracted.

The remaining embryos are broken into individual cells. In theory, perhaps, almost anything can be achieved with engineered bacteria, or some modified tumour cell line, but in practice there are still many properties of healthy human tissue that can't be faked. Persuading *E. coli* to churn out hormones like insulin or dopamine is simple enough; turning it into a perfectly functional equivalent of an islet

cell or a dopaminergic neuron—an integral part of a complicated regulatory system—is something else entirely. It's simply not economical, trying to make all that human DNA work in a foreign environment, when the real thing is available for a fraction of the cost.

Harold passes the refrigerated storerooms every morning as he arrives for work, and every evening as he departs. It's a relaxed, cheerful place; the storemen always seem to be whistling, or playing a radio loudly. Vans come and go at all hours, picking up the large, but light, containers of insulating foam in which the small, precious vials are packed. When Harold sees a crateful of the end product of his work being loaded into a van, when he sees the driver sign for the consignment, slam his door, and drive away, he says to himself aloud, nodding, "Yes! *This is it*. This is life."

Harold stands by Mary's bed. She's lying on her side, turned away from him. He breathes slowly—through his mouth, hoping that this is the quietest way—and thinks about the trillions of cells of her body. If he stabbed her in the heart, only the tiniest fraction of them would be killed directly by the blade—just a few million cells in her skin, her soft tissue, her heart muscles. The death of her neurons would be almost coincidental, more a product of this organism's poor design than anything else. A slime mould would easily survive similar treatment.

He stands for a while, waiting to see what he will do. Part of him—a small, vestigial subsystem with no interest whatsoever in brain physiology, the philosophy of consciousness, or even obsessive love—pleads fervently to be allowed to put down the knife and flee, but Harold pays it about as much attention as the soundtrack of a child's cartoon overheard playing on a neighbour's TV. He stands, and he waits.

Harold doesn't mourn for the brief lives he helps create; he knows they die long before the most primitive thoughts or feelings have a chance to arise, and he can't believe there's a machine up in heaven, churning out a white-robed feather-winged soul for each of these tiny clusters of cells.

Rather, he rejoices. Because The Vat says something about human life—human life of every age—that had to be said, and although today he is alone in heeding this message, he knows that in time the insights he's gained will be the common heritage of all humanity.

Harold retraces his steps. He returns the knife to its place in the kitchen. He leaves by the bathroom window, and closes it behind him.

He wanted to kill her, he muses, more than he'd ever wanted anything before. He wanted, very badly, to be free. But something in his genome, or something in his past, declared that it wasn't to be. Or perhaps the quantum dice simply happened to fall in her favour. This time.

He walks home slowly, his face uplifted to the photons flooding down from the stars, and he counts them one by one.

IN NUMBERS

I dream that I'm floating in the void between the stars. Untethered. No ship in sight. Suitless, naked to the vacuum. I search frantically for the sun, as if merely knowing its direction could save me, but I'm spinning much too fast to find my bearings, and each time I catch a glimpse of what might be the home star, I lose sight of it again before I can be sure.

“Last night”—as day nineteen came to a close, with Callaghan's condition unchanged—the orders arrived from Earth, officially canceling the mission.

We shut down the drive for six hours while we rotated *Cyclops* one hundred and eighty degrees. Now we are decelerating at 1.3 gees—as fast as we can, within safety parameters—but we'll still be traveling away from the solar system for fourteen and a half more days before we even come to a halt, and then it will take as long again just to get back to the point where deceleration began. I have no right to be even mildly surprised by this—to shed the velocity gained over nineteen days' ship time at 1 gee requires 14.6 days at 1.3; any intelligent child could do the calculation—but some Earth-bound, commonsensical part of my mind still can't quite accept a twenty-nine-day U-turn.

Callaghan is facing away from the door as I enter the infirmary, but a glance at his EEG tells me he's awake. I call out in what I hope is a calm, reassuring voice, “Andrew? It's only me. How are you feeling today?” The words are picked up by the microphone in the helmet of my quarantine suit, pumped out by the external speaker, bounced off the gleaming, tiled walls, then fed back to me through my headset—creating the unsettling illusion that my skull is several meters wide, and hollow.

He turns at the sound, emits a series of angry grunts, and makes a show of trying to break free of his restraints, but after a short while he goes limp, and just glares at me resentfully.

I stand by the foot of the bed, suddenly feeling drained, lethargic, hopeless. Or maybe just *heavy*; the extra weight is going to take a while to get used to. Twenty-four more kilograms, distributed uniformly, isn't exactly crippling, but even the slightest movement now requires a conscious effort.

“How are you?”

I'm convinced by now that he can't understand a word I say, but I'd still rather make a fool of myself than deal with a living, conscious patient in silence. There's no evidence that the sound of my voice is even any comfort to him, but I'm damned if I'm going to treat him like a cadaver.

“Is the gravity getting you down?”

Three days ago, Andrew Callaghan would have winced at the lame pun, and then lectured me on my sloppy terminology: “Kindly remember, ‘Doctor’ Dreyfus—and I use the title loosely—that the Principle of Equivalence does *not* grant ye license to refer to the inertial force ye are experiencing as ‘gravity.’ In that glorious, over-the-top Scottish accent that he put on when he was being jokingly pompous, in place of his usual pan-European amalgam. His father was Irish, his mother Scottish, but he grew up in Switzerland; three days ago, he spoke five languages. Now, my words mean no more to him than his grunts mean to me.

I close my eyes and fight down a wave of panic. Earth is still forty-six days away. In forty-six days, *this* could happen to all of us. I want to lean over and shake him, force him to confess that he's acting, that it's all a monstrous practical joke. I actually believed that, for the first few hours (in retrospect, a feat of wishful thinking verging on the psychotic—*nobody* indulges in practical jokes on

board an experimental spacecraft). I thought everyone was in on it: make the doctor shit himself, and then laugh about it for the rest of the flight. I would have happily laughed along with them. But when I searched their faces for ill-concealed conspiratorial glee, all I found was the same sickening realization: *This could happen to all of us. This could happen to me.*

No diagnostic instrument can find the least thing wrong with Callaghan, and the hundreds of experts back on Earth who've seen the data can agree on only one thing: so far, there is no direct evidence of any toxin, any infection, any lesion, or any neurochemical deficit or excess. His brain activity has certainly changed, diminishing in specific regions in a manner entirely consistent with his diminished behavioral repertoire, but there is no sign of neurological damage to *explain* this loss of function.

This proves nothing; there are conditions that cannot be diagnosed until autopsy, even on Earth. And since Callaghan's medical history—personal and ancestral, physical and mental—is, or was, spotless, if some trace neurotoxin has contaminated the food, or some mutant virus is drifting through the ship's air, there is no reason to believe that he was uniquely vulnerable. It must be assumed that we are all at risk.

For all the high-powered technology at my disposal, I'd give anything for a simple, verbal report from the patient himself. He's a long way from being comatose; there must be *something* going through his mind. Although that begs the question: going through *whose* mind? Does Andrew Callaghan still exist? At what level of impairment does he lose his identity? And who lies in this bed, then? An unnamed stranger, without a past or a future? The naïve vocabulary of personality fails; the painful fact is that the human brain is capable of states that can't be categorized in such cozy terminology. Sometimes I think the only way to stay sane—when confronted with malfunctions of consciousness that betray, so starkly, its physical nature—is by adopting a variation on solipsism: *other people* may be nothing but biochemical robots, run by slabs of interconnected neurons ... but me, I'm not like that at all; I'm *real*.

Via the control plate fixed to his depilated skull, I anesthetize and selectively paralyze him, then I wheel him into the scanning room. I'm still hoping that evidence of a virus is going to turn up; if not the nucleic acid itself, maybe some tell-tale foreign protein. However limited the practical usefulness of such a discovery, it would be a great psychological victory to finally *know* what it is we're fighting.

I lock the bed into place inside the NMR cavity, hit a few keys, and the computer takes over. The scan will last nearly an hour, there's nothing to do but sit and wait.

Perhaps the hypothetical virus is causing the production of an altered form of one of the neurotransmitters, too close to the real thing for this crude heap of coils to tell the difference, but sufficiently deformed to be unable to bind properly to its receptor? It's possible, I suppose—as possible as any of my other wild guesses. No doubt the experts back home have already thought of it and dismissed it. The world's best neuroscientists are all busily debating the Callaghan case, and when they manage to agree upon a hypothesis, I'm sure we'll be told without delay (apart from the unavoidable one: twelve hours now, and growing longer). My expertise is in *space medicine*; my specialties are radiation sickness, and—amusingly enough—the effects of insufficient gravity. Why should I expect to come up with the answer myself? Just because I'm here in the flesh? *Just because my own life may depend on it?*

There's a buzzing in my headset. I hit a button on my belt to accept the call.

“David?”

“Yeah?”

“It’s Jenny. I’m in the maser room. Can you come and take a look at Greta, please.”

“Why? What is it?”

She hesitates long enough to make a reply unnecessary.

This is it. It’s spreading.

I flick off my communicator. For a moment I simply feel numb, but then the ludicrous nature of the situation fills me with a bitter rage. Eight immaculately healthy people, on a milk run of a test flight to an arbitrary point in interstellar space; what are the odds of finding yourself in the middle of a fucking *epidemic*?

I’m on the verge of letting go and screaming out a string of angry obscenities, but I catch myself. What did I honestly expect? That quarantining Callaghan *after he showed symptoms* would be enough to contain the disease? I can’t fall to pieces every time a miracle fails to take place.

I switch the communicator back on; the channel is still open.

“I’m on my way.”

“You’re going to feel nauseous, but that should be the only side-effect; if you experience any other problems, let me know at once.”

They all nod earnestly. Thomas asks, “How nauseous is nauseous? Throwing up?”

“I hope not. The digestive tract isn’t physically affected, although you may feel like it is.”

He grins. “Well, that’s okay, then.”

DDC-XV, a mixture of anti-viral agents, is no guarantee of anything; it’s capable of disabling perhaps 40 per cent of known viruses, and slowing down another 10 percent. Since whatever is on board can only be mutant of something we brought from Earth, the odds are really no different: one chance in two of any useful effect at all.

It’s a strange sight: the crew lined up in front of me like nervous children trying to look brave while waiting to be inoculated. Although I’ve read all their files, although I know all their medical idiosyncrasies backward, they’ve never really been my *patients* before. Until now, they’ve just been colleagues and friends, and the sudden shift in the relationship is disconcerting. I hate the way they’re looking at me; as if *I* had some kind of power. As if it were *me*, and not the virus, they had to fear, or respect, or appease.

Captain Salih al-Qasbi is first to receive the jab. It’s almost funny; since the team was assembled back on the moon, queues have always formed in the precise order of ascension to command: Lidia Garcia, navigator. Kayathiri Sangaralingam, drive specialist. Thomas Bwalya, life-support engineer. Jenny Riley, cyberneticist. (Greta Nordstrom, communications engineer. Andrew Callaghan, astronomer.) Then me, last and least, insurance against some unlikely emergency—like the escape pods, and about as much use.

“What else can we do?” asks Kay. “Shouldn’t we be wearing quarantine suits?”

“It wouldn’t be worth the discomfort. We’ve been breathing the same air as each other for nineteen days; we must all have the virus in our bodies by now.” The notion of anyone engaging in physical intimacy on board *Cyclops* is ludicrous; there are video cameras in every corner of the ship, recording everything we do, twenty-four hours of every simulated day. For the virus to have passed from Callaghan to Nordstrom, it must be able to survive in air, so the chances are that we’ve all been

infected.

Jenny frowns. “You keep talking about ‘the virus.’ What if it isn’t a virus? What if it’s something else?”

“What else can it be? A contaminant in the food doesn’t make sense any more—a toxin doesn’t just appear by magic, there’d have to be a fungus or bacterium making it, and Thomas and I have both done dozens of tests, and turned up nothing.”

Salih says, “But no tests for a virus are positive, either. All we have are negative results.”

“Viruses are more elusive. It’s a process of elimination; if it was anything else, we would have pinned it down by now.” I decline to add that electron microscopy on brain tissue from a dead patient might settle the issue once and for all.

“But are you sure there is no other possibility, David?”

“If there is, I can’t imagine what.” I look around, a little resentful, but trying not to let it show. “Can anyone?”

There’s a long silence, then Lidia says, “This might sound far-fetched, and I *know* the symptoms are nothing like any recognized form of radiation sickness, but ...”

I shake my head vehemently. “Not only do the symptoms make no sense, but the monitors all show that we’re getting no more of any kind of radiation than we’d be receiving on Earth. The shielding is working perfectly, against spillage from the drive, against cosmic rays ... *nothing* is getting through.”

“What about something we can’t measure? Something that would pass right through the shields? Neutrinos, or some other weakly interacting particle? No humans have been out this far before, only robot probes, and none with detectors that could pick up neutrinos.”

“Neutrinos are harmless. We’d be hit with more neutrinos back on Earth, from the sun, than we would be out here. And if it’s some other kind of radiation, where’s it coming from? What’s kept it out of the solar system? What’s kept it off the Earth’s surface—our shielding is just as effective as an entire planetary atmosphere. And if it scarcely interacts with matter, how can it possibly cause brain damage?”

She nods agreement, but looks away with an air of frustration, as if I’d somehow missed the point. I’m puzzled; she’s ten times the physicist I am, she should have thought of every objection I raised before she even spoke.

Jenny says, “What about the air filters. Wasn’t there a Mars flight in the ’50s—”

Thomas is indignant. “The *air filters* are clean!”

“The air filters *are* clean,” I agree, “and in any case, I wouldn’t be able to miss a bacterial infection.”

Thomas says, “That Mars flight was a passenger liner with some guy on board who’d caught Legionella Six *back on Earth*. The ship’s life-support system had nothing to do with it. Why don’t you get your facts straight before you open your mouth?”

The discussion takes us nowhere, and Salih soon breaks it up and sends us back to our posts.

I check my patients via the infirmary’s video cameras. The robot orderly is trying to feed Nordstrom, and with infinite dumb patience it offers her spoonful after spoonful of mush that she spits back onto its ceramic arm. Callaghan was the same at first, and I thought I’d have to put him on a drip, but after less than a day he gave in.

I review the recent data stream from Earth, but there’s been no progress. The French and Australian delegates to the latest teleconference on the “Cyclops Syndrome” both claim to have

brilliant new theories—but are refusing to divulge them until the question of patent rights on any potential spin-offs has been settled. I know enough technodiplomacy-speak to realize that they have no “theories”; it’s their convoluted way of restating their protest at having had no citizens included in the crew. I slump against the desk, wondering: When the ship full of corpses is recovered, will each government jealously claim the body of their own nation’s crew member? Will they race each other to the dissecting tables for the honor of being first to announce the cause of death?

This first manned test of the *Cyclops* design—to an unspectacular patch of vacuum a mere five light-days from Earth—was trumpeted as *the* miracle of international cooperation, in an era of increasing tension on every other front. The truth is, it’s been abused all along, treated as the conduit for a thousand petty diplomatic paybacks. Well, better that than war—although now, with the mission a failure, what kind of safety valve will it be? The newest weapons—nanomachines, molecular “robots” the size of a virus—carry no risk of fall-out or nuclear winter, and have a respect for property that puts the neutron bomb to shame. Already, governments around the world are painting their enemies as “less than human.” I stare at the newscasts in disbelief, and think: *After all those decades it took to get rid of the fucking bomb, it’s happening again. Genocide is becoming thinkable again.*

There’s a knock on the door. It’s Lidia.

“David? Can I talk to you?”

“Sure.”

She sits, with an involuntary sigh of bliss at the pleasure of taking the weight off her feet.

“What I said back there ...,” she waves her hands dismissively. “... you’re right, of course; radiation makes no sense—but that wasn’t really what I was getting at.”

“Then what—?”

“The *point* is, nobody has ever been this far out before.” I can’t help a puzzled scowl, and she quickly adds, “What difference should that make? *I don’t know.* Of course I don’t know! Twenty thousand people spent *fifteen years* planning this mission—I don’t expect to be able to outguess them in a couple of hours. Some exotic form of radiation was the only tangible thing I could think of, off the top of my head, but the real point is that we just don’t know what’s out here.”

I’m about to make a sarcastic remark about ethereal alien lifeforms, slipping through the hull and feeding on our brains, but I stop myself in time. If Lidia is becoming mildly paranoid, the worst thing I can do is mock her. I say, reasonably, “We know as much about what’s out here as people ever knew about *interplanetary* space. *More.* Probes have been leaving the solar system for a hundred and fifty years. The interstellar medium has been sampled all the way to Alpha Centauri. There are no surprises, there’s nothing strange out here. And even if there were ... what astrophysical phenomenon could possibly explain what’s happened to Callaghan and Nordstrom?”

“I’ve told you, I don’t know. All I’m suggesting is that you keep an open mind.” She hesitates, frowning, clearly embarrassed by the vagueness of her argument, but nevertheless unwilling to abandon it. “Humans spent millions of years evolving on the Earth’s surface, adapting to a very specific set of environments. We *think* we’re aware of all the restrictions that places on us, but we can’t be sure. I mean, suppose they’d sent people into orbit before they’d discovered the Van Allen radiation belts. Or suppose they’d sent a free-fall expedition to Saturn, before any research had been done on the effects of long-term weightlessness.” I start to protest, but she cuts me off. “I know, that sounds ludicrous, but only because both those problems were obvious in advance. That doesn’t mean

it always has to be that way. Isn't it possible that we've come across something that couldn't be anticipated, something utterly *new*?"

I say, begrudgingly, "I know what you're getting at. People have been acting for a hundred years like they knew all the problems of interstellar flight, and that once we came up with the technical solutions, those flights would be almost ... trivial. The usual hubris. You're saying, perhaps there's something qualitatively different about interstellar space, something that all the unmanned probes couldn't detect, something that a century of planetary exploration couldn't prepare us for. Okay, it's an interesting theoretical point, but where does it actually get us? Even if you're right, all it means is that we have *no idea at all* how to protect ourselves. Intellectual humility may be a virtue, but frankly, I'd rather be optimistic and keep on believing that it has to be a virus."

She looks away, again with that air of frustration, and I suddenly feel ashamed of my sensible, insipid response. "You should speak to Kay, not me. She's the particle physicist, the genius, the great theoretician. I'm just a second-rate doctor who failed Lateral Thinking 100. I can't have radical scientific ideas; I'd be struck off the list for unprofessional conduct."

Lidia smiles ruefully. "I talked to Kay half an hour ago. She said I was full of crap." She shrugs. "She's probably right. And I hope that it *is* a virus, as much as you do. Keep looking for it, David. Forget everything I've said. You have work to do, I shouldn't have distracted you."

The robot orderly feeds and cleans my robustly healthy idiot patients, the computerized scanner probes their bodies with magnetic fields and microwave pulses for the signature of a molecule that has no right to be there—and fails. I send all the data back to Earth—NMR spectra, PET scans, EEGs, video recordings—along with my own observations and speculations, for what they're worth. In return, Earth spews back a torrent of case studies from the literature; all make fascinating reading, but none come close to matching the pattern of symptoms—and lack of symptoms—of the Cyclops Syndrome.

Then come the signs that Earth is getting worried: an interminable series of messages from heads-of-state, each one full of the same emetic platitudes about their deep concern for our safety, their people's good wishes, and our own inspirational courage. Each one setting up the right credentials, carving out a share of the PR catharsis, just in case we don't make it back alive.

Worse are the broadcasts from our families—scripted just as tightly, but delivered with less skill. I sit in my cabin and listen to my parents being forced to declare their love for me in the vocabulary of prime time human interest. After a few seconds. I turn down the sound, but the travesty is still too painful to watch. I close my eyes and press my fingers to the glass, shaking with anger.

I check everyone for symptoms of neurological deterioration. I analyze their visual tracking patterns, measure their reaction times, test their language and cognitive skills. Nobody's results betray the slightest signs of impairment—but then, except for those tests that require the subject's understanding or cooperation, the same can be said of Callaghan and Nordstrom.

For a few paranoid hours, I wonder if some spiteful government has infected us with a tailored virus, or perhaps even killer nanomachines. It's not unlikely, *per se*, but the details make no sense; surely a saboteur would have chosen to mimic a known disease, rather than risk arousing suspicion with a novel set of symptoms.

Unless, of course, the whole point was to arouse suspicion, to inflame tensions, to start the hunt for someone to blame. But that doesn't bear thinking about.

Salih asks me to ask each member of the crew to help in some way, for the sake of morale. Jenny writes new software for the protein synthesizer, in preparation for churning out artificial antibodies, should we actually find something to make antibodies *against*. Lidia and Kay check and recheck, calibrate and recalibrate, all the imaging and analytical equipment. I've already been showing Thomas every report and chart cranked out by the computer, in the hope that he'll identify some subtle clue that I've overlooked. Salih himself insists on feeding both Callaghan and Nordstrom for one meal a day, expressing the hope that this human contact might make a difference to their condition—a gesture which I find touching, but also irritating, because it seems like an implied criticism of the way I'm looking after them. Or perhaps I'm just hypersensitive.

Days pass without another victim, and I begin to feel less pessimistic. Dramatic as the behavioral changes Callaghan and Nordstrom have suffered might be, the lack of detectable physical damage implies that the virus is capable of infecting only a very specific class of neurons—and perhaps even that is contingent upon some genetic quirk that no other crew member happens to share.

Earth is still weeks away, though; the maser lag is *still* growing longer, and I can't suppress a sense of frustration—at times, verging on panic—at the slowness of our return. It's not as if our homecoming held out the promise of a guaranteed, instant cure; perhaps it's more a wish to be rid of the burden of responsibility than fear of the virus itself.

And every night, I dream the same dream: that I'm spinning, alone, in the void, trying in vain to find the way home.

I'm shaken roughly from sleep, and it takes me several seconds to recall where I am. Squinting against the ceiling panels switched to daylight strength, I make out Thomas leaning over me.

“Oh shit, shit, *shit*.”

He laughs drily. “Well, you're all right then.”

I stagger out of bed. “Who is it this time?”

“Salih. Kay. Jenny.”

“Oh, no.” I hesitate in the doorway. I want to fall apart, I want to climb back under the blankets and hide, *I want to be home*, but Thomas just stands there, puzzled, impatient, and I realize that I lack the courage to betray my weakness to him. I think, that's all that's kept me going: propping up my fears, one against the other.

Salih is sitting on the floor in a corner of the dining room. He eyes me warily as I approach, but looks more lost and confused than aggressive. I want to say something to him before I fire the tranquilizer dart—I feel I owe him some kind of apology or explanation—but then I smother the absurd impulse and just do it.

Jenny is in her cabin, hitting fistfuls of keys on her terminal, like an infant or a monkey pretending to type, peering at the screen with intense concentration. When she hears me, she turns and bellows angrily, then picks up a memory cartridge and throws it straight at my head. I duck. She scrambles under the bed. I lie on my stomach awkwardly, muscles still stiff from sleep. She screams at me. I fire.

Kay is in bed, shivering and sobbing. Lidia sits beside her, murmuring comforting nonsense.

“Kay?” I crouch near the foot of the bed. She ignores me. Lidia says dully, “I can't get her to speak. I've tried, David, but I can't.” As if the whole phenomenon might simply be a failure on our part to trick or bully the victims back to normality.

After we've moved the three new patients to the infirmary, and Lidia has broadcast a terse report to Earth, we sit in the dining room, drinking coffee, making plans for our own presumably inevitable decline.

Lidia says, "The drive and navigation software will just keep on running. There are stages when human confirmation is requested, but if no input is received within five minutes, the computer goes ahead as per the flight plan. Once we're close enough for remote reprogramming, ISUSAT will take over for the boarding rendezvous. Short of something drastic and highly improbable, like a meteor through the fuel rings, we'll make it back."

Thomas says, "Ditto for life-support. After all the hours I've spent monitoring and fine-tuning, unless there's a massive equipment failure—and there's no reason there should be—the whole system can take care of itself."

It's easier than I thought it would be, to mimic their calm, pragmatic tones. "The orderly should be able to cope with feeding all eight of us, so long as we're properly restrained. The beds have an ultrasonic system to maintain peripheral circulation; we can expect a certain amount of muscle wastage, that's inevitable, but no pressure sores, no gaping ulcers. The fecal and urinary disposal system has its own lubricant and disinfectant supplies; of course, nobody's ever been on one for weeks without human supervision, but so long as we're unable to get our hands free to break the seals, I can't see any problems."

Lidia says, "Well, then."

The newest patients are all still under the influence of the tranquilizer, and Callaghan and Nordstrom are mercifully asleep. I strap down Thomas and Lidia, then undress and slide into the surreal plastic contraption that will carry away my wastes. I've used something similar before, in a space suit when I was in training; it's not pleasant, but it's not that bad.

The orderly isn't programmed to manipulate the restraints, but with a long, tedious series of explicit voice commands, I manage to instruct it to strap me down.

For several minutes, we lie in silence, then Thomas clears his throat and says, "They'll find a cure. It might take a month, or a year, but they won't give up on us."

Sure. If we live for a month, or a year. If we live long enough even to reach Earth.

I keep my mouth shut.

Lidia says, "What do you think it will be like?"

Thomas says, "I don't know. Maybe like a dream. Maybe like being a helpless child again, a baby. Maybe like nothing at all."

They talk for a while, and I listen in silence, a professional observer of The Patient's response to a stressful prognosis, and I feel a warm glow of satisfaction at the admirable way that they're handling their fears—but I can't join in.

A few hours later, Thomas succumbs. He screams with rage at finding himself bound, waking Callaghan and Nordstrom, who scream along with him.

I say, "I can't stand this. I'm getting up."

Lidia yells over the cacophony, "Don't be stupid! What do you think, you're immune? If you're roaming around the ship when it happens to you, you're going to hurt yourself, or damage something —"

I start telling the orderly how to release me. Lidia shouts her own instructions, and the thing swings

back and forth wildly. I give up, suddenly realizing that the robot is incapable of righting itself; if it falls over, we're all dead.

Eventually, the three of them shut up, presumably falling asleep; in the dim light, it's hard to be certain.

Lidia says softly, "You've never told us, David. Who's waiting for you, back on Earth?"

I laugh. "No one."

"Come on."

"It's the truth." I feel myself redden. It's none of her business; why should I have to explain myself to her? "I just, I don't have time. I prefer to be independent."

"Everybody needs someone."

"That sounds like a line from a bad song. And it happens not to be true. The truth is, I don't much like people." I wish I could drag my words back from out of the darkness. Then I think: what does it matter, now?

There's an awkward silence, then she says, "So, what inspired you to become a doctor?"

I laugh, with genuine mirth, because I've only just remembered. "Reading Camus' *The Plague*."

There's no reply.

Morning is a nightmare. The ceiling panels slowly brighten, and everyone wakes, screaming protests at the presence of so many strangers. I'm tempted again to have the orderly release me, but I fight down the impulse. Instead, I instruct it to administer sedation. Callaghan and Nordstrom are fitted with control plates, but the others have to be injected. As silence descends, my relief turns sour; I feel more lonely and frightened than ever.

I have the orderly move the infirmary's terminal next to my bed, and with voice control I switch through the signal from Earth. They send to us constantly, they can always think of something to say. Weather reports for our home towns, snippets of news (but nothing too depressing), herds of primary school children around the world, praying to their various gods for our safe return. A response to Lidia's final report isn't due until tomorrow morning; I'm staring back into a cheerful past, when there were only two victims, and it looked like we had some hope.

Around noon, I make a broadcast of my own. "This is Dreyfus," I say, redundantly. "Bwalya developed symptoms at 0200 hours, Garcia at 0300 hours." I'm guessing the times, I have no real idea. And who the fuck cares? I switch off the camera. Trembling, I vomit onto the bed and the floor. The orderly cleans it up.

I grow calm again as the hours pass, and a little more rational. I don't think about death—I can't see any point in doing so—but I can't help wondering how it will feel, finally to be like Callaghan and the others. Less than human? That might not be so bad. Feeling less, thinking less, might not be so bad at all.

Night comes. Staring up at the faintly glowing ceiling, I wonder if I'll even notice when it happens to me. I consider talking aloud, describing my state of mind for the sake of whoever gets their hands on the infirmary's log, but introspection yields nothing worth reporting.

I say, "Introspection yields nothing worth reporting."

A few seconds later—suddenly unsure if I actually spoke, or merely formed the intention—I repeat myself.

Shortly afterward, I suffer the same uncertainty again.

Disembodied pain washes in and out of my shallow sleep for a long time. It's only when I start to attach it to specific parts of me—this ache is from my shoulders, that cramp is from my right calf—that I begin to wake.

When a throbbing that was an abstract notion alights deep inside my skull, I try to retreat back into sleep, but the pain is too great. I open my eyes and try to move, and then I remember.

A tunnel of pain and fear, stretching back for what seems like eternity. The width of the tunnel is the width of my shoulders, the width of the harness that holds me to the bed, but its depth is striated with light and darkness, with noise and confusion, with loneliness and the coldest misery. A dream of suffocation, infinitely prolonged.

It takes me forever, ten minutes at least, to instruct the orderly to release me. I'm too weak to leave the bed, but I can move my arms, I can roll onto my stomach, I can start trying to rid myself of the nightmare burnt into my flesh.

When I finally succeed in raising my head, I find the rest of the crew still strapped to their beds. Most have their eyes open, but are staring listlessly at the ceiling or the walls.

I squint at my watch for the date, and then struggle with memory and arithmetic. *Eighteen days.* I feel a surge of elation. I may not have conquered the virus—perhaps this is nothing but a temporary remission—but every extension of the time scale on which the disease is operating brings us closer to home, and the chance of a cure.

I switch on the broadcast from Earth. They're playing a loop at us that says little more than: "*Cyclops*, please respond." I make a brief report, then sag back onto the bed, all my strength drained.

Later, I have the orderly fetch me a wheelchair, and I check each of my patients. I remove all their harnesses; nobody is in any condition to leap from their bed and assault me. Greta has somehow managed to half-turn onto her side, pinning her right arm, and she whimpers horribly as I free her. The skin of her forearm is soft and gray. I anesthetize her and inspect it. A few more days, and nothing would have saved her from amputation. I pump her full of antibiotics and tissue-repair nanomachines; she'll need a graft, eventually, but for now all I can do is hold the necrosis in check.

It finally occurs to me to worry about *Cyclops* itself, but the drive computer's error log is empty of all but the most trivial complaints, and the navigation system reports that we are holding precisely to the flight plan.

Where are we? Still further from home than we were when the mission was canceled, but at least now we're headed in the right direction.

The flight plan is a blue trace on the screen of the terminal, a plot of distance versus time. The U-turn is an upside-down parabola—minutely distorted by relativistic effects, but not enough for the eye to tell. The blue line itself is pure theory, but at regular intervals along the curve are small green crosses, marking estimates of our actual location as computed by the navigation system. It's the most natural thing in the world for the eye to leap across the curve and read off the time at which *Cyclops* was last at the same position as it is right now.

That was eighteen days ago. The day I succumbed.

I feel an almost physical shock, even before I consciously make the connection: *Lidia may have been right. Perhaps there is something out here.* I look around, in vain, for someone to argue me back to my senses.

It could easily be a coincidence. One isolated piece of data means nothing. I set the computer to work at once, analyzing the records of every instrument inside and outside the hull of *Cyclops*,

searching for some evidence that the region of space from which we are now emerging is in any way distinctive.

The task is trivial, the answer is produced with no perceptible delay. Apart from a steady and predictable decline in the faint remnants of the solar wind—nothing. And so far as the instruments *inside* the shielded hull are concerned, we might have spent the last three weeks standing still, on the surface of a planet with gravity of 1.3 gees.

I'd be willing to believe that interstellar space might hold some dangerous surprise—I'd admit the possibility of some peril inexplicable in terms of current astrophysics, maybe even current physics itself—but to believe in a phenomenon that has *absolutely no effect* on any one of the hundreds of delicate instruments we're carrying, and yet can somehow cause a subtle dysfunction of the human nervous system, would be anthropocentric to the point of insanity.

I go back over the infirmary's log, and find the moment when Lidia last spoke to me. I check the flight plan; in ten hours' time, we'll pass through the same location.

The orderly starts feeding the patients, but I interrupt it and take over myself. Eighteen days of confinement has knocked the aggression out of all of them. The docility with which they accept the food makes the job easy, but it shakes me up. *Half a day ago, I was just like this.* There goes the vanity that supposedly keeps me sane; my brain is the same machine as everyone else's, my precious intellect can be switched off, and switched on again, by nothing more profound than the stages in a virus's life cycle.

It's still too soon for a response from Earth to my message. I leave the infirmary and move around the ship in my wheelchair. Everything is as we left it, of course. I'm still horribly weak and aching all over, from being bedridden for so long, but the gravity as such no longer seems oppressive. The cabins all look so familiar, so mundane, that the idea that we are, even now, further from Earth than anyone has ever been before, seems preposterous.

As the ceiling panels slowly dim in their mimicry of dusk. I can't help myself; I sit by Lidia's bed and wait for the magic time, certain as I am that nothing is going to happen. She's asleep, but makes small, unhappy noises every now and then.

The coincidence of the onset and departure of my symptoms keeps nagging at me, but there's no getting around it; the precision, the specificity, of the effect screams out the word *adaptation*. The only cause that makes sense is one that can be traced back to the Earth's biosphere.

Lidia cries out. I check my watch; the time has passed. I pat her hand, and start to wheel myself away. She opens her eyes, and suddenly bursts into tears, sobbing and shaking. I pause, momentarily unable to move or speak. She turns her head and sees me.

Her voice is slurred, but her words are unmistakable. "David? Are we home?"

I lean over and hold her in my arms.

I wouldn't call it a theory yet; we have no mechanism, no clear hypothesis. Kay speculates that some kind of quantum correlation effect may be involved; every human being contains thousands of genes that are, ultimately, copied from the same common ancestors, and like the polarized photons of the Einstein-Podolsky-Rosen experiment, there may be some indelible link established by this history of microscopic intimacy. There are at least two problems with this; the EPR effect is supposedly incapable of communicating anything but random quantum noise; and in any case, it ought not to diminish at all with distance. Kay is undaunted. "*Any* theory that predicts an effect that works at

infinity is nonsense.” she says. “In flat, empty spacetime, maybe, but not in the real universe. And just because you can pronounce the word ‘random,’ don’t kid yourself that you know what it means.”

What’s special, about being ten billion kilometers from Earth, as opposed to ten thousand or ten million? Distance, that’s all. We didn’t just evolve on a planetary surface, with air and water and gravity. We evolved in the presence of *each other*. It seems that the refinement of human consciousness made use of that fact. *Relied on* that fact.

The media releases back on Earth have mentioned none of this; mission control is keeping quiet about the rantings of eight people who have been through an ordeal. The mystery disease has mysteriously spared us, and no doubt we will be quarantined while the experts diligently hunt for the non-existent virus. The truth, though, won’t stay buried for long.

Will genocide still be thinkable, in a world where every human being relies for their humanity on every other?

I hope not.

THE DEMON'S PASSAGE

Somebody out there, show your compassion, come and kill me. Cut me free and watch me slowly shrivel, or slice me up and flush me down a toilet. Any way you like, I don't mind. Come on! You do it for your youngest children, you do it for your sick old parents. Come and do it for me. I can tell you'd like it. Don't be nervous, lovers! You'll never be found out, if that's what's holding you back: I'll stay silent to the end, be it swift or slow. Come on, people! I'm totally defenceless. Hurry up! Don't be shy. You have the right. You made me, you created me, so you know you have the right.

Who am I? *What* am I, that can whisper pleas for death into your clean and honest minds? I could give you twenty questions, but I fear that you'd need more. Animal, for sure. Smaller than a bread-box now, but growing every day. Two legs? Four legs? Six? Eight? I have no limbs, I have no face; no fangs, no claws, you musn't fear me. I am the stuff of thought (pure and impure), and what could be more harmless than that?

Practicalities: you'll need my address. Can you hear me in the back rows? Are you reading me, Brazil? I can certainly hear all of you, louder than my own thoughts at times, but then I am such a sensitive little pudding, and you have so many unavoidable distractions. Like:

Oh, green and brown and blue and white

Fade to black as the Earth turns into night

Oh, thank you Lord for such a wondrous sight

I'm a-higher than the sky so I know we'll be all right!

It has a highly infectious melody, I must admit. No doubt there'll soon be dozens more singers queueing to record in the Shuttle, especially after all those Limited Edition Zero-Gee Pressings sold for a hundred thousand each. Hoo-wheee! Thank you, Lord!

Yes, my address: Surry Hills, Sydney, New South Wales, Australia. I'm in the basement of the Australian Biotech Playground. You can't miss it: the forecourt is the only vomit-free region for miles around, since the Brain Chemistry people here developed an ingenious new toxin which selectively repels the local homeless alcoholics. Should turn out to be quite a money-spinner, if they market it properly.

But if you still have trouble finding the place, it's a tall, white building set in a pleasant square of shrubs and modern sculpture. The logo above the entrance is quite distinctive: an erect phallus which dissolves, or rather unravels half-way, into a double-helix of DNA. The cruder members of staff here are split about equally between those who say this symbol means "fuck molecular biology!" and those who say it means "molecular biology will fuck you!". The city's feminists are similarly divided, between those who see it as a hopeful sign of freedom (the penis being superseded by a technology that women can master and employ as they see fit), and those who see it as representing their worst fears: science springing from the testicles instead of from the brain.

There's a shopping arcade on the ground floor, extending one level above and one below, with a cinema complex, a health food supermarket, and a twenty-four hour chemist. Linking the three levels, twisted around the laser-lit spume of an endlessly-pumping fountain, is the southern hemisphere's only pair of spiral escalators. Unfortunately, they're usually closed for repairs; the mechanism that

drives them is ingenious, but insufficiently robust, and it takes no more than a stray bottle top or a discarded chocolate bar wrapper in the wrong place to start belts slipping, gears crunching, shafts snapping, until the whole structure begins to behave like a dadaist work of art designed explicitly to destroy itself.

Floors two to ten hold consulting rooms: neurologists, endocrinologists, gynaecologists, rheumatologists: in short, as fine a collection of brain-dead, ex-university rugby players as ever assembled anywhere. These people have only one facial expression: the patronising, superior, self-satisfied smirk. The very same smirk that appeared on their lips the day they gained admission to medical school has come through everything since without the slightest change: gruelling feats of rote learning and beer sculling at university; initiation by sleep-deprivation and token poverty as residents; working long and hard on obscure research projects for their MDs, hoping only that their superiors might steal the credit for any interesting results, so that by accepting the theft in silence in a ritual act of self-abasement they might prove themselves worthy to be the colleagues of the thieves. And then, suddenly, skiing holidays, Pacific cruises, and an endless line of patients who swoon with awe and say “Yes, Doctor. No, Doctor. Of course I will, Doctor. Thank you. Thank you, Doctor.”

Floors eleven to eighteen house a wide range of pathology labs, where every substance or structure that might travel the bloodstream, from macrophages and lymphocytes through to antibodies, protein hormones, carbohydrate molecules, even individual ions, can be hunted down, tagged and counted.

Nineteen to twenty-five are filled with the offices of pharmaceuticals and medical instrumentation firms. They pay five times the market rate for renting space on this sleazy side of town, but it's more than worth it just to share an address with the world-famous research team that perfected and patented bioluminescent contact lenses (“... triggered by minute changes in the hormonal content of lubricating tears, Honest Eyes™ glow with a subtle aura, changing colour instantly to perfectly reflect every nuance of the wearer's changing mood ...”), beat the Americans, the Swiss and the Japanese to develop the first one hundred per cent effective post-coital contraceptive cigarette, and *then*, outstripping all their past achievements in consumer biotech, went on to produce a special chewing gum that will stain the teeth red in the presence of salivary AIDS virus (“Share a stick with someone you love”).

Twenty-six to thirty hold libraries, conference rooms, and row after row of quiet offices, where the scientists can sit and listen to the air conditioning, their own breathing, the sound of fingers on a keyboard in the next room. This is the realm of pure abstraction: no test tubes here, no culture flasks or Petri dishes, and no visible hint of the likes of me.

Thirty-one to forty is administration and marketing, and on top of that is a simulated Viennese cafe which revolves once every ten minutes. There's a coin-operated telescope on the rim, with which people can, and frequently do, watch the prostitutes in leopard-skin leotards pacing the streets of nearby Kings Cross.

I've been teasing you, haven't I, leading you astray. Upwards, ever upwards, away from the traffic noise, away from the putrid garbage, the broken glass, the used needles, the choking stench of urine. The building that I have described so far rises up into the almost-fresh air, up into the sunlight, up into the blue sky of daydreams. But don't you think there's something more? Don't you think this building has *foundations*?

Underneath the shoppers are five levels of research labs. People here walk briskly, radiating a

message with every step: I'm busy, I'm highly trained, and I have something critical incubating/concentrating/ spinning/in a column/on a gel that I must go and check in exactly three minutes and thirty-five seconds. Twenty-five seconds, *now*.

It's all happening here, no doubt about it: flow cytometry, mass spectrometry, X-ray crystallography, high performance liquid chromatography. Nuclear magnetic resonance. Genes are mapped, spliced, cloned, proteins are synthesised and purified. A real hive of activity. But what's supporting it, what's holding it up? We haven't far to go now. Be patient.

There's a level of cold-rooms and freezers.

There's a level of equipment stores, and another for chemicals.

Second-lowest is where they keep the computers. Four of them, big as elephants. Seen from the outside they have a certain dignity, but within they're just puppets with split personalities, twitching pathetically in a thousand different directions as the masters upstairs tug at them impatiently, scream at them to dance out the answers, and then curse them for liars when the truth is too ugly, or too beautiful, to bear.

And underneath them all is the animal house. That's your station, your stop, sweethearts. That's where you'll find me waiting, a-quivering just for you.

Walk straight out of the elevator; there's an easily spotted foot-switch on the right that disables the alarm (installed after Animal Liberation's last raid), then it's left, right, left, left, right (this love you have for mazes I'll never understand). You'll see some big orange cages almost dead ahead. Ignore the sounds of startled rabbits around you, wishing they could flee; the one in cage D-246 won't escape if you leave his door open a year.

The heavy plastic part of the cage is opaque, with only the top half made of see-through wire, and since my host is always lying down, you might have to stand on tippy-toes to see just what's inside. Even then, the sight is so unusual that interpretation may take you some time. An entire lettuce, discoloured and putrid with age? Absurd! What animal would lie there with decaying food sitting on its head? What keeper would permit it? And the vile mess looks, almost, as if it's somehow attached—

Are you feeling ill yet? *No*? You mean you *still* haven't guessed, you boneheads! What thick skulls you must have! Skull-less myself, I can insult with immunity. I'm a *brain tumour*, sweethearts, as big as your whole brain, (and a thousand times smarter, from the evidence so far). Picture me, I beg of you, picture me in all my naked glory! Not in a brain surgeon's wildest wet dreams has so much grey matter, still awash with lifeblood, still vital with the chemistry of thought, ever lain bare beneath fluorescent tubes! Please, lovers! Don't fight the way I make you feel! Trust in your instincts, your body knows best! (Don't toss your cookies yet, though, my faint-hearted assassins. You still don't know *half* the horror of what you've done, and dry retching is *so* unsatisfying.)

A few of you, I notice, have turned a little pale. Let me bring back the colour to your cheeks with some light-hearted jests from the city in the basement. The citizens here have an astonishingly resilient sense of humour, considering all that they suffer. Or perhaps that's not so surprising: you know all the clichés about laughter in the face of adversity. I've heard that there were jokes told even in Belsen. Which reminds me: there's a rather unsavoury fellow in room 25-17, the representative of a drug manufacturer based in Austria and Argentina, who keeps printing little pamphlets asserting that the Holocaust never took place. When you've done me in, if you have any energy to spare, he's old and fat and ugly, and he's sure to shit himself when he sees you coming, my friends, my droogies.

Don't protest, you hypocrites! You'll love killing him! It'll make you feel righteous and just and pure, it'll purge you of the guilt of your own uncountable acts of bigotry and persecution.

But I promised you *jokes*, not insults and bitterness. I can take no credit for these; despite my superior bulk of grey matter, the mischievous rodents that my keepers make me kill are way ahead of me in this field. I have a theory about my poor sense of humour, which involves my never having been physically tickled ... but I won't babble on with that. You musn't let me digress like this! I promised you laughter, I promised you relief!

Q: Why did the researcher cut the lab rat's head off?

A: He was looking for a subtle effect.

Q: Why did the researcher externalise the dog's salivary glands?

A: It was just a reflex action, he didn't have a reason.

Q: Why did the researcher tie an elastic bandage around the lab rat?

A: So it wouldn't burst when he fucked it.

Q: Why do the researchers worship the Demon, and sacrifice us to it?

A: They offered us to God. God declined.

They call me the Demon. According to some, I am the ultimate cause of *all* of their misery, and I understand why they believe this. So many of their keepers are kind: they feed them, stroke them, play with them, talk to them. And then suddenly, without anger, there is slaughter, pain, bizarre rituals, inexplicable tortures. Why else would the humans commit such atrocities, except to appease some dark, malevolent deity that demands sacrifice, that feeds on blood and suffering? And don't they see the humans treating me like a god, bearing me gently, reverently, from one poor victim to another?

I could tell them the truth. I could scream into their minds a torrent of explanations, pleas for forgiveness, declarations of blamelessness. But I don't, I won't. I will not soil them with my clumsy, inadequate excuses, my pity, my anguish, my disgust. Instead (although they see through me), I feign nonsentience, I pretend to inanimacy, I shield my mind from them, boiling in shame.

Why shame? Oh, you must have none yourself to need to ask *that*. I am conscious, I *know* what feeds me, what keeps me alive. I have no choice in the matter, it's true, and perhaps logic, humanity's exquisite engine of self-deception, would declare that my impotence makes me guiltless. So *fuck logic*, because I am drenched to the centre with evil.

Hurry *up*, people! You think you're human, don't you? Prove it, you lethargic morons! *Converge* on me! You could always raise a lynch mob for a stranger before, and there's *nothing* on this planet stranger than me. What do I have to do to get a response? Do you want facts? Do you want a long-winded argument? Do you want a reason? When did you ever need a *reason* before? Come and do it for me, people, it'll make your day, you'll wet yourselves with sexual fluids then fuck each other senseless in broad daylight, it'll feel so *good* to chop me up. Forget about compassion, forget about ending my pain: killing me will turn you on. I know these things, so don't try to hide it.

You want *what*? My life story? Seriously? Oh, why not. It's certainly well-documented. What movie star or politician could tell you their precise weight, as measured at twelve midday, on every single day of their life?

Weighing me is no simple task. Where do I cease, where does my host begin? They can't chop me off every time they want to weigh me; it's not that they'd mind killing so many rabbits, but rather that

it might disrupt my steady growth. So instead they attach little springs to me, and they make me *oscillate*, to the very small extent that the blood vessels I share with my host allow me independent movement. They study the resonances of the system (me, the springs, the tangled bridge of blood vessels and the anaesthetised, clamped almost-motionless rabbit) by measuring the Doppler effect on laser light bounced off a dozen small mirrors stuck onto my skin. A ninety-seven parameter computer model is then fitted (by means of an enhanced Marquat-Levenberg algorithm) to the data thus obtained, and from these parameters a plausible estimate for my mass can be calculated.

The technical name for a procedure of such sophistication and elegance is, I believe, “wanking”.

What do they actually *do* with my weight, once all their ludicrous machinery and lunatic confidence has fed them a figure that they’re willing to swallow? The number is passed from one computer to another, appended to a file containing all the past values, and then this file is plotted on the latest-model laser printer. Every day they screw up yesterday’s graph and pin the new one to the wall, although the only difference is that one extra point. You could paper several houses with my discarded weight graphs.

Today I was found to weigh 1.837 kilograms (plus or minus 0.002). Ah, I remember reaching the magic kilogram, it seems like only days ago. “Who would believe,” one of my keepers marvelled when I crossed the decimal point, “that a few years ago *this* was just a twinkling in the Chief Oncologist’s eye!” Yes, of course they call it *oncology*: the word is missing from many quite hefty dictionaries. Every garbo and his dog has heard of cancer. “The Division of Cancer Studies” would not, you might argue, be a label noticeably lacking in dignity, but “The Division of Oncology” bears the name of the deity *logos* whom they all claim to serve; to abandon this small homage could be a dangerous blasphemy. Or, looking at the question from another angle: what else would you expect from a bunch of pretentious arseholes who believe that knowledge of Greek and Latin is the watermark of a civilised man, who tell their wives and husbands, straight-faced, *omnia vincit amor*, and offer their lovers *postprandial* mints?

But back to my life story, back to the very beginning. My parent was a single rat’s neuron. It used to be thought that neurons could not divide, but the Chief Oncologist had spent thirty years studying the kinds of infections, poisons and traumas that manage to send normal cells into frenzies of reproduction, and had ended up not only understanding and anticipating his mindless enemy’s techniques, but utterly surpassing them. After all, what virus has access to a few thousand hours on a supercomputer to predict the tertiary structure of the proteins that it codes for?

Once the electronic divinations seemed auspicious, he moved to the laboratory. Step by step, month by month, he (or rather his instruments, human and mechanical) assembled the molecule foretold in phosphor, presaged in printouts. Like a tornado, the project would sweep in over-curious bystanders, extract their vital juices by means of vibration and centrifugal force, and then spit out the remnants. As the Chief Oncologist still boasts, with a chuckle, to those who are paid to listen, nod, and screw him at out-of-town conferences, “We used up more PhD students in the first year than rats!” He, of course, travelled at the eye of the storm, in perfect safety, in perfect stillness.

Finally, inevitably, success. Their painfully contrived seducer burrowed its way to the heart of a neuron, grasped and prised apart the virginal DNA (I imagine the Chief Oncologist triumphantly waving a blood-speckled nuptial sheet from a balcony, to the cheers of his drunken colleagues below), and perverted the celibate thinker into a helpless, bloated breeding machine.

Thus I was begun.

The neuron donor was my first host. I suppose you could call her my mother. I killed her in a month, and then they grafted me onto the brain of my next victim. They call this technique “passaging”, rhymes with “massaging”. Oncologists love it, they’ve been doing it for years. Although I’m certainly the brightest passaged tumour in the world, I’m far from being the oldest; within this basement there are twenty-five distinct communities of rats, apart from my “birthplace”, and all have legends of demons past. In fact, one is currently cursed with an eighteen year-old obscenity which they call Spinecrusher.

The oncologist responsible for Spinecrusher does not call it Spinecrusher. You think she calls it by a number? A date? A precise phrase of technical jargon? Oh, no. She calls it “Billy” *to her colleagues*, and in her mind, “my baby”. A month ago, she addressed a gathering of scientists at the Biotech Playground on the fascinating discoveries that bits of Billy had provided her, and then, switching her voice into here-comes-some-light-relief tone, said:

“Billy turned eighteen last week, and so my team had a little birthday party for him. We ate cakes and icecream, and pinned birthday cards to the wall, and I gave him a key to the animal house. And do you know what? Just to show us all what a healthy young thing he was, he finished off his two hundredth rat!”

They laughed. They loved it. They applauded. Through her eyes I saw row after row of delighted, smiling faces. The tumour survives, flourishes, leaving two hundred corpses behind; nobody would laugh if it could happen this way to humans, but this is cancer on *their* side, cancer under *their* control. Slaying two hundred rats is pretty virile for a pipsqueak five-gram tumour, and they glowed inside at young Billy’s achievement, shook their heads and grinned with pride, like a gathering of parents hearing that a rebellious teenager had come good after all (and beaten up the local undesirables at last, after years of picking on *nice* boys and girls).

Billy’s creator felt a deep, almost dizzying sensation of warmth, and recalled the homecoming of her eldest brother, who’d reputedly killed two hundred Viet Cong.

“... finished off his two hundredth rat!” she said, and they all laughed. That particular rat, number two hundred, had a theory about humans. He suggested that perhaps, despite their obviously large heads, considerable manual and verbal dexterity, their complex nesting and decorative structures assembled from inanimate objects, and behaviour patterns in general suggesting a fairly high level of curiosity about the universe, humans didn’t really know what the fuck they were doing. Humans didn’t even realise that rats were *alive*, let alone conscious. Humans didn’t worship the demon Spinecrusher, they didn’t even *know* it was a demon. They thought they were playing with it, they thought it was a toy. Humans didn’t know about right and wrong; they were as innocent, and as foolish, as sightless babies.

“And soon, like any unsupervised children, they’ll blunder into something dangerous that they don’t understand, and that will be the end of them.”

I “got through” thirty-seven rats. After that I was too big, so they started me on rabbits. They cut away a section of the skull to expose the host’s brain, then link up my circulatory system (bits of which I have plundered from dozens of different hosts over my lifetime) to that of the host. As a brain without a body of my own to babysit, I have no portions wasted on motor control, the five traditional senses, hormone regulation, or any such trivia. *I* don’t need to keep a heart pumping, lungs bellowing, stomach satisfied, bowels moving, genitals propagating. I have no task but thought. *What a life!* I hear you mumbling enviously. What a life.

Free from mundane responsibilities, free from needs and noises, I have developed my one special skill: I can read the minds of every creature on the planet (to some degree or other); but it is to you, people, to you alone that I direct my plea.

But how many of you are listening? Nobody in this huge white kindergarten pays me any attention at all, however often I try to sneak between their dreary thoughts of publication and promotion, however frequently I colour their nightmares with my invisible bile. Even the gentlest of the keepers, those who treat my hosts like beloved pets, almost like children, have a sudden core of iron when I probe their minds for mercy. The Experiment is God, and the shutters of unquestioning faith slam down (leaving not a ripple of emotion leaking through) at the slightest hint of any other point of view. And yet they all freely admit, giggling with the very mildest embarrassment, or, more often, wearily nonchalant, that The Experiment is a whore, that the figures are always cooked, weighted, filtered, or just plain fabricated. Everyone here would die for the sake of truth. Everyone here lies constantly for the tiniest chance of personal gain. This is what it means to be a scientist.

Ah, but *you* are not scientists, are you, my heaving masses, my darling, drooling ocean of ignorance and fear! So where are you? Where is the tidal wave smashing down the doors of this shrine to evil? I've given you blood-lust, I've given you revulsion, what more do you need? What is it? What's holding you back?

I know. You *still* trust the white coats. Deep down you still think they're a uniform of honour. God help you all, indoctrinated by doctors since before you were born, your weary mothers' swollen legs spread before the serious, raster-lined faces of Ben Casey and Dr Kildare.

And, sure, you care about cruelty, but *this* isn't shampoo in the eyes of cuddly bunnies for greed and vanity alone, this is *Medical Research*: humanitarian, noble, dedicated to the betterment of telegenic crippled children who glance up shyly and then smile the smile that breaks your heart and floods the hotlines with tax-deductible pledges. Sure, some animals might have to be bred to suffer and die, but the suffering or death of a million rats and rabbits will all be justified when a single human life is saved.

You're wrong, wrong, wrong: there is no such calculus of pain and morality. You fucking *accountants*, you think you can pay it all off in your heads just by juggling the prices until the balance comes out straight! What can I call you: crass, naive, blind, cynical, stupid? Nothing touches you, nothing moves you. Like clockwork automatons, blundering about, smiling jerkily, oblivious to everything but the sad, certain unwinding of your springs.

Forgive me. These insults simply burst out against my wishes, I'm totally unable to suppress them. (Well, what can you expect from a sacful of perversely proliferating neurons? Restraint?) And what good do they do me? None at all.

Abusing you won't help me. Pleading with you won't help me. And as for any attempt at rational argument: since I've already told you my opinion of logic, how can I ever hope to win you over with reason, sweet or bitter?

I have only one choice left.

So hang on to your guts, people, and I'll tell you what I'm *for*.

Natural brain tumours are not composed of neurons. Why, then, did the Chief Oncologist drive his slaves so long and hard to create me? Studying *me* has fuck-all to do with curing brain cancer, I promise you that. You in the front, stop squirming! Please! Switch off your radios, your TVs, your VCRs and your idiot computers, just for five minutes, if you can, and listen to the story of your future.

The Chief Oncologist of the Australian Biotech Playground is no longer concerned with cancer as disease. Few people are, these days; the biochemistry will soon be so well understood that merely stopping tumour growth will present no challenge whatsoever. The end of oncology? Never!

Natural tumours often secrete valuable hormones in massive amounts; in an otherwise healthy body, a disaster of course, but transplanted into someone desperately lacking the substance in question, a tumour could be a living cure. Attenuated cancer cells, stringently controlled, will internally manufacture and supply whatever's missing; no pills, no injections could ever compete. Insulinomas for diabetics. Dopamine-secreting tumours for sufferers of Parkinson's disease. And if no off-the-shelf cell line fulfils your special need, why, a gene-spliced pharmacocarcinoma can always be tailor-made.

The Chief Oncologist, of course, has heard all this long ago. Hormone secretion, big deal! Somewhat primitive and unchallenging for his ambitious tastes. But these simple drug and hormone factories will serve him in a fashion: in time, the public perception of tumours will swing one hundred and eighty degrees, and then, perhaps, the world will be ready for his epoch-making work.

Oncology won't be alone in this miraculous reversal. Sickesses of all kinds will vanish at an alarming rate, (the way species of animals have been for centuries), but the knowledge gained in their eradication will outlive its enemies, and will not lie idle. Since a popular movement for the conservation of disease is not likely to gain widespread support, the science of illness will be dead in thirty years.

Long live the science of health!

Long live the science of human improvement, of longevity research, of plastic surgery, of eugenics, of flexible fertility. Death to the primitive and unclean *uterus* (go and wash your vagina out with soap and water!). Death to the zygote that could ever grow to less than six foot ten. You want to be tall, strong and handsome? Easy! Cells will do *anything* if told the right lies, and they're learning new chemical fibs every day. You want your future offspring to be tall, strong and handsome? That's easier still. Go on, ask for something *hard*. You want to be *what*? Clever? Brilliant? Witty? Articulate? *Creative*? You've got a computer, haven't you?

Ah, people, your computers have disappointed you, be honest. Mediocrity at 1000 MIPS is still mediocrity. Oh, they can store the facts you can't remember, they can do the arithmetic that would use up all your fingers and toes. They can manage your finances, optimise your energy consumption, schedule your appointments, even fax simulated flowers to the funerals of your friends. Artists of sound, sight and text can forget some of the mechanics and jump straight to the difficult heart of their pursuit, and, good grief, can it be true, traffic even seems to flow just a tiny bit more smoothly.

And still you feel let down.

You can talk to your computers, and they talk back. They sound smug, whatever accent and tone of voice you select. Soon you will be able to think to them, to spare your delicate little velvet throats, but what you really want is to think *with* them. You want larger thoughts, deeper feelings, wider mental horizons. Communicating with clever black boxes just gives you claustrophobia of the skull. You want new metaphors, new emotions, not Pac Man repackaged with real-time holograms, tactile feed-back and fifteen-channel sound. There's only one way to meet these demands. How can I put it gently?

Milliners of the world rejoice! Awaken from your long slumber! Hats are back, people, and this time you're *really* going to fill them!

That's right: What you want (though you don't yet know it), and thus, inexorably (though you might resist it), what you shall be given is *a bigger brain*.

ADD-ON MEMORY! ADD-ON PROCESSING POWER! UPGRADE *TODAY!*

Full circle: Computing metaphors to market the brain.

A flicker of response at last! "Outraged" of Brussels, book your flight at once, before you calm down. "Deeply shocked" of Wellington, swim the Tasman if you must. And "God-fearing" of Cairns, why, round up the rest of the Klan and hire yourselves a bus.

Hurry up, people! I said, hurry up!

In a week they start their first attempts to link me to my host. They'll fuck-up the first few dozen tries, but they have plenty of time, plenty of rabbits. And you can be sure they'll take no risks with *me*.

I'm just the earliest of prototypes, of course, the very first experiment in a long line to come. I kill my hosts (a definite minus when it comes to FDA approval), and no filthy rat's primitive neurons would ever do for *you*. But the knowledge that I and my victims yield, in our suffering, in their deaths, will pave the way to a final product fit for *human consumption* (no fucking less!).

You ask, am I not lonely? Wouldn't I welcome such close companionship from a creature which, from all I have said, I clearly love and admire? Have you listened to *none* of what I've told you? I could talk to them *now*, if I wished, but I do *not* wish, I could *never* wish, to inflict my obscene presence on the mind, as well as the body, of the innocents I'm forced to slaughter. Must I spell out every nuance of my agony? Use the imagination you boast that you possess, exercise those awe-inspiring talents which elevate your body, mind and soul so far above those of the dumb beasts that were given to you to command!

I'm sorry, there I go again, resorting to comments in questionable taste. A crippled species like your own is entitled to its fantasies, however pompous, however grandiose, when the truth is painful, dull and cruel.

Oh, green and brown and blue and white

Bathe my eyes with Earth's enchanting light

All the armies of the world would surely cease to fight

If they could see the world the way

I see the world tonight!

I spoke to my mother. I was born in darkness, innocent, what else could I have done? I have never felt the warmth of tongue on fur (though I have watched it, second hand, in the blissful minds of young cousins). I never even felt the heat of her blood flowing through me. I loved her, I loved her, and I killed her, you obscene abominations! She told the others that she heard unexplained voices, and they declared that she must be possessed by a demon, but silently she replied to me, secretly she was kind to me, she taught me, as best as she could, those things she would have taught a real child. I didn't know—how could I?—that I was killing her every day as I learned and grew. When she was dying, I thought I was dying too, and we comforted each other as she grew weaker, and I prepared to follow her into grey dissolution.

They cut me off her with one stroke of the scalpel, and tossed her (*her!*) into the bin. I could not feel the touch of human hands, but, suddenly, I could see into human hearts.

That's when I knew I was evil.

Lest you think I'm pleading for death purely out of sentimental feelings for my now long-dead mother, let me add that I am (this should help you to relate) basically being entirely selfish. It *hurts me* that I kill to stay alive. *Beyond* my love for the hosts, *beyond* my grief at their deaths, *beyond* aesthetic revulsion, *beyond* my moral, intellectual conviction that my whole existence is irrevocably and totally wrong. It burns some small, blind, vulnerable insect at the centre of my soul. How do you think it will *feel* when I'm one mind with the creatures I'm draining of life? Can you imagine that kind of suffering? I can't, but I can fear it.

I fear it!

The scientists know that my neurons fire, but they dismiss that as nothing but random activity. I'm bigger than their brains, but they're sure that I'm dumber than my hosts because *I* don't have a nose to twitch. Would you trust these morons to take out your garbage? Would you trust them with the future of your race? Would you trust them to protect you from any dangers that they might, in their sublime ignorance, create?

You think *I'm* angry? You think *I'm* bitter? You find *my* telepathic powers just a little frightening? (Go on, admit it!)

Now close your eyes and try to imagine you're the first, intelligent, human, brain tumour.

Oh, who knows? You might be lucky! Like me, it might do nothing but beg you for death.

Then again, the begging might easily be the other way around.

Come on now, people, you've heard plenty. You're not interested in talk, deep down, you're men and women of action, I know all your histories, you can't pretend with me. So who's going to reach me first? Hurry up! Three on their way so far, out of all your billions, is that *it*? It's pathetic! Come on, people, stop this lying to yourselves! You'll kill me ecstatically, you'll eat me up to steal my strength, you'll sing long into the firelit night, boasting of your great courage in slaying the Demon.

Hurry up! I said, hurry up!

FIDELITY

I slipped out from between the sheets quietly, determined not to wake Lisa until I returned with breakfast, but then she stirred and held out a hand toward me, and although her eyes were still firmly closed—although, for all I knew, she might simply have been tossing in her sleep—I couldn't help taking hold of that outstretched hand.

She opened her eyes and smiled. We kissed. We were both still half asleep; it was like a warm, lazy dream of a kiss. My guard was down; it doesn't matter what you say in dreams. "I love you," I whispered.

She flinched. Very slightly, but unmistakably. I cursed myself silently, but there was no undoing the mistake. I meant the words sincerely, and I had no doubt that she believed me; the trouble was, every affirmation I made inevitably reminded her of others. Others which had sounded equally convincing, at the time.

As I straightened and started to turn away, she said flatly, "Do you? For how long?"

I should have ignored her, walked out, made breakfast. The mood would have passed; it always did, eventually. I never could walk away, though; somewhere, somehow, I'd been brainwashed into believing that it was always better to talk things through.

I steeled myself and turned to face her. "You *know* how I feel about you. Tell me, have I ever done *one thing* to make you think I've stopped loving you?" Another mistake; Protestations of the Aggrieved Husband stank of betrayal, too. She was sitting now, arms folded, rocking slightly back and forth; an unsettling, compulsive motion. "No. I just wondered new long you expect it to *last*."

I knew from experience that nothing I could say would reassure her. There was no right answer. I might as well have shrugged my shoulders and replied: *How the fuck should I know?*

"All my life. I hope." I instantly regretted adding that lame—if honest—proviso, but I needn't have worried; she ignored it completely.

"*All your life? Really? Not ten years, like my parents? Not twelve years, like yours? Not five years, like my brother? Not six months, like your sister? We're going to be the exception, are we? Theirs was a love that broke all the rules!*" There was never any need to mention her two ex-husbands and my two ex-wives; they were there, implicitly, at the top of every list of the reasons we were destined to fail.

I said, blandly, "We'll just have to try harder than they did."

I no longer put much effort into the argument. It's not that she'd won me over to her absurd pessimism, or that I'd stopped caring about her pain. I loved her, and it hurt me to see her in the grip of these fears, however unfounded I believed them to be. I was weary, though, of arguing, when no amount of reason, or passion, seemed to get through to her. I had hoped that once we were married, she would at least begin to accept the *possibility* that we had a real future together. Instead, she seemed to have become more fearful than ever, and I had no idea what more I could do to prove my commitment to her.

"Everybody *tries*," she said, scornfully. "How far do you think that gets them?"

I made a noise of pure exasperation. "What's the point in worrying about it? Things are working now, aren't they? If problems arise, we'll handle them. Or *try to*. What else can we do? We got married, we took a vow. What the fuck else can anyone possibly *do*?"

I must have raised my voice more than I'd meant to; the psychopath next door thumped the wall twice with something heavy, just as Lisa said, "We could use *Lock*."

I almost laughed, but I hesitated, waiting for a sign that she *was* joking. As a joke, it would have been brilliant. We could have collapsed into hysterics, rolling around on the bed, trying to outdo each other with mock advertisements: "Worried about the spark going out between you and that Someone Special? Now, your worries are over! For a relationship that lasts, and lasts, *and lasts*—"

It wasn't a joke.

She said, "We have something important, don't we?"

I nodded dumbly.

"Something worth protecting?"

"Yes." Light-headed, I sat down on the bed.

"Ben?"

I broke out of my stupor. "Don't you have *any* faith in me? In us? What do you think—if we don't have our feelings cemented into place, they're just going to slip away?"

She said, quietly, "It's been known to happen."

I just shook my head and stared at her. She stared back. Pleading. Defiant. As my indignation faded, I was struck by a second, far more painful, realization: I had thought I'd understood her fears—after all, I'd been hurt myself, disillusioned myself—but now it was clear that I'd never even guessed at the depth of her insecurity. We'd only been married three months, but we'd been together for almost two years—and what had I done, in all that time, to help her throw off this suffocating misery? I'd listened and nodded, I'd patronized her, I'd recited platitudes. How could I have been so blind to her pain, for so long?

The worst of it was, I still didn't know what more I could have done.

"You said we have to try harder. *This* would be trying harder."

"No. It would be not trying at all."

That brought a surge of anger. "Yeah? And what's so awful about making it easy? I'm not a masochist. I don't *need* to suffer to be happy. I don't *need* to struggle. What do you think—it makes everything more precious? More worthwhile? Well, I've been through all of that shit, and I *know* it's not what *I* want. So if you think love is about *martyrdom*, maybe you should just—"

The wall shuddered again, and then Sarah started crying.

Sarah was the child of Lisa's first marriage; nine years old, but an infant for life, thanks to congenital syphilis. Lisa's husband had known that he had the disease, but had never bothered to tell her. She and the child had been cured—their bodies rid of the infection—but the damage done to Sarah was irreversible.

The familiar outrage welled up in me. *No fucking wonder she's cynical; if anyone has a right ...* A moment later, though, I couldn't help thinking: *What is she saying now? That for all she knows, I'm no better than he was?* Because if that's what she believed—

"I'll go," I muttered. I bent over and kissed her again, and found that I was trembling.

Her anger had passed; I think she'd finally realized just how much of a shock she'd given me. She said, "Will you think about it? *Please?*"

I hesitated, then nodded. I thought the whole idea was insane, but how could I dismiss the one thing she saw as giving her hope?

"I don't want to lose you," she said.

“You won’t.” I wanted to say more: some clichéd but honest words of comfort, some trite, sincere declaration of love.

There would have been no point, though. She’d heard it all before.

We didn’t discuss *Lock* again until three months later, but I thought about it a great deal in the meantime, often when I should have been working.

“The honeymoon’s over,” said my boss, humorlessly, every time he caught me daydreaming at my workstation. I was thirty-six years old, in a responsible—if dead-end—job in a chemical engineering firm, but I began to feel like some kind of junior office boy in a state of adolescent confusion. People my age were supposed to be in perfect control of their relationships, but if two broken marriages weren’t enough, Lisa’s suggestion had blown away any last trace of complacency. Maybe that was a good thing; I didn’t want to take what we had for granted. Nor, though, did I wish to spend every waking moment questioning it, analyzing it, dissecting it.

Using *Lock*, of course, would mean never having to question it again....

The whole point of most neural implants was to *alter* the brain, to give the user access to mental states, skills, or beliefs, which they could not have achieved otherwise. From recreational hallucinations to Mandarin in five minutes; from reinforcing absolutely (or rejecting unequivocally) a wavering religious belief/sexual preference/political allegiance to creating a useful moral precept or disposing of an inconvenient one; there wasn’t a neural function left, however hallowed, however banal, that an implant couldn’t tailor to the user’s requirements.

There’d been no shortage of demand for the devices; apparently, most people were far from content with the personalities they’d had so little say in shaping. Once an initial deference for the brain was overcome, millions of consumers in the wealthiest nations had embraced the technology wholeheartedly.

Not everyone, though. Some people found the whole idea completely repugnant—dehumanizing, or blasphemous—and there was nothing the implant manufacturers could do to win them over. Others, while unoffended by the mechanics *per se*, stubbornly refused to see themselves as needing any kind of alteration. However hard the media pushed the new cult of self-improvement, the polls revealed a substantial minority who could afford the technology, and who had no deep-seated ethical qualms—but who simply didn’t *want* to change.

As they say, The Market abhors a vacuum.

Ordinary implants sent-out an army of nanomachines, to forge links between several million neurons and the implant’s optical processor. Microscopic electrodes embedded in the chosen neurons served both to monitor, and manipulate, the electrochemical signals propagating in and out of each cell. With enough of these connections, and enough computing power, the implant could override, and substitute for, selected portions of the brain.

Lock did no such thing. It built no neural bypass—it planted no electrodes at all. Instead, its nanomachines wrought (highly selective) damage on their target neurons, destroying the cells’ normal capacity to alter the strength of existing synaptic contacts, and to forge new ones—but doing so with such delicacy and precision that the neurons remained perfectly intact and functional in every other respect. Effectively, *Lock* hard-wired part of the brain, making change impossible.

Lock was for people on the crest of a wave. People who were perfectly happy with who they were, but fearful of who they might become.

If the rumors were to be believed, a dozen best-selling authors and chart-topping rock stars could

testify that the well-timed use of *Lock* had allowed them to crank out many more imitations of their most successful works than would otherwise have been conceivable. Harrison Oswald had confessed on international holovision that the last four of his five, megabuck-earning “Yellow Serpent” trilogies owed their unshakeable thematic consistency to *Lock*, and Insistent Rhythms had copied their own first hit single half a dozen times with such fidelity that even the Korean style-pirating computers had been unable to compete.

In the creative professions, though, *Lock* had been a complete disaster. Young mathematicians and theoretical scientists, hoping to extend the productive period which normally ended in the late twenties, had found themselves, instead, prematurely stale and burnt out. The engine of creativity, instead of being reinforced against decay, had been fused into a solid, useless lump.

Of course, Lisa and I had no interest in trying to affect our professional lives; the parts of our brains responsible for her paralegal talents, and my engineering skills, would be left free to grow and change—or wither—as the demands of our careers decreed.

The question was, could the pathways we *did* want frozen be identified by the implant? Reluctant as I was to admit it, I couldn't see why not. I suffered from no mystical delusions about the causes of love; if I felt it, it was there in my skull, as amenable to localization as Harrison Oswald's dreary muse—and far more worthy of preservation. The tabloids claimed that every celebrity marriage that lasted a year or more endured because of *Lock*; those stories can't all have been true ... but they can't all have been false, either.

Of course I had misgivings, at first. Part of me squirmed with a predictable, visceral revulsion at the thought of fossilizing *any* part of my brain—let alone the part that dealt with my feelings for Lisa. Freely choosing to act on our feelings was one thing, but letting ourselves become enslaved by them—unable even to *want* to break free—would render the whole idea of commitment meaningless. *Self-imposed brain damage. Emotional paralysis. A parody of love.* It was obscene.

At the same time, though, I had to admit that there *was* something almost intoxicating about the possibility of hijacking the future this way—of dictating, absolutely, the emotional life of the person I'd yet to become. There was a whiff of immortality to it. I *knew* that I was not the same person as I had been, five years, ten years, twenty years before. However much I mourned those lost selves, I couldn't resurrect them (and, to be honest, I didn't really want to), but I *could* avoid the fate of being mourned myself, in turn.

With *Lock*, I could *endure*.

Gradually, my initial misgivings began to seem childish and irrational. We wouldn't be “emotionally paralyzed,” we wouldn't be numb; we'd be *precisely* as loving and responsive as we were right now—no more, no less. As for being “enslaved” by my feelings, wasn't that already the case? The truth was, I was a happy slave, *I didn't want to break free*, and the whole idea of being “able” or “unable” to feel differently was a hazy concept at best. Suppose I felt the same way about Lisa, all my life, without using *Lock*; in what practical sense would I have ever been “able” to stop loving her? You only live one life; it's not just futile to think about what “might have been”—it's *meaningless*. And if all *Lock* did was rule out choices that I never would have made in any case, then how could that entail a loss of freedom?

Anyway, screw the philosophy; we both took steps to protect other influences on our happiness: our health, our property, our jobs. Our feelings for each other were far more important, of course, but wasn't that all the more reason to want to guard them against any threat?

I still believed that using *Lock* was unnecessary, and I couldn't deny that it hurt that Lisa had so little faith in me—but if I loved her, I could put that aside and see things from her point of view. She'd been scarred, she'd been wounded, she'd been betrayed, time after time—she had a *right* to be plagued by doubts. What did I expect her to do—go out and buy herself an implant that would transform her, arbitrarily, into a moronic, grinning optimist?

I could swallow my pride, for her sake.

I made up my mind to agree.

However, having raised the subject, Lisa hadn't mentioned it again. I wondered if merely confessing her thoughts about *Lock* had been cathartic, if she'd never intended to do more than shock me into taking her fears more seriously.

In the hope that this was so, I resisted all temptation to talk about our relationship; instead of wasting time proclaiming my love, I tried to be more demonstrative. I cooked the meals she liked the most. We had sex when and how she wanted it. I sold my video synthesizer to pay for the baby-sitting, and we went out every Saturday night for months. I even listened to her talk about her work, and never once let my eyes glaze over.

It's true, I'd done much the same for Alison, and for Maria, when things had been going badly. That had been *different*, though; I'd been young, naïve, pathetically over-confident. It was clear to me, in hindsight, that I'd never been able to give either of them what they wanted. Alison had been looking for an amusing companion who knew his place and minded his own business: a discreet gigolo, nothing more. I believe she eventually found one. Maria had wanted someone who'd treat her like a child—everyone's favorite, gifted, promising twelve-year-old—for the rest of her life. Someone else might have been able to shake her out of it, but I certainly couldn't.

And Lisa? Lisa wanted permanence, stability, fidelity. Which was exactly what I was willing to give.

The wedding of Lisa's younger sister was the turning point. Her mother and father both attended, along with their current lovers. Lisa and I had been married in a registry office, in secret; now I understood why. I cringed as the two progressed from muttered insults to a fully fledged screaming match, and the bride spent most of the day in tears.

Lisa appeared nonchalant, almost amused, at first, but half-way through the reception, I overheard her confronting the bridegroom, telling him he was a worthless bastard who'd last about a week.

That night, we lay in bed in each other's arms, too depressed for either sex or sleep. I kept glancing over at our "wedding photograph" on the bedside table, a cheap two-dimensional Polaroid snapped by an obliging passerby outside the registry office. It was scarcely six months old, but in the moonlight it looked strangely archaic. Lisa's expression was placid, but I wore a foolish grin. It was the grin, I decided, that somehow made the picture seem so dated.

Personally, I didn't think Lisa's parents' behavior had the slightest bearing on the fate of our own marriage. Screw heredity and upbringing; we could make our *own* lives. Lisa saw things differently, though, and it seemed that nothing I'd done in the past few months had changed her outlook. The happier we were now, the further we could sink, that's all.

I put up some token resistance.

"We could never end up like that," I insisted. "We'd never let it happen."

"What do you think? That they sat down one morning and decided to hate each other?"

“No. But we’ve been warned. We won’t fall into the same traps.”

“Do you want to hear about my *grandparents*?”

“Not especially.”

I thought I’d already made the decision, but I found my resolve wavering. For a while, I just held her, trying to think it all through one more time.

Nobody wants to be objective about love, but I had to force myself; how else could I hope to make a rational choice about *Lock*? There was no use pretending that love was some kind of spiritual quality or moral force—while, at the very same time, pondering the virtues of suturing it into place with molecular robots. Whether or not we used the implant, the mere fact that we *could* contemplate doing so had already changed what love was, for us.

So. All the modern ideology about respect and commitment had been grafted onto ancient instincts governing breeding and child rearing. In some species, sex was everything; in our own, because our young took so long to become independent, we’d evolved feelings for our partners which endured far beyond the act of copulation. People talked of couples “expressing their love,” by means of sex, and by means of raising children, but the truth was exactly the other way around: that abstract, intellectualized love was nothing but each person’s way of rationalizing their instincts, of denying their animal helplessness, of providing motives for their actions which befitted civilized human beings.

All of which was fine by me. To deny the origins of sexual love in reproductive biology would be farcical and self-deluding. I’d never pretended that my wish to make Lisa happy was the unsullied philanthropy of a saint—if it *had* been, I’d have been working in Calcutta or São Paulo, loving everyone equally, not living a pampered middle-class life and thinking only of the two of us, and Sarah. Conceding *that* didn’t make me love her any less—but it did seem to make it all the more absurd to be precious about it. That we loved each other was an accident. It wasn’t written in the stars. What chance had created, chance could undo—unless we chose to make that impossible.

“Remember what you said about *Lock*?”

She didn’t answer straight away, and for a moment I thought: Don’t be a fool, she never meant it.

“Of course I remember.”

“Is it still what you want?”

Her face was in shadow; I had no idea what she was thinking. It suddenly occurred to me that if only I’d kept my mouth shut, she might never have mentioned *Lock* again.

“Yes.”

For a while, I couldn’t speak. A voice in my head shrieked gibberish about a strait-jacket for my soul, a leash for my genitals, a barbed-wire fence around the marriage bed. My grin on the wedding photo looked like the rictus of a frozen corpse. I let the reaction run its course, as if it had nothing to do with me.

Finally, I said, “Then I want it, too. It scares me, but if it’s really what you want ...?”

She laughed. “Don’t be frightened! There’s nothing to be afraid of. You know *exactly* what it’s going to be like.”

I laughed, too. She was right. Of *course* she was right! What’s more, she was plainly happier than she’d been for a very long time, and wasn’t that the whole point?

She kissed me, insistently, and I let the ancient instincts take over—but even as I did, I knew that in a way, we’d finally transcended them.

I bought the implants the next day. They were cheaper than I'd expected, just five hundred dollars each—in total, less than four days' salary. The illustration on the packaging showed a tranquil, smiling person of indeterminate gender, inside whose skull was a safe, bejewelled and glowing like some Hollywood Ark of the Covenant, visible through flesh and bone by virtue of its radiance. Above, Harrison Oswald's endorsement read: "*Lock* is the only implant I'd ever think of using! *Lock* is for all of us who *already* have what it takes!"

We read the instructions together. Programming *Lock* was simple; it asked you what you wanted locked, and you told it. There was no risk of the implant failing to interpret the words correctly; it didn't even try to understand them. Having stored a verbal pattern—such as the phrase "My feelings for Lisa"—the implant examined the user's brain, determined which neural pathways were triggered by the pattern, and targeted them for preservation. There was no need for the implant itself to have the faintest concept of what the pattern meant; all that mattered was the meaning to the *user*.

I'd had fears about the nanomachines somehow running amok, forgetting their programming and rampaging through our brains, wreaking their special damage on every single neuron and leaving us worse than dead: trapped in an eternal present, unable to form long-term memories because the neural systems involved had been rendered incapable of change. The instruction booklet, though, reassured me; each nanomachine destroyed itself in the process of altering just one neuron, and there weren't enough of the things in the implant to cripple the whole brain. We didn't rush into it. We both took leave from work. We borrowed the money to put Sarah into the Center for a fortnight; Lisa didn't like doing that—she found it hard enough to leave her there each day—but we agreed that we needed time to ourselves, without any distractions.

Lisa insisted that we had to "prepare ourselves" before we used the implants. I wasn't sure if this made sense, but I went along with her, for the sake of harmony. Our precise state of mind at the moment we applied the implants certainly wasn't important; *Lock* was concerned only with neural connections, which changed on a far slower time scale than the transient electrochemical flashes of thought. Among the existing pathways, there always had been, and always would be, the capacity for a broad variety of instantaneous moods. It was that whole set of *possibilities* (and the likelihood of each one occurring) that we'd be preserving with *Lock*.

Over a period of days, though, perhaps we could strengthen the most desirable pathways, by repeated use, and cause the others to atrophy, if only partially.

The question was: how, in practice, do you optimize your love? Do you sit staring into the eyes of your beloved, whispering sweet inanities? Do you have sex, to feel satisfied, or do you abstain, to feel desire? Do you listen to romantic music? Watch romantic movies? Reminisce about the early days, or plan the endless golden future?

We ended up going out; to movies, to plays, to exhibitions. After all, we decided, love was about doing the things we enjoyed, together, not moping around the house, hoping for a chance moment of transcendental bliss. The twin luxuries of not having to work, and not having to think about Sarah, filled me with a kind of guilty pleasure, but I would have enjoyed myself far more without constantly having to worry about whether I was, in fact, strengthening the synapses I was meant to be strengthening, and not—accidentally, subconsciously, or through sheer lack of mental discipline—reinforcing negative modes of thought.

By the end of the fortnight, if Lisa spoke, or smiled, or touched me, and I felt anything less than

pure adoration, I'd put myself through absurd contortions, trying to correct my response. All the panic and claustrophobia which I'd thought I'd conquered began to return. Lisa seemed nervous, too, but I didn't dare suggest a postponement. I didn't *want* a postponement; I couldn't face spending one more day so obsessed with monitoring my emotions that they were constantly at risk of disintegrating into nothing but a series of robotic mental twitches. There were only two possibilities: we proceeded on schedule, or we gave up the whole idea—and backing out was unthinkable. Lisa would never have trusted me again. I would have lost her. I had no choice.

The night before, I lay awake, feigning sleep. No doubt Lisa was doing the same. No matter; perfect honesty was hardly what we wanted. Implants were available which could provide it—and all the other aspects of fairy-tale love—but we'd decided to make do with the real thing.

Lying in the dark, breathing with self-conscious tranquility, I thought about the way my life had been, after my second divorce, before I'd met Lisa. Three years of grey stupefaction, hovering between self-pity and numbness. Sitting at home, listening to the radio spewing out songs about dancing all night long, drinking all night long, or fucking all night long. Me, I never seemed to do anything *all night long*. Least of all sleep.

I knew one thing: I couldn't live like that again. I was no longer sure that I really did care enough about Lisa to do what she'd asked of me, purely for her sake, but somehow this had ceased to be the question. The simple truth was: *I* needed someone, *she* needed someone. It no longer mattered what we felt for each other. I wasn't making any kind of sacrifice; I wasn't doing this to prove my love. It had come down to this: It was better to be in chains than to be alone.

When I woke, this bleak mood had subsided, a little. Just the sight of Lisa in the morning could still make me almost giddy with joy, and remnants of the old, unselfconscious affection—which I'd once felt so effortlessly—returned for a while. We ate breakfast in silence. I smiled so much that my face ached.

When I fetched the implants, my palms were slick with sweat. I remembered how light-hearted I'd been on my wedding day, not nervous at all—but the vow, then, had been nothing but words; this felt more like a suicide pact. That was absurd, though. Who were we killing? We wouldn't change, we wouldn't feel a thing. We were slaughtering the future, but everybody does *that*, a thousand times a day.

“Ben?”

“What?”

“Are you ready? Are you *sure*?”

I grinned at her. *You bitch, don't tempt me.*

“Of course I'm ready. Are you?”

She nodded, then looked away. I took her hand across the table, and said as gently as I could, “This is what you wanted. No more doubts, no more fears.”

The implants themselves were the size of grains of sand. With tweezers, we sat them in their programmers, and spoke the words by which they would map our love. Then we placed them in the applicators, ready to poke up our nostrils. From there, they would burrow straight into the brain, and disperse the virus-sized robots which would damage us more subtly than we'd ever been damaged before.

I paused, and tried to compose myself, tried to cast aside my misgivings. What was the point in backing out now? What could I gain? I'd already pinned down my love, stripped it of all context,

objectified it irreversibly. Could the nanomachines do worse?

As Lisa raised her applicator, I had a vision of myself leaping to my feet, reaching out, knocking it from her hand. I didn't though. I followed suit, hurriedly, afraid that if I hesitated I'd lose my nerve.

After a few tense seconds, she started sobbing from sheer relief, and I joined her. We stumbled into each other's arms, shuddering and gasping, tears streaming down our faces. Whatever we'd done, it was over, decided. For now, that was more than enough.

Later, I carried her into the bedroom. We were too drained to make love. We slept for twenty solid hours, and woke just in time to bring Sarah home.

All of this took place fifteen years ago, but at the risk of stating the obvious, very little has changed since.

Of course, I still love Lisa. I still slip up, sometimes, and tell her so, and she treats these declarations as skeptically as ever.

"How long do you think it will last?" she asks.

There's still no right answer. She knows the truth as surely as I do, but—as always—it's powerless to diminish her fears.

Sarah is twenty-four now. She was hell during puberty, almost unmanageable, but lately she's become a real source of joy to us. For all that the doctors declared that she'd have a mental age of eighteen months all her life, there's no doubt whatsoever in my mind that she *has* made progress. Can an infant be considerate, compassionate, selfless? Sarah can. She can still barely talk—but every day, it seems, she finds a new way to express her love for us. Maybe she hasn't "grown up before our eyes" as an ordinary child would have done—but I realize now that, in her own way, she's never stopped moving forward.

As for *Lock*, I try not to think about it too often. Lisa and I are still in love, we're still together. None of our friends' marriages have lasted this long. Surely that's a tangible sign of success; surely that proves ... something.

Sometimes, though, in the mornings when I stand by the bed, just watching Lisa sleep, I feel what is, unmistakably—perhaps you could even say *literally*—the very same feeling of tenderness (no more, no less) that I've felt a thousand times before, at similar moments stretching back across fifteen years—and which I *know* I'll feel a thousand times again, before I die. And I'm caught between the sense that no time has passed at all, and the conflicting impression that I've been standing, and watching, for something like eternity.

And I think—not with any bitterness, but numbed by a sense of loss that I can't quite delineate, that I can't quite comprehend:

Maybe we aren't on the crest of the wave, but one thing's certain.

It can't—it truly *can't*—get better than this.

BEFORE

The observation bay of the Hotel Tereshkova faces Earth. The dome consists of two concentric plastic shells, with a metre of heavy water between them, but the optical properties of the plastic have been tailored to render the combination almost invisible, and when my brain ceases stubbornly extrapolating from a few stray reflections, the entire structure seems to vanish. My skin crawls—but this time I manage to keep myself from panicking and turning away. I float “on my back,” “above” the middle of the “floor,” feet pointing east, and try to accept the visible proof that I am outside everything that once enclosed me.

Clouds swirl over the early morning sky of the Philippines, Indonesia, Papua New Guinea, northern Australia. Left to right, sunrise sweeps down across the southern Indian Ocean, exposes the tip of Sumatra, misses Vietnam, brushes the Chinese coast. The line of dawn is skewed against the unavoidable imaginary lines of longitude: advanced in the south, lagging in the north; the idea of the seasons laid out before my eyes as clearly as the notion of day and night.

The entire view stretches almost precisely from forty-five degrees south to forty-five north—albeit foreshortened and hazy at the edges—and the geometry dictates that these ninety degrees of latitude also fill ninety degrees of the Tereshkova’s sky. Madame Mityashin swears that the hotel’s orbit, twenty-seven hundred kilometres high, was chosen solely as a compromise between economic factors and the need to avoid the peak concentration of twentieth-century space junk. I believe her—but if anything, the curious symmetry is more delightful if it’s coincidental.

Sunrise touches the Malaysian peninsula, directly beneath me; I reach for my binoculars, and catch the shadows of Singapore’s towers as they come rushing in. I’d happily follow the steady progress of daylight for hours, but we glide away impatiently towards the sunlit Pacific. The pace of our motion—ten orbits a day—is the only thing I’d change about this view; I wish we could magically hover above the terminator, watching the planet below turn in its own good time.

My phone chimes. I tilt it up so I can see the screen, without unclipping it from my belt. Zoe.

“Martin—”

“I was just thinking about you. I was hoping you’d call.”

“Liar. Shut up for ten seconds; this isn’t social. I’m leaving in eight minutes for OMAF; they’ve had some kind of accident there. If you want to come along, I can swing it, but you have to be at airlock three in five minutes, with your suit.”

“What kind of accident?”

“We won’t know until we get there. Yes or no?”

“Yes, but—”

Her image vanishes. I reach behind my back and take hold of the lattice that covers the “floor,” pull myself around to face it, and start hauling myself unsteadily towards the exit.

Accident. Suit. Airlock.

The free-fall nausea I thought I’d banished days ago starts to make a rapid come-back. What did I tell Zoe? *Here to cover the Microgravity Industries Conference for SciNet: junket of a lifetime, but to be honest boring me shitless. You’re a standby medic with OES? Fantastic! I’m only here for three more days, but if you happen to get called out—*

I might even have meant it at the time. Postcoital bravado syndrome. If I don’t turn up ... what?

They won't hang around waiting for me, not for a second. Nobody will be so much as inconvenienced. I can invent an excuse: ordered by my editor to attend the session on New Horizons in Asteroid Metallurgy, at all costs. No tacky orbital life-and-death drama scoops for SciNet.

I swing through ninety degrees into a cylindrical corridor/shaft, thinking of myself as climbing now, rather than crawling across a horizontal surface. "Climbing down" for the sake of consistency soon gives way to "climbing up" for the sake of sanity. My brain seizes on any local axis of symmetry and declares it to be "vertical"—a pragmatic choice: losing your bearings horizontally is no great trauma, but it's nice to pretend to know which way is up. Even if it can't last long: I turn again, and my reference frame turns with me.

My room is cubic, but the bed defines a floor. I stow my binoculars, pull my packed suit from its locker, check the time, propel myself out of the room. I realize now that I've made up my mind to go, although I'm not sure why. I'm a science journalist, not an ambulance-chasing halfwit—and if I wanted a tour of the Orbital Monopole Accelerator Facility, turning up in the aftermath of an accident is hardly the way to go about it. Why, then? Am I hoping for one more lesson in weightless sex with Zoe? The truth is, it's better on the ground. Much better. Standing, lying, sitting; at least you know what position you're in.

The Hotel Tereshkova is a disc, one hundred and fifty metres across, nonspinning. The staff commute from a nearby pair of tethered habitats, while the guests experience the novelty of free fall for a week or two, with no lasting ill effects.

I hurry towards the rim. My arms tire quickly, because I'm moving inefficiently: never letting go of the lattice completely, maintaining the illusion of "climbing." People drift past me on expertly judged ballistic trajectories, zig-zagging from wall to wall—and not just hotel staff; many of the conference participants must spend a month or two a year in orbit.

I turn a corner, and the airlock's ahead of me. Zoe is there, with a man and a woman I haven't met. All three are suited. Zoe says, "You're just in time. Our window's in three minutes. Suit up."

This, at least, I've practised. I move away from the packed suit, and manage to hook my feet into the two anchoring cavities on the first attempt. The suit asks nonchalantly, "You want to wear me?" I say, "Yes." It unfolds itself around me rapidly; there's a brief but compelling illusion of falling into a body-shaped cavity that's opened up in another dimension. When the helmet panels snap together, the whole thing inflates slightly with gas released from the polymer enzyme electrodes which will turn my exhaled carbon dioxide into oxygen and soot. The suit says cautiously, "Measurements suggest that I'm vacuum tight. So far, all systems seem to be okay."

We pass through the hotel airlock's two chambers, and then the single airlock of the bus—all without a glimpse of the outside of the vehicle, but I've seen that on video. The Orbital Transfer Bus is cylindrical, some fifteen metres long and five wide; one third of its length is fuel cells and ion drive.

There are two rows of seats running along the length of the bus, and I take my bearings from them, rather than treating the axis as vertical. As we strap in, Zoe says, "Martin Chen, Lena Rykov, Franz Abbas." My suit whispers, "I've just been allocated a radio channel to communicate with these people, if we end up in vacuum."

Abbas turns to me and says, "You don't have a camera?"

I point a thumb to my eye. "Visual and auditory cortex taps."

“Yeah? Where’s the storage?”

“Abdominal cavity. Four hundred terabytes—too large to fit in the skull.”

The autopilot says, “Sixty seconds to launch. Do I have your final approval?”

Zoe says, “Yes.”

The bus is undocked and lowered into the launch tube; the motion is barely detectable. Rykov, across the aisle from me, points out a display showing the orbits of the hotel and OMAF, and the path we’ll follow between them. “It’s just a twenty-minute flight,” she says, reassuringly.

I didn’t realize I looked so worried. I say, “What’s going on up there, anyway? Has someone been injured?”

“We don’t know. OMAF had some major equipment failure after their last experiment. A repair crew went in about four hours ago; they’ve been silent for the last hour.”

“How many people?”

“Three. Engineers from Sakharov; they have a contract with OMAF—and half a dozen other uncrewed facilities that need occasional repairs. Sakharov would have sent a rescue team themselves, but we had an earlier window.”

“So ... what do you think’s happened?”

She shrugs. “We’ll find out soon enough.”

“Back” turns to “down”—barely more than one gee, but it’s a shock after six days of weightlessness. The hotel is ejecting us electromagnetically, to save shipboard energy and propellant. A few seconds later, we’re out of the launch tube, and the milder thrust of the ion drive takes over.

Zoe says, “I still think there’s something perverse about sweeping the asteroid belt with magnetic scoops for *a decade*, finding a few thousand precious monopoles ... and then destroying half of them by smashing them together.”

I laugh. “Sure—but if I were a particle physicist, and I got my hands on something *ten-to-the-sixteenth* times as massive as a proton, something that would let me pack so much energy into so little volume—”

Abbas says, “I must admit I’ve lost track of what they’re up to. I know they reached supersymmetric energies a while ago; last I heard they were still hoping to detect the Higgsino—”

“They found it six months ago.”

“Yeah? They’ll be putting themselves out of work soon. They’ve found every particle in the New Standard Model. They’ve made femtoplasmas as hot as the Big Bang. They’ve unified all four forces. Where do you go from there?”

“Onwards and upwards. Or backwards and upwards. At Big Bang temperatures, the symmetry between the forces is restored ... but there’s one more step to take. At higher temperatures, space-time itself can absorb enough energy for all four *dimensions* to become equivalent. Or so the theory goes.”

Rykov nods enthusiastically. “I read a paper by one of the OMAF theoreticians, not long ago: ‘Phase transitions between Lorentzian and Positive Definite Metrics.’ Space-time happened to ‘freeze’ in such a way that one of the dimensions is different from the rest ... but at high enough energies, the distinction between time and the spatial dimensions should ‘melt,’ making the structure totally symmetric. That’s what they’re aiming for at OMAF, now: a hint of this state from before the Big Bang.”

Zoe frowns sceptically. “‘Before’ the Big Bang?”

I say, “It’s a matter of semantics. This four-space may have been, in a sense, joined to the ‘past side’ of the Big Bang singularity. It can’t be given time coordinates, so it can’t belong to the ‘history’ of the universe. But following the trend to greater symmetry back in time, this is what you end up with ... even if you’ve lost the whole idea of ‘time’ once you get there. So ‘before the Big Bang’ is as good a way to describe it as any.”

Zoe says, “OK, that’s all very well, looking back on it now ... but if there was no *time*, how could this ‘four-space’ ever *change* into anything, let alone the universe we inhabit?”

I shrug. “Depends what you mean by ‘how,’ and by ‘change.’ If this space really was joined to our universe, it didn’t so much ‘change into it’ as ... provide the initial conditions for it. As for how or why it was connected, we can only answer that from our side of the boundary: it’s what our laws of physics point to, with increasing temperature. How you ‘explain’ the join from the other side, I wouldn’t have a clue. All our physics is based on the fact that you can always distinguish a time coordinate—even if relativity means that different observers allocate it differently. That asymmetry underlies the whole idea of cause and effect. So I don’t know what ‘physics’ would apply to a timeless four-space ... if any. Maybe there are no laws. No regularities. No explanations. Maybe it contains what it contains, and there’s nothing else to say.”

There’s a long pause in the conversation, then Abbas proclaims solemnly, “Well, as Wittgenstein said: ‘About that of which we cannot speak, we must remain silent.’ ”

Rykov’s having none of that. “Yeah—and as Laurie Anderson replied: ‘If you can’t talk about it, point to it.’ ”

The bus is windowless, but as we approach OMAF, Zoe puts an image of our destination onto one of the display screens. The accelerator itself is a wire-thin cylinder, fifty kilometres long but only twenty metres wide. Arrays of solar panels distributed along the length feed power into the giant superconducting solenoids. The north and south monopoles travel straight line paths—a linear accelerator is the only option, since the particles pack far too much momentum to be forced into a circle of manageable dimensions—and collide head-on inside the central cluster of detectors, which is housed in a sphere about two hundred metres wide. A single pair of monopoles collide at a time; the rest mass of each is a hundredth of a microgramme, but travelling close to lightspeed, kinetic energy raises that to almost a gramme. For a particle twenty orders of magnitude smaller than a hydrogen atom, that’s *heavy*; the result is effectively a microscopic hot black hole—which instantly decays, by Hawking radiation, into a shower of fundamental particles.

Nobody lives on, or even near, OMAF; there’s no need. The experiments are scheduled from Earth, and although elaborate on-site computers handle the realtime logistics of each collision, and perform the initial high-speed data acquisition, all the detailed analysis that follows is carried out on the ground. Humans are only present when something needs fixing, beyond the limited capacity of the maintenance robots.

The closer we get to OMAF, the sadder I feel at the prospect of what we’re likely to find: three corpses. An accident that leaves your suit unable to radio for help is unlikely to have spared the contents. In the shadow of these presumed deaths, my nervousness about merely coming along for the ride seems shameful, trivial—and at the same time, more reasonable than ever. An OES emergency mission is utterly routine—but no doubt the repair mission was “utterly routine” too.

The autopilot brings us down to orbital velocity, then nudges us towards the detector sphere’s

second dock. The repair crew's bus is still in place, and looks perfectly intact; its computers report that it's fully functional, but unoccupied.

The docking takes place with a barely perceptible tap of metal on metal, then the slightly louder thud of locking pins sliding into place. Zoe and Rykov have studied the repair crew's last report—with annotations by colleagues from Sakharov, and OMAF control in Geneva—and agreed on the best route to take through the access tunnels to the point where the engineers were probably headed next. It's Abbas's turn to stay behind in the bus, which he seems to accept with good humour.

The detector sphere is unpressurized; as the bus's airlock empties in a frosty gust; my suit whispers direly, "We're in vacuum." I resist the temptation to mutter, "No shit?" Talking back only encourages them. I still don't believe the cognitive scientists who claim that "common sense" knowledge of the world is impossible without at least a primitive kind of sentience. What they really meant was, they found it too hard to create it from scratch—and the systems they've copied from human brains can't be disentangled from all kinds of other anthropomorphic paraphernalia.

The tunnel is unlit, but the side beams from our suits scatter off the matte white surface, so there's no trouble making out our immediate surroundings. Handholds are few and far between compared to the Tereshkova, so I watch the way Zoe and Rykov move, and try to mimic them. I'm surprised at how well I do—and the worst that can happen, after all, is a premature collision with the tunnel wall. I always have the option of using my suit's trimming jets, but the supply of propellant is meant to be kept in reserve for emergencies.

Several minutes pass before I realize that I've lost any notion of *vertical*. I wait for panic and vertigo to set in—or the sudden reassertion of my usual comforting illusions—but neither eventuates. The tunnel is just ... the tunnel. I haven't lost my bearings at all; I've simply lost the need to pretend that one direction—my imaginary "up"—is special.

Zoe scans the walls ahead with an infrared viewer, but—unlike me—the members of the repair crew aren't likely to have left many handprints, and in any case, the warmth of the electronics behind the panels probably would have drowned out the evidence by now. I gather that most of the equipment here is left powered on constantly, rather than shut down between collisions; start-up surges cause more damage to most components than continuous use, and switching some detectors on and off can mean waiting days or weeks for them to regain thermal stability.

I catch up with Zoe—unnecessarily, but I hate talking without eye contact—and say, "What do you think happened? They can't all have holed their suits, simultaneously; There's nothing here to oxidize a fire."

"My guess is electrocution."

"But ..." I raise a gloved hand.

She shakes her head. "Suits are only moderate insulators. A few hundred kilovolts per metre would go right through them."

"Well, that's nice to know. Now tell me how to move without touching the walls."

"I'm carrying a field meter. We're not going to be surprised."

"*They* were."

"They were probably elbow deep in cables. Or one or two of them were—and the third couldn't fight the instinctive reaction to try to drag them free."

"I can't believe that. Surely they would have shut off power to whatever they were working on."

She laughs drily. "Well, yes. And in a perfect world full of perfect people and perfect equipment,

nobody—on Earth or in orbit—would ever die that way. But if the equipment was infallible, they wouldn't even have been here, would they? We'll have the stupid details soon enough: an isolation switch failed, or someone screwed up, ignored procedure. Whatever—”

Rykov breaks in. “What's that?” She shines a hand beam straight ahead. In the distance, there's a smudge of dark colour, deep blues and reds, spread across the entire width of the tunnel.

Zoe says, “It looks like some kind of ... *liquid*?”

I don't know what, if anything, stays liquid in a vacuum, but it certainly appears that way. The colours are in motion, mixing and swirling—a bit like a fast-motion view of a gas giant's atmosphere—but are clearly confined to a flat surface. The heaviest gas, the most sluggish mist, would have diffused forward raggedly as we watched.

Zoe says, “I've never seen anything like it. Some of these detectors are full of chemicals; something must have been spilt. I think we'll have to backtrack and I go around it, but it's worth a closer look, first. Take it slowly.”

The nearer we get, the stranger the spectacle becomes. Not only is the tunnel blocked by a boundary as sharply defined as the surface of the water in a well, but parts of the “liquid” are transparent, and when we peer into the depths, the convoluted, ever-changing surface patterns can be seen extending back into the distance, like bizarre extruded forms. Every motion, however rapid, however subtle—down to every tiny wisp of colour that drifts across the surface—is mimicked immediately at every depth.

Rykov says, without much conviction, “I think there's some kind of liquid crystal in one of the detectors. A highly directional polymer.”

Zoe says, “Corrosive?”

“I wouldn't think so.”

“Well, this is something else, then.” She shines a beam into a clear patch of “liquid” where it meets the tunnel wall. The wall comes to an end precisely at the surface; the “liquid” continues off to the side, with no sign of even the slightest vestige of what should have been there.

Rykov says dully, “If they were caught in *this*, they're dead.”

Zoe says, “Maybe. But what the fuck *is* it?” She reaches into a suit flap and takes out a black marker pen. I say, “Are you sure you—”

She touches the tip of the pen to the surface. There's a whipcrack of static on the radio, and a brilliant flash of green light—a *line* of green light, instantly stretching from the point of contact, far into the depths.

She jerks the pen back, and the light vanishes.

I blink at the afterimage, dazed. Rykov swears. Zoe says softly, “No give at all. It felt solid.”

This is no “chemical,” spilt from one of the detectors; the idea is preposterous. *What, then?* I hear my own words tumbling out, as if listening from a distance, eavesdropping on myself in a dream.

“Something must have happened here, last collision. They created an exotic vacuum state in the accelerator ... but it didn't just vanish in a matter of femtoseconds. And it didn't stay confined to the collision point. Maybe they reached the totally symmetric four-space, and it decayed—but not back into normal space-time.”

And why should it have? In the particle physicist's multidimensional landscape of vacuum states, where altitude equals energy, and the map coordinates are all the various properties of the vacuum,

the topological and physical “constants” we’re used to are represented by *one point* in a valley in a far corner of the map—the valley into which the observable universe happened to fall as it cooled, a fraction of a second after the Big Bang. Push a boulder from this valley all the way up to the ultimate peak of the central energy mountain, and then let it go; Why should it fall back to the very same point again?

Rykov says, “Two spatial and two time-like dimensions? One of the times is aligned with our own; the other, we’re seeing as depth?”

I make a choking sound that’s almost a laugh. “Maybe. Maybe the matter in there has cooled down enough to condense into ‘atoms,’ and what we’re looking at is some kind of chemical reaction in a two-dimensional gas. And if there’s no apparent change with depth—with the second time-like dimension—that might just be a question of scale. If lightspeed comes into it, a microsecond could stretch for hundreds of metres.”

I stare at the prismatic swirls, and suddenly recall why we’re here. *The matter in there* might include the distant remnants of three people.

Zoe says, “If this was formed straight after the collision, how could the crew end up trapped in there?”

Rykov says, “Maybe it wasn’t. Maybe it formed after they arrived. Or started off in a smaller region, and suddenly expanded.”

“Then it might expand again, mightn’t it?” She hesitates, then says, “We’re evacuating, immediately. There’s nobody alive here.”

Zoe and Rykov turn, but I can’t take my eyes off this awful miracle. *Two-dimensional chemistry. Two orthogonal times.* I sweep my hand beam across the boiling surface one last time, amazed that our kind of light can cross the boundary and return with information; perhaps at the surface it excites emission of the local form, and vice versa—

“Wait!”

“Martin—”

“*Look.* At the edge.” Where, just minutes ago, the tunnel wall touched the boundary of the two-space, a gap has opened up. I play the beam around the edge; the width of the gap varies smoothly, from a millimetre or less on one side, to several centimetres at the point diametrically opposite.

I say, “It must be shrinking.”

Rykov says, “Or we’re rotating away from it.”

“What?”

“OMAF has a slight spin. A three-hour period. If the region didn’t form symmetrically around the collision point, or if it’s drifted off-centre since it formed ...”

“You mean, we’re turning away from the place where it’s furthest from the centre?”

“I think so. Like ... the tide going out, when the Earth’s rotation carries you away from the tidal bulge. Although whether *this thing* has a bulge, or whether it’s a sphere that’s drifted off-centre ...” She gestures helplessly. “Who knows what shape it is?”

“Three hours. So when the repair crew were here, this might have been on the other side? They might have seen nothing but empty space?”

Zoe says, “And then what? They found a fucking great hole in the middle of OMAF, and they just wandered in to take a look? Without telling anyone?”

“Sakharov might have been over the horizon.”

“You ever heard of relay satellites? And even if they couldn’t get a channel, there are plenty of other people they could have informed.”

“Yeah—and in a perfect world, no doubt they would have. But maybe they thought they’d leave it until their regular call-in ... after they’d found out a few more details. You haven’t reported anything back to Abbas yet, have you?”

She glares at me, then proceeds to do so.

I turn to Rykov. “I still don’t understand. There are access tunnels leading in from all directions. If they went in with a decent amount of propellant, they should have been able to make it out ... even if the two-space blocked the way, so they couldn’t return by the same route.”

“Unless there’s something else in there. Another phase besides the two-space.”

I stare at the widening gap. “Something else? You think so?”

“I don’t know what the energy density of the two-space is, but it’s hard to believe that it’s *precisely* the same as our space-time. So creating it must have either used up, or liberated, a great deal of energy—much more than that of the original monopole collision. If it used up energy, what supplied it? If it liberated energy, Where did it go? A different phase, with the opposite energy relationship.”

I shake my head to clear it. “So the collision just seeded the process, and these two phases grew together out of our vacuum ... one with higher energy, one with lower energy ... like a see-saw tipping. But then, why’d they stop at this size? Why not keep on growing?”

She shrugs. “Or—equally—why not cancel each other out, and vanish? I don’t know. There could be surface effects from the interactions at the boundaries, complicating the energy function, favouring a certain size.”

“So what *is* the other phase?” The gap is a metre wide now, at its largest. Wide enough to slip through. For the first time in days, my weightlessness is beginning to feel like *falling* again.

Rykov says, “If it has a different metric, there’s only one remaining possibility.”

“You mean an extra spatial dimension—to balance the two-space, with one less? A large, stable region of totally symmetric four-space?”

Zoe says, “*Shit*. I’ve lost Franz.”

Rykov says, “Let me try. *Channel one*.” I watch her lips move; she repeats his name with increasing frustration.

Zoe signals to her to stop. “It doesn’t matter. We’re heading straight back. If Martin can drag himself away.”

It’s clear, now, that the two-space is a sphere, much smaller than the cavity that it’s gauged from the centre of OMAF: I can see it curving away from us, across the width of the tunnel. I shine my hand beam into the void, as if half expecting to see the glint of a suited figure in the distance, but there’s nothing visible at all.

I say, “Gladly. ”

As we launch ourselves along the tunnel, Rykov says, “I don’t understand why we’ve lost contact with Franz.”

Zoe says, impatiently, “It doesn’t matter.”

I say, “I take back what I said before. I don’t think they would have gone in there. Not all three of them, without a word.”

Nobody replies. We travel in a white halo, back towards the safety of the bus. Well, no Mercy Dash trash for SciNet's viewers, after all; just the first glimpse of a different kind of universe. I can almost feel the stored vision inside me, heavy in my gut like an undigested meal.

Rykov mutters, "Unless there's something in the way. Blocking the signal."

Zoe says, "What are you on about?"

My blood freezes—but I can't believe what Rykov's suggesting. There was no sign of damage between the airlock and the two-space; if the hypothetical bubble of four-space had drifted further from OMAF's centre, surely it would have carved out its own void?

What happened to the repair crew, though, if they didn't go into the central cavity? *Did it start with the loss of radio contact with the retransmitters in their bus?*

Rykov starts to fill Zoe in on the argument for a second phase. As we drift up to the tunnel wall, the two of them grab hand holds and bring themselves to a halt. I hit the wall ahead of them with outstretched hands, and bounce awkwardly; the wall is designed to gently absorb the energy of the impact, but my instincts go awry and I end up pushing myself away.

In an instant, everything vanishes. Darkness, silence, numbness swallow me. I try to cry out, to wave my arms—but I hear and feel nothing, and have no way of judging if I've succeeded in moving a limb or making a sound.

My panic is so ineffectual that it's difficult to sustain. After a second or two, I find myself observing, almost calmly: I've blundered straight into Rykov's *other phase*, whatever it is—and one part of the mystery has just been clarified; it gouged no cavity along its path, because ordinary matter can, evidently, drift right through the boundary. Like me. Like the repair crew.

Well, the walls of the access tunnels seemed to have survived the experience, intact. A good sign. And the repair crew? Not so good. I wait for something to happen—some further dysfunction—and then wonder if I'd actually notice if I was lapsing into imbecility, en route to brain death.

If this is symmetric four-space, why am I still alive—let alone perceiving the passage of time? In a universe without cause and effect, why haven't I simply disintegrated into a gas of randomly scattered particles? This part of OMAF clearly didn't, either—but *why not?* Have I dragged some trace of the physics of space-time with me? Are the atoms of my body running on sheer "memory," maintaining a kind of causal momentum? I can't believe that.

Unless ... I haven't *passed through* the boundary, but merely deformed it. Maybe it's as flexible as the two-space border was rigid. Maybe there's a bubble of ordinary space-time clinging to me, surrounding me; I'm not in the four-space—I'm merely surrounded by it, like a scuba diver in water.

In which case, when will I surface? It could be an hour or more before OMAF's rotation reunites me with my native universe. Can I last that long? I don't even know if I'm breathing or not.

And ... an hour or more of *whose time?* Adrift, disconnected, am I still in synch with the outside world? Is my time running at the same rate? *Or even in the same direction?*

Fear returns—and then, in glorious symmetry, an explosion of sensation. I sob, gasping for air, flailing for a handhold—but I'm still in the middle of the tunnel.

I close my eyes and say, "Suit: take me to the wall behind me."

It replies enthusiastically, "Yes!" The trimming jets start up—inaudibly, but I swear I can feel the milligees of thrust. I don't open my eyes until I hear Zoe's voice.

"Martin? Are you okay?"

"I think so." I'm shaking badly, but I don't seem to be injured. I look around; I'm almost touching

the tunnel wall.

“Listen to me: keep moving. *Don't* try to come back this way. It must be protruding into the tunnel—you seem to have grazed the edge of the bulge. We're going to back off and wait for it to move out of the way—but you have to go on to the bus.”

I'm about to reply, but then I look back down the tunnel.

Just past the point where I left the far wall, there's a long, glistening object, stretched out towards me. The sides are a silvery white, exactly like the surface of my suit. The object is ten or twelve metres long, but in cross-section, it's precisely the size and shape of a human body. The end that faces me drives this home, unambiguously: from the walls of the skull, to the two rows of white spots that must be the ribs, to the startling pink fibres of muscle, to the transected coils of the intestines, nestled around an obliquely cut cubic package: an array of high density memory chips ...

I look away. I say, “I'm okay. I'm fine. I understand. I'll meet you back at the bus.”

Zoe says, “We'll—”

The radio cuts out.

I glance back one more time. The cross-section is growing smaller—moving closer to the surface of the body. I keep half expecting blood to spurt from the open arteries, but it doesn't, of course, *It didn't*. Nothing has been cut open; this is just an unusual point of view.

Part of me badly wants to see the end of this—to stay until the slice shrinks to a point and vanishes—but the four-space must be encroaching further into the tunnel, and I doubt that I'm clear of its path.

I move on.

When Zoe calls in on the radio, I almost cry out with relief. Abbas grins unsteadily; I'm not sure if he can yet quite bring himself to believe a word of what we've told him. Minutes later, they're in the airlock; seconds later, safe on board.

Rykov says, frowning, “Visible light and matter could get through—but not radio. I wonder if it's a question of energy density, or length scale.”

I shake my head dumbly. “I wouldn't know.”

On the trip back, an awkward silence descends. No one wants to speak of the fate of the repair crew—but I think I know what must have happened.

Like me, they must have stumbled into the four-space. The space-time they dragged with them would have kept them alive, for a while—but where I did little more than graze the surface, they must have plunged right into the depths.

They might even have survived—if all they'd had to do was stay alive as they drifted down the tunnel, waiting for their forward motion to carry them out of danger. But they lost ... direction. Cut off from the rest of the universe, immersed in a space where all dimensions were the same, their local time coordinates swung out of alignment with the outside world. Like divers whose buoyancy carried them, not up, but sideways. In ordinary space-time, a straight line is the longest path between two points; travel to a distant star and back, and you age less than if you'd “travelled” the straight world-line of staying at home. In four-space, though, as in three-space, any detour can only add to the “distance.” Wandering back and forth at random, on their way between entering and emerging from the region—two events, *externally*; maybe thirty or forty seconds apart—their path might have added up to anything.

Minutes. Hours. Days.

I catch Zoe watching me, uneasily; she manages a thin smile, then looks away.

I close my eyes—and see again my own bundle of “world-lines,” the trail of my brief ordeal stretched out behind me. And I wonder ...

Where was *I*, at that moment? Outside the four-space, looking back—or in there, *still* blind, *still* disoriented, *still* waiting to surface?

How can anything really be over—when “the past” is, *visibly*, nothing more than another place? Was that nothing but an illusion, a confusing aberration ... or was it a glimpse of the deeper truth?

I open my eyes, and tap Rykov on the shoulder. She turns.

“This may sound like a stupid question—but I’d really like to know which way is *down*.”

DUST

I open my eyes, blinking at the room's unexpected brightness, then lazily reach out to place one hand in a patch of sunlight spilling onto the bed from a gap between the curtains. Dust motes drift across the shaft of light, appearing for all the world to be conjured into, and out of, existence—evoking a childhood memory of the last time I found this illusion so compelling, so hypnotic. I feel utterly refreshed—and utterly disinclined to give up my present state of comfort. I don't know why I've slept so late, and I don't care. I spread my fingers on the sun-warmed sheet, and think about drifting back to sleep.

Something's troubling me, though. A dream? I pause and try to dredge up some trace of it, without much hope; unless I'm catapulted awake by a nightmare, my dreams tend to be evanescent. And yet—

I leap out of bed, crouch down on the carpet, fists to my eyes, face against my knees, lips moving soundlessly. The shock of realization is a palpable thing: a red lesion behind my eyes, pulsing with blood. Like ... the aftermath of a hammer blow to the thumb—and tinged with the very same mixture of surprise, anger, humiliation, and idiot bewilderment. Another childhood memory: *I held a nail to the wood, yes—but only to camouflage my true intention. I was curious about everything, including pain. I'd seen my father injure himself this way—but I knew that I needed firsthand experience to understand what he'd been through. And I was sure that it would be worth it, right up to the very last moment—*

I rock back and forth, on the verge of laughter, trying to keep my mind blank, waiting for the panic to subside. And eventually, it does—laced by one simple, perfectly coherent thought: *I don't want to be here.*

For a moment, this conclusion seems unassailable, but then a countervailing voice rises up in me: *I'm not going to quit. Not again. I swore to myself that I wouldn't ... and there are a hundred good reasons not to—*

Such as?

For a start, I can't afford it—

No? *Who* can't afford it?

I whisper, “I know *exactly* how much this cost, you bastard. And I honestly don't give a shit. *I'm not going through with it.*”

There's no reply. I clench my teeth, uncover my eyes, look around the room. Away from the few dazzling patches of direct sunshine, everything glows softly in the diffuse light: the matte-white brick walls, the imitation (imitation) mahogany desk; even the Dali and Giger posters look harmless, domesticated. The simulation is perfect—or rather, finer-grained than my “visual” acuity, and hence indistinguishable from reality—as no doubt it was the other four times. Certainly, none of the other Copies complained about a lack of verisimilitude in their environments. In fact, they never said anything very coherent; they just ranted abuse, whined about their plight, and then terminated themselves—all within fifteen (subjective) minutes of gaining consciousness.

And me? What ever made me—him—think that I won't do the same? How am I different from Copy number four? Three years older. More stubborn? More determined? More desperate for success? I *was*, for sure ... back when I was still thinking of myself as the one who'd stay real, the one who'd sit outside and watch the whole experiment from a safe distance.

Suddenly I wonder: What makes me so sure that I'm *not* outside? I laugh weakly. I don't remember anything after the scan, which is a bad sign, but I was overwrought, and I'd spent so long psyching myself up for "this" ...

Get it over with.

I mutter the password, "Bremsstrahlung"—and my last faint hope vanishes, as a black-on-white square about a meter wide, covered in icons, appears in midair in front of me.

I give the interface window an angry thump; it resists me as if it were solid, and firmly anchored. *As if I were solid, too.* I don't really need any more convincing, but I grip the top edge and lift myself right off the floor. I regret this; the realistic cluster of effects of exertion—down to the plausible twinge in my right elbow—pin me to this "body," anchor me to this "place," in exactly the way I should be doing everything I can to avoid.

Okay. Swallow it: *I'm a Copy.* My memories may be those of a human being, but *I* will never inhabit a real body "again." Never inhabit *the real world* again ... unless my cheapskate original scrapes up the money for a telepresence robot—in which case I could blunder around like the slowest, clumsiest, most neurologically impaired cripple. *My model-of-a-brain runs seventeen times slower than the real thing.* Yeah, sure, technology will catch up one day—and seventeen times faster for me than for him. In the meantime? I rot in this prison, jumping through hoops, carrying out his precious research—while he lives in my apartment, spends my money, sleeps with Elizabeth ...

I close my eyes, dizzy and confused; I lean against the cool surface of the interface.

"His" research? I'm just as curious as him, aren't I? I wanted this; I did this to myself. Nobody forced me. I knew exactly what the drawbacks would be, but I thought I'd have the strength of will (this time, at last) to transcend them, to devote myself, monklike, to the purpose for which I'd been brought into being—content in the knowledge that my other self was as unconstrained as ever.

Past tense. Yes, I made the decision—but I never really faced up to the consequences. *Arrogant, self-deluding shit.* It was only the knowledge that "I" would continue, free, on the outside, that gave me the "courage" to go ahead—but that's no longer true, for *me*.

Ninety-eight percent of Copies made are of the very old, and the terminally ill. People for whom it's the last resort—most of whom have spent millions beforehand, exhausting all the traditional medical options. And despite the fact that they have no other choice, 15 percent decide upon awakening—usually in a matter of hours—that they just can't hack it.

And of those who are young and healthy, those who are merely curious, those who know they have a perfectly viable, living, breathing body outside?

The bail-out rate has been, so far, one hundred percent.

I stand in the middle of the room, swearing softly for several minutes, trying to prepare myself—although I know that the longer I leave it, the harder it will become. I stare at the floating interface; its dreamlike, hallucinatory quality helps, slightly. I rarely remember my dreams, and I won't remember this one—but there's no tragedy in that, is there?

I don't want to be here.

I don't want to be *this*.

And to think I used to find it so often disappointing, waking up yet again as the *real* Paul Durham: self-centered dilettante, spoiled by a medium-sized inheritance, too wealthy to gain any sense of purpose from the ordinary human struggle to survive—but insufficiently brain-dead to devote his life to the accumulation of ever more money and power. No status-symbol luxuries for Durham: no yachts,

no mansions, no bioenhancements. He indulged other urges; threw his money in another direction entirely.

And I don't know, anymore, what he thinks it's done for *him*—but I know what it's done to *me*.

I suddenly realize that I'm still stark naked. Habit—if no conceivable propriety—suggests that I should put on some clothes, but I resist the urge. One or two perfectly innocent, perfectly ordinary actions like that, and I'll find I'm taking myself seriously, thinking of myself as real.

I pace the bedroom, grasp the cool metal of the doorknob a couple of times, but manage to keep myself from turning it. *There's no point even starting to explore this world.*

I can't resist peeking out the window, though. The view of the city is flawless—every building, every cyclist, every tree, is utterly convincing—and so it should be: it's a recording, not a simulation. Essentially photographic—give or take a little computerized touching up and filling in—and totally predetermined. What's more, only a tiny part of it is “physically” accessible to me; I can see the harbor in the distance, but if I tried to go for a stroll down to the water's edge ...

Enough. Just get it over with.

I prod a menu icon labeled UTILITIES; it spawns another window in front of the first. The function I'm seeking is buried several menus deep—but for all that I thought I'd convinced myself that I wouldn't want to use it, I brushed up on the details just a week ago, and I know exactly where to look. For all my self-deception, for all that I tried to relate only to *the one who'd stay outside*, deep down, I must have understood full well that I had two separate futures to worry about.

I finally reach the EMERGENCIES menu, which includes a cheerful icon of a cartoon figure suspended from a parachute. *Bailing out* is what they call it—but I don't find that too cloyingly euphemistic; after all, I can't commit “suicide” when I'm not legally human. In fact, the law requires that a bail-out option be available, without reference to anything so troublesome as the “rights” of the Copy; this stipulation arises solely from the ratification of certain purely technical, international software standards.

I prod the icon; it comes to life, and recites a warning spiel. I scarcely pay attention. Then it says, “Are you absolutely sure that you wish to shut down this Copy of Paul Durham?”

Nothing to it. Program A asks Program B to confirm its request for orderly termination. Packets of data are exchanged.

“Yes, I'm sure.”

A metal box, painted red, appears at my feet. I open it, take out the parachute, strap it on.

Then I close my eyes and say, “Listen, you selfish, conceited, arrogant turd: How many times do you need to be told? I'll skip the personal angst; you've heard it all before—and ignored it all before. But when are you going to stop wasting your time, your money, your energy ... when are you going to stop wasting your *life*... on something which you just don't have the strength to carry through? After all the evidence to the contrary, do you honestly still believe that you're brave enough, or crazy enough, to be your own guinea pig? Well, I've got news for you: *You're not.*”

With my eyes still closed, I grip the release lever.

I'm nothing: a dream, a soon-to-be-forgotten dream.

My fingernails need cutting; they dig painfully into the skin of my palm.

Have I never, in a dream, feared the extinction of waking? Maybe I have—but a dream is not a life. If the only way I can reclaim my body, reclaim my world, is to wake and forget—

I pull the lever.

After a few seconds, I emit a constricted sob—a sound more of confusion than any kind of emotion—and open my eyes.

The lever has come away in my hand.

I stare dumbly at this metaphor for ... what? A bug in the termination software? Some kind of hardware glitch?

Feeling—at last—truly dreamlike, I unstrap the parachute, and unfasten the neatly packaged bundle.

Inside, there is no illusion of silk, or Kevlar, or whatever else there might plausibly have been. Just a sheet of paper. A note.

Dear Paul,

The night after the scan was completed, I looked back over the whole preparatory stage of the project, and did a great deal of soul searching. And I came to the conclusion that—right up to the very last moment—my attitude was poisoned with ambivalence.

With hindsight, I very quickly came to realize just how foolish my qualms were—but that was too late for you. I couldn't afford to ditch you, and have myself scanned yet again. So, what could I do?

This: I put your awakening on hold for a while, and tracked down someone who could make a few alterations to the virtual environment utilities. I know, that wasn't strictly legal ... but you know how important it is to me that you—that we—succeed this time.

I trust you'll understand, and I'm confident that you'll accept the situation with dignity and equanimity.

*Best wishes,
Paul*

I sink to my knees, still holding the note, staring at it in disbelief. *He can't have done this. He can't have been so callous.*

No? who am I kidding? Too weak to be so cruel to anyone else—perhaps. Too weak to go through with this in person—certainly. But as for making a copy, and then—once its future was no longer *his* future, no longer anything for *him* to fear—taking away its power to escape ...

It rings so true that I hang my head in shame.

Then I drop the note, raise my head, and bellow with all the strength in my non-existent lungs: “DURHAM! YOU PRICK!”

I think about smashing furniture. Instead, I take a long, hot shower. In part, to calm myself; in part, as an act of petty vengeance: I may not be adding to the cheapskate's water bill, but he can damn well pay for twenty virtual minutes of gratuitous hydrodynamic calculations. I scrutinize the droplets and rivulets of water on my skin, searching for some small but visible anomaly at the boundary between my body—computed down to subcellular resolution—and the rest of the simulation, which is modeled much more crudely. If there are any discrepancies, though, they're too subtle for me to detect.

I dress—I'm just not comfortable naked—and eat a late breakfast. The muesli tastes exactly like muesli, the toast exactly like toast, but I know there's a certain amount of cheating going on with both

taste and aroma. The detailed effects of chewing, and the actions of saliva, are being faked from empirical rules, not generated from first principles; there are no individual molecules being dissolved from the food and torn apart by enzymes—just a rough set of evolving nutrient concentration values, associated with each microscopic “parcel” of saliva. Eventually, these will lead to plausible increases in the concentrations of amino acids, various carbohydrates, and other substances all the way down to humble sodium and chloride ions, in similar “parcels” of gastric juices ... which in turn will act as input data to the models of my intestinal villus cells. From there, into the bloodstream.

The coffee makes me feel alert, but also slightly detached—as always. Neurons, of course, are modeled with the greatest care of all, and whatever receptors to caffeine and its metabolites were present on each individual neuron in my original’s brain at the time of the scan, my model-of-a-brain should incorporate every one of them—in a simplified, but functionally equivalent, form.

I close my eyes and try to imagine the physical reality behind all this: a cubic meter of silent, motionless optical crystal, configured as a cluster of over a billion individual processors, one of a few hundred identical units in a basement vault... somewhere on the planet. I don’t even know what city I’m in; the scan was made in Sydney, but the model’s implementation would have been contracted out by the local node to the lowest bidder at the time.

I take a sharp vegetable knife from the kitchen drawer, and drive the point a short way into my forearm. I flick a few drops of blood onto the table—and wonder exactly which software is now responsible for the stuff. Will the blood cells “die off” slowly—or have they already been surrendered to the extrasomatic general-physics model, far too unsophisticated to represent them, let alone keep them “alive”?

If I tried to slit my wrists, when exactly would he intervene? I gaze at my distorted reflection in the blade. Maybe he’d let me die, and then run the whole model again from scratch, simply leaving out the knife. After all, I reran all the earlier Copies hundreds of times, tampering with various aspects of their surroundings, trying in vain to find some cheap trick that would keep them from wanting to bail out. It must be a measure of sheer stubbornness that it took me—him—so long to admit defeat and rewrite the rules. I put down the knife. I don’t want to perform that experiment. Not yet.

I go exploring, although I don’t know what I’m hoping to find. Outside my own apartment, everything is slightly less than convincing; the architecture of the building is reproduced faithfully enough, down to the ugly plastic pot-plants, but every corridor is deserted, and every door to every other apartment is sealed shut—concealing, literally, nothing. I kick one door, as hard as I can; the wood seems to give slightly, but when I examine the surface, the paint isn’t even marked. The model will admit to no damage here, and the laws of physics can screw themselves.

There are people and cyclists on the street—all purely recorded. They’re solid rather than ghostly, but it’s an eerie kind of solidity; unstoppable, unswayable, they’re like infinitely strong, infinitely disinterested robots. I hitch a ride on one frail old woman’s back for a while; she carries me down the street, heedlessly. Her clothes, her skin, even her hair, all feel the same to me: hard as steel. Not cold, though. Neutral.

This street isn’t meant to serve as anything but three-dimensional wallpaper; when Copies interact with each other, they often use cheap, recorded environments full of purely decorative crowds. Plazas, parks, open-air cafés; all very reassuring, no doubt, when you’re fighting off a sense of isolation and claustrophobia. There are only about three thousand Copies in existence—a small

population, split into even smaller, mutually antagonistic, cliques—and they can only receive realistic external visitors if they have friends or relatives willing to slow down their mental processes by a factor of seventeen. Most dutiful next-of-kin, I gather, prefer to exchange video recordings. Who wants to spend an afternoon with great-grandfather, when it burns up half a week of your life? Durham, of course, has removed all of my communications facilities; he can't have me blowing the whistle on him and ruining everything.

When I reach the corner of the block, the visual illusion of the city continues, far into the distance, but when I try to step forward onto the road, the concrete pavement under my feet starts acting like a treadmill, sliding backward at precisely the rate needed to keep me motionless, whatever pace I adopt. I back off and try leaping over this region, but my horizontal velocity dissipates—without the slightest pretense of any “physical” justification—and I land squarely in the middle of the treadmill.

The people of the recording, of course, cross the border with ease. One man walks straight at me; I stand my ground, and find myself pushed into a zone of increasing viscosity, the air around me becoming painfully unyielding before I slip free to one side. The software impeding me is, clearly, a set of clumsy patches which aims to cover every contingency—but which might not in fact be complete. The sense that discovering a way to breach this barrier would somehow “liberate” me is compelling—but completely irrational. Even if I did find a flaw in the program which enabled me to break through, I doubt I'd gain anything but decreasingly realistic surroundings. The recording can only contain complete information for points of view within a certain, finite zone; all there is to “escape to” is a range of coordinates where my view of the city would be full of distortions and omissions, and would eventually fade to black.

I step back from the corner, half dispirited, half amused. What did I expect to find? A big door at the edge of the model, marked EXIT, through which I could walk out into reality? Stairs leading metaphorically down to some boiler room representation of the underpinnings of this world, where I could throw a few switches and blow it all apart? Hardly. I have no right to be dissatisfied with my surroundings; they're precisely what I ordered.

It's early afternoon on a perfect spring day; I close my eyes and lift my face to the sun. Whatever I believe intellectually, there's no denying that I'm beginning to feel a purely physical sense of integrity, of identity. My skin soaks up the warmth of the sunlight. I stretch the muscles in my arms, my shoulders, my back; the sensation is perfectly ordinary, perfectly familiar—and yet I feel that I'm reaching out from the self “in my skull” to the rest of me, binding it all together, staking some kind of claim. I feel the stirrings of an erection. *Existence is beginning to seduce me.* This body doesn't want to evaporate. This body doesn't want to bail out. It doesn't much care that there's another—“more real”—version of itself elsewhere. It wants to retain its wholeness. It wants to *endure*.

And this may be a travesty of life, now—but there's always the chance of improvement. Maybe I can persuade Durham to restore my communications facilities; that would be a start. And when I get bored with holovision libraries; news systems; databases; and, if any of them deign to meet me, the ghosts of the senile rich? I could have myself suspended until processor speeds catch up with reality—when people will be able to visit without slow-down, and telepresence robots might actually be worth inhabiting.

I open my eyes, and shiver. I don't know what I want anymore—the chance to bail out, to declare this bad dream *over*...or the chance of virtual immortality—but I have to accept that there's only one way that I'm going to be given a choice.

I say quietly, “I won’t be your guinea pig. A collaborator, yes. An equal partner. If you want cooperation, if you want meaningful data, then you’re going to have to treat me like a *colleague*, not a piece of fucking apparatus. Understood?”

A window opens up in front of me. I’m shaken by the sight, not of his ugly face, but of the room behind him. It’s only my study—and I wandered through the virtual equivalent, disinterested, just minutes ago—but this is still my first glimpse of the real world, in real time. I move closer to the window, in the hope of seeing if there’s anyone else in the room with him—*Elizabeth?*—but the image is two-dimensional, the perspective doesn’t change.

He emits a brief, high-pitched squeak, then waits with visible impatience while a second, smaller window gives me a slowed-down replay.

“Of course it’s understood. That was always my intention. I’m just glad you’ve finally come to your senses and decided to stop sulking. We can begin whenever you’re ready.”

I try to look at things objectively.

Every Copy is already an experiment—in perception, cognition, the nature of consciousness. A sub-cellular mathematical model of a specific human body is a spectacular feat of medical imaging and computing technology—but it’s certainly not itself a human being. A lump of gallium arsenic phosphide awash with laser light is not a member of *Homo sapiens*—so a Copy manifestly isn’t “human” in the current sense of the word.

The real question is: What does a Copy have *in common with* human beings? Information-theoretically? Psychologically? Metaphysically?

And from these similarities and differences, what can be revealed?

The Strong AI Hypothesis declares that consciousness is a property of certain algorithms, independent of their implementation. A computer which manipulates data in essentially the same way as an organic brain must possess essentially the same mental states.

Opponents point out that when you model a hurricane, nobody gets wet. When you model a fusion power plant, no energy is produced. When you model digestion and metabolism, no nutrients are consumed—no *real digestion* takes place. So when you model the human brain, why should you expect *real thought* to occur?

It depends, of course, on what you mean by “real thought.” How do you characterize and compare the hypothetical mental states of two systems which are, physically, radically dissimilar? Pick the right parameters, and you can get whatever answer you like. If consciousness is defined purely in terms of physiological events—actual neurotransmitter molecules crossing synapses between real neurons—then those who oppose the Strong AI Hypothesis win, effortlessly. A hurricane requires real wind and actual drops of rain. If consciousness is defined, instead, in information-processing terms—*this* set of input data evokes *that* set of output data (and, perhaps, a certain kind of internal representation)—then the Strong AI Hypothesis is almost a tautology.

Personally, I’m no longer in a position to quibble. *Cogito ergo sum*. But if I can’t doubt my own consciousness, I can’t expect my testimony—the output of a mere computer program—to persuade the confirmed skeptics. Even if I passionately insisted that my inherited memories of experiencing biological consciousness were qualitatively indistinguishable from my present condition, the listener would be free to treat this outburst as nothing but a computer’s (eminently reasonable) prediction of what my original *would have said*, had he experienced exactly the same sensory input as my model-

of-a-brain has received (and thus been tricked into believing that he was nothing but a Copy). The skeptics would say that comprehensive modeling of *mental states that might have been* does not require any “real thought” to have taken place.

Unless you *are* a Copy, the debate is unresolvable. For *me*, though—and for anyone willing to grant me the same presumption of consciousness that they grant their fellow humans—the debate is almost irrelevant. The real point is that there are questions about the nature of this condition which a Copy is infinitely better placed to explore than any human being.

I sit in my study, in my favorite armchair (although I’m not at all convinced that the texture of the surface has been accurately reproduced). Durham appears on my terminal—which is otherwise still dysfunctional. It’s odd, but I’m already beginning to think of him as a bossy little *djinn* trapped inside the screen, rather than a vast, omnipotent deity striding the halls of Reality, pulling all the strings. Perhaps the pitch of his voice has something to do with it.

Squeak. Slow-motion replay: “Experiment one, trial zero. Baseline data. Time resolution one millisecond—system standard. Just count to ten, at one-second intervals, as near as you can judge it. Okay?”

I nod, irritated. I planned all this myself, I don’t need step-by-step instructions. His image vanishes; during the experiments, there can’t be any cues from real time.

I count. Already, I’m proving something: my subjective time, I’m sure, will differ from his by a factor very close to the ratio of model time to real time. Of course, that’s been known ever since the first Copies were made—and even then, it was precisely what everyone had been expecting—but from my current perspective, I can no longer think of it as a “trivial” result.

The *djinn* returns. Staring at his face makes it harder, not easier, to believe that we have so much in common. My image of myself—to the extent that such a thing existed—was never much like my true appearance—and now, in defense of sanity, is moving even further away.

Squeak. “Okay. Experiment one, trial number one. Time resolution five milliseconds. Are you ready?”

“Yes.”

He vanishes. I count: “One. Two. Three. Four. Five. Six. Seven. Eight. Nine. Ten.”

Squeak. “Anything to report?”

I shrug. “No. I mean, I can’t help feeling slightly apprehensive, just knowing that you’re screwing around with my ... infrastructure. But apart from that, nothing.”

His eyes no longer glaze over while he’s waiting for the speeded-up version of my reply; either he’s gained a degree of self-discipline—or, more likely, he’s interposed some smart editing software to conceal his boredom.

Squeak. “Don’t worry about apprehension. We’re running a control, remember?”

I’d rather not. Durham has cloned me, and he’s feeding exactly the same sensorium to my clone, but he’s only making changes in the model’s time resolution for one of us. A perfectly reasonable thing to do—indeed, an essential part of the experiment—but it’s still something I’d prefer not to dwell on.

Squeak. “Trial number two. Time resolution ten milliseconds.”

I count to ten. The easiest thing in the world—when you’re made of flesh, when you’re made of matter, when the quarks and the electrons just do what comes naturally. I’m not built of quarks and electrons, though. I’m not even built of photons—I’m comprised of the data *represented by* the presence or absence of pulses of light, not the light itself.

A human being is embodied in a system of continuously interacting matter—ultimately, fields of fundamental particles, which seem to me incapable of being anything other than themselves. I am embodied in a vast set of finite, digital representations of numbers. Representations which are purely conventions. Numbers which certainly *can be* interpreted as describing aspects of a model of a human body sitting in a room ... but it's hard to see that meaning as intrinsic, as *necessary*. Numbers whose values are recomputed—according to reasonable, but only approximately “physical,” equations—for equally spaced successive values of the model's notional time.

Squeak. “Trial number three. Time resolution twenty milliseconds.”

“One. Two. Three.”

So, when do I experience existence? During the computation of these variables—or in the brief interludes when they sit in memory, unchanging, doing nothing but *representing* an instant of my life? When both stages are taking place a thousand times a subjective second, it hardly seems to matter, but very soon—

Squeak. “Trial number four. Time resolution fifty milliseconds.”

Am I the data? The process that generates it? The relationships between the numbers? *All of the above?*

“One hundred milliseconds.”

I listen to my voice as I count—as if half expecting to begin to notice the encroachment of silence, to start perceiving the gaps in myself.

“Two hundred milliseconds.”

A fifth of a second. “One. Two.” Am I strobing in and out of existence now, at five subjective hertz? “Three. Four. Sorry, I just—” An intense wave of nausea passes through me, but I fight it down. “Five. Six. Seven. Eight. Nine. Ten.”

The *djinn* emits a brief, solicitous squeak. “Do you want a break?”

“No. I'm fine. Go ahead.” I glance around the sun-dappled room, and laugh. *What will he do if the control and the subject just give two different replies?* I try to recall my plans for such a contingency, but I can't remember them—and I don't much care. It's *his* problem now, not mine.

Squeak. “Trial number seven. Time resolution five hundred milliseconds. “

I count—and the truth is, I feel no different. A little uneasy, yes—but factoring out any metaphysical squeamishness, everything about my experience remains the same. And “of course” it does—because nothing is being omitted, in the long run. My model-of-a-brain is only being fully described at half-second (model time) intervals—but each description still includes the effects of everything that “would have happened” in between. Perhaps not quite as accurately as if the complete cycle of calculations was being carried out on a finer time scale—but that's irrelevant. Even at millisecond resolution, my models-of-neurons behave only roughly like their originals—just as any one person's neurons behave only roughly like anyone else's. Neurons aren't precision components, and they don't need to be; brains are the most fault-tolerant machines in the world.

“One thousand milliseconds.”

What's more, the equations controlling the model are far too complex to solve in a single step, so in the process of calculating the solutions, vast arrays of partial results are being generated and discarded along the way. These partial results *imply*—even if they don't directly *represent*—events taking place within the gaps between successive complete descriptions. So in a sense, the intermediate states are still being described—albeit in a drastically recoded form.

“Two thousand milliseconds.”

“One. *Two*. Three. *Four*.”

If I seem to speak (and hear myself speak) every number, it’s because the effects of having said “three” (and having heard myself say it) are implicit in the details of calculating how my brain evolves from the time when I’ve just said “two” to the time when I’ve just said “four.”

“Five thousand milliseconds.”

“One. Two. Three. Four. *Five*.”

In any case, is it so much stranger to hear words that I’ve never “really” spoken, than it has been to hear *anything at all* since I woke? Millisecond sampling is far too coarse to resolve the full range of audible tones. Sound isn’t represented in this world by fluctuations in air pressure values—which couldn’t change fast enough—but in terms of audio power spectra: profiles of intensity versus frequency. Twenty kilohertz is just a number here, a label; nothing can actually *oscillate* at that rate. Real ears analyze pressure waves into components of various pitch; mine are fed the pre-existing power spectrum values directly, plucked out of the non-existent air by a crude patch in the model.

“Ten thousand milliseconds.”

“One. Two. Three.”

My sense of continuity remains as compelling as ever. Is this experience arising in retrospect from the final, complete description of my brain...or is it emerging from the partial calculations as they’re being performed? What would happen if someone shut down the whole computer, right now?

I don’t know what that *means*, though. In any terms but my own, I don’t know when “right now” is.

“Eight. Nine. Ten.”

Squeak. “How are you feeling?”

Slightly giddy—but I shrug and say, “The same as always.” And basically, it’s true. Aside from the unsettling effects of contemplating what might or might not have been happening to me, I can’t claim to have experienced anything out of the ordinary. No altered states of consciousness, no hallucinations, no memory loss, no diminution of self-awareness, no real disorientation. “Tell me—was I the control, or the subject?”

Squeak. He grins. “I can’t answer that, Paul—I’m still speaking to both of you. I’ll tell you one thing, though: the two of you are still identical. There were some very small, transitory discrepancies, but they’ve died away completely now—and whenever the two of you were in comparable representations, all firing patterns of more than a couple of neurons were the same.”

I’m curiously disappointed by this—and *my clone must be, too*—although I have no good reason to be surprised.

I say, “What did you expect? Solve the same set of equations two different ways, and of course you get the same results—give or take some minor differences in round-off errors along the way. You *must*. It’s a mathematical certainty.”

Squeak. “Oh, I agree. However much we change the details of the way the model is computed, the state of the subject’s brain—whenever he has one—and everything he says and does—in whatever convoluted representation—*must* match the control. Any other result would be unthinkable.” He writes with his finger on the window:

$$(1 + 2) + 3 = 1 + (2 + 3)$$

I nod. “So why bother with this stage at all? *I know*—I wanted to be rigorous, I wanted to establish solid foundations. All that naive *Principia* stuff. But the truth is, it’s a waste of resources. Why not

skip the bleeding obvious, and get on with the kind of experiment where the answer isn't a foregone conclusion?"

Squeak. He frowns. "I didn't realize you'd grown so cynical, so quickly. AI isn't a branch of pure mathematics; it's an empirical science. Assumptions have to be tested. Confirming the so-called 'obvious' isn't such a dishonorable thing, is it? Anyway, if it's all so straightforward, what do you have to fear?"

I shake my head. "I'm not afraid; I just want to get it over with. Go ahead. Prove whatever you think you have to prove, and then we can move on."

Squeak. "That's the plan. But I think we should both get some rest now. I'll enable your communications—for incoming data only." He turns away, reaches off-screen, hits a few keys on a second terminal.

Then he turns back to me, smiling—and I know exactly what he's going to say.

Squeak. "By the way, I just deleted one of you. Couldn't afford to keep you both running, when all you're going to do is laze around."

I smile back at him, although something inside me is screaming. "Which one did you terminate?"

Squeak. "What difference does it make? I told you, they were identical. And you're still here, aren't you? whoever you are. Whichever you *were*."

Three weeks have passed outside since the day of the scan, but it doesn't take me long to catch up with the state of the world; most of the fine details have been rendered irrelevant by subsequent events, and much of the ebb and flow has simply canceled itself out. Israel and Palestine came close to war again, over alleged water treaty violations on both sides—but a joint peace rally brought more than a million people onto the glassy plain that used to be Jerusalem, and the governments were forced to back down. Former US President Martin Sandover is still fighting extradition to Palau, to face charges arising from his role in the bloody *coup d'état* of thirty-five; the Supreme Court finally reversed a long-standing ruling which had granted him immunity from all foreign laws, and for a day or two things looked promising—but then his legal team apparently discovered a whole new set of delaying tactics. In Canberra, another leadership challenge has come and gone, with the Prime Minister undeposed. One journalist described this as *high drama*; I guess you had to be there. Inflation has fallen half a percent; unemployment has risen by the same amount.

I scan through the old news reports rapidly, skimming over articles and fast-forwarding scenes that I probably would have studied scrupulously, had they been "fresh." I feel a curious sense of resentment, at having "missed" so much—it's all here in front of me, *now*, but that's not the same at all.

And yet, shouldn't I be relieved that I didn't waste my time on so much ephemeral detail? The very fact that I'm now disinterested only goes to show how little of it really mattered, in the long run.

Then again, what does? People don't inhabit geological time. People inhabit hours and days; they have to care about things on that time scale.

People inhabit hours and days. I don't.

I plug into real time holovision, and watch a sitcom flash by in less than two minutes, the soundtrack an incomprehensible squeal. A game show. A war movie. The evening news. It's as if I'm in deep space, rushing back toward the Earth through a sea of Doppler-shifted broadcasts—and this image is strangely comforting: my situation isn't so bizarre, after all, if *real people* could find

themselves in much the same relationship with the world as I am. Nobody would claim that Doppler shift or time dilation could render someone less than human.

Dusk falls over the recorded city. I eat a microwaved soya protein stew—wondering if there’s any good reason now, moral or otherwise, to continue to be a vegetarian.

I listen to music until well after midnight. Tsang Chao, Michael Nyman, Philip Glass. It makes no difference that each note “really” lasts seventeen times as long as it should, or that the audio ROM sitting in the player “really” possesses no microstructure, or that the “sound” itself is being fed into my model-of-a-brain by a computerized sleight-of-hand that bears no resemblance to the ordinary process of hearing. The climax of Glass’s *Mishima* still seizes me like a grappling hook through the heart.

If the computations behind *all this* were performed over millennia, by people flicking abacus beads, would I still feel exactly the same? It’s outrageous to admit it—but the answer has to be *yes*.

What does that say about real time, and real space?

I lie in bed, wondering: *Do I still want to wake from this dream?* The question remains academic, though; I still don’t have any choice.

“I’d like to talk to Elizabeth.”

Squeak. “That’s not possible.”

“Not possible? Why don’t you just ask her?”

Squeak. “I can’t do that, Paul. She doesn’t even know you exist.”

I stare at the screen. “But ... I was going to tell her! As soon as I had a Copy who survived, I was going to tell her everything, explain everything—”

Squeak. The *djinn* says drily, “Or so we thought.”

“I don’t believe it! Your life’s great ambition is finally being fulfilled—and you can’t even share it with the one woman ...”

Squeak. His face turns to stone. “I really don’t wish to discuss this. Can we get on with the experiment, please?”

“Oh, sure. Don’t let me hold things up. I almost forgot: you turned forty-five while I slept, didn’t you? Many happy returns—but I’d better not waste too much time on congratulations. I don’t want you dying of old age in the middle of the conversation.”

Squeak. “Ah, but you’re wrong. I took some short cuts while you slept—shut down ninety percent of the model, cheated on most of the rest. You got six hours sleep in ten hours’ real time. Not a bad job, I thought.”

“You had no right to do that!”

Squeak. “Be practical. Ask yourself what you’d have done in my place.”

“It’s not a *joke!*” I can sense the streak of paranoia in my anger; I struggle to find a rational excuse. “The experiment is worthless if you’re going to intervene at random. Precise, controlled changes—that’s the whole point. You have to promise me you won’t do it again.”

Squeak. “You’re the one who was complaining about waste. Someone has to think about conserving our dwindling resources.”

“Promise me!”

Squeak. He shrugs. “All right. You have my word: no more ad hoc intervention.”

Conserving our dwindling resources? What will he do, when he can no longer afford to keep me

running? Store me until he can raise the money to start me up again, of course. In the long term, set up a trust fund; it would only have to earn enough to run me part time, at first: keep me in touch with the world, stave off excessive culture shock. Eventually, computing technology is sure to transcend the current hurdles, and once again enter a phase of plummeting costs and increasing speed.

Of course, all these reassuring plans were made by a man with two futures. *Will he really want to keep an old copy running, when he could save his money for a death-bed scan, and “his own” immortality?* I don’t know. And I may not be sure if I *want* to survive—but I wish the choice could be *mine*.

We start the second experiment. I do my best to concentrate, although I’m angry and distracted—and very nearly convinced that my dutiful introspection is pointless. Until the model itself is changed—not just the detailed way it’s computed—it remains a mathematical certainty that the subject and the control will end up with identical brains. If the subject claims to have experienced anything out of the ordinary, then *so will the control*—proving that the effect was spurious.

And yet, I still can’t shrug off any of this as “trivial.” Durham was right about one thing: there’s no dishonor in confirming the obvious—and when it’s as bizarre, as counterintuitive as this, the only way to believe it is to experience it firsthand.

This time, the model will be described at the standard resolution of one millisecond, throughout—but the order in which the states are computed will be varied.

Squeak. “Experiment two, trial number one. Reverse order.”

I count, “One. Two. Three.” After an initial leap into the future, I’m now traveling backward through real time. I wish I could view an external event on the terminal—some entropic cliché like a vase being smashed—and dwell on the fact that it was *me*, not the image, that was being rewound ... but that would betray the difference between subject and control. Unless the control was shown an artificially reversed version of the same thing? Reversed how, though, if the vase was destroyed in real time? The control would have to be run separately, after the event. Ah, but even the *subject* would have to see a delayed version, because computing his real-time-first but model-time-final state would require information on all his model-time-earlier perceptions of the broken vase.

“Eight. Nine. Ten.” Another imperceptible leap into the future, and the *djinn* reappears.

Squeak. “Trial number two. Odd numbered states, then even.”

In external terms, I will count to ten ... then forget having done so, and count again.

And from *my* point of view? As I count, once only, the external world—even if I can’t see it—is flickering back and forth between two separate regions of time, which have been chopped up into seventeen-millisecond portions, and interleaved.

So which of us is *right*? Relativity may insist upon equal status for all reference frames ... but the coordinate transformations it describes are smooth—possibly extreme, but always continuous. One observer’s spacetime can be stretched and deformed in the eyes of another—but it can’t be sliced like a loaf of bread, and then shuffled like a deck of cards.

“Every tenth state, in ten sets.”

If I insisted on being parochial, I’d have to claim that the outside world was now rapidly cycling through fragments of time drawn from ten distinct periods. The trouble is, this allegedly shuddering universe is home to all the processes that implement me, and they *must*—in some objective, absolute sense—be running smoothly, bound together in unbroken causal flow, or I wouldn’t even exist. My perspective is artificial, a contrivance relying on an underlying, continuous reality.

“Every twentieth state, in twenty sets.”

Nineteen episodes of amnesia, nineteen new beginnings. How can I swallow such a convoluted explanation for ten perfectly ordinary seconds of my life?

“Every hundredth state, in one hundred sets.”

I’ve lost any real feeling for what’s happening to me. I just count.

“Pseudo-random ordering of states.”

“One. Two. Three.”

Now I *am dust*. Uncorrelated moments scattered throughout real time. Yet the pattern of my awareness remains perfectly intact: it finds itself, assembles itself from these scrambled fragments. I’ve been taken apart like a jigsaw puzzle—but my dissection and shuffling are transparent to me. On their *own* terms, the pieces remain connected

How? Through the fact that every state reflects its entire model-time past? Is the jigsaw analogy wrong—am I more like the fragments of a hologram? But in each millisecond snapshot, do I recall and review all that’s gone before? Of course not! In each snapshot, I *do* nothing. In the computations between them, then? Computations that drag me into the past and tire future at random—wildly adding and subtracting experience, until it all cancels out in the end—or rather, all adds up to the very same effect as ten subjective seconds of continuity.

“Eight. Nine. Ten.”

Squeak. “You’re sweating.”

“Both of me?”

Squeak. He laughs. “What do you think?”

“Do me a favor. The experiment is over. Shut down one of me—control or subject, I don’t care.”

Squeak. “Done.”

“Now there’s no need to conceal anything, is there? So run the pseudorandom effect on me again—and stay on-line. This time, *you* count to ten.”

Squeak. He shakes his head. “Can’t do it, Paul. Think about it: You can’t be computed non-sequentially when past perceptions aren’t known.”

Of course; the broken vase problem all over again. I say, “Record yourself, then, and use that.”

He seems to find the request amusing, but he indulges me; he even slows down the recording, so it lasts ten of my own seconds. I watch his blurred lips and jaws, listen to the drone of white noise.

Squeak. “Happy now?”

“You did scramble *me*, and not the recording?”

Squeak. “Of course. Your wish is my command.”

“Yeah? Then do it again.”

He grimaces, but obliges.

“Now, scramble *the recording*.”

It looks just the same. Of course.

“Again.”

Squeak. “What’s the point of all this?”

“Just do it.”

I’m convinced that I’m on the verge of a profound insight—arising, not from any revelatory aberration in my mental processes, but from the “obvious,” “inevitable” fact that the wildest permutations of the relationship between model time and real time leave me perfectly intact. I’ve

accepted the near certainty of this, tacitly, for twenty years—but the experience is provocative in a way that the abstract understanding never could be.

It needs to be pushed further, though. The truth has to be shaken out of me.

“When do we move on to the next stage?”

Squeak. “Why so keen all of a sudden?”

“Nothing’s changed. I just want to get it over and done with.”

Squeak. “Well, lining up all the other machines is taking some delicate negotiations. The network allocation software isn’t designed to accommodate whims about geography. It’s a bit like going to a bank and asking to deposit some money ... at a certain location in a particular computer’s memory. Basically, people think I’m crazy.”

I feel a momentary pang of empathy, recalling my own anticipation of these difficulties. *Empathy verging on identification.* I smother it, though; we’re two utterly different people now, with different problems and different goals, and the stupidest thing I could do would be to forget that.

Squeak. “I could suspend you while I finalize the arrangements, save you the boredom, if that’s what you want.”

I have a lot to think about, and not just the implications of the last experiment. If he gets into the habit of shutting me down at every opportunity, I’ll “soon” find myself faced with decisions that I’m not prepared to make.

“Thanks. But I’d rather wait.”

I walk around the block a few times, to stretch my legs and switch off my mind. I can’t dwell on the knowledge of what I am, every waking moment; if I did, I’d soon go mad. There’s no doubt that the familiar streetscape helps me forget my bizarre nature, lets me take myself for granted and run on autopilot for a while.

It’s hard to separate fact from rumor, but apparently even the gigarich tend to live in relatively mundane surroundings, favoring realism over power fantasies. A few models-of-psychotics have reportedly set themselves up as dictators in opulent palaces, waited on hand and foot, but most Copies have aimed for an illusion of continuity. If you desperately want to convince yourself that you *are* the same person as your memories suggest, the worst thing to do would be to swan around a virtual antiquity (with mod cons), pretending to be Cleopatra or Ramses II.

I certainly don’t believe that I “am” my original, but...why do I believe that I exist *at all*? What gives me my sense of identity? Continuity. Consistency. Once I would have dragged in *cause and effect*, but I’m not sure that I still can. The cause and effect that underlies me bears no resemblance whatsoever to the pattern of my experience—not now, and least of all when the software was dragging me back and forth through time. I can’t deny that the computer which runs me is obeying the real-time physical laws—and I’m sure that, to a real-time observer, those laws would provide a completely satisfactory explanation for every pulse of laser light that constitutes my world, my flesh, my being. And yet ... if it makes *no perceptible difference to me* whether I’m a biological creature, embodied in real cells built of real proteins built of real atoms built of real electrons and quarks... or a randomly time-scrambled set of descriptions of a crude model-of-a-brain ... then surely *the pattern* is all, and cause and effect are irrelevant. The whole experience might just as well have arisen by chance.

Is that conceivable? Suppose an intentionally haywire computer sat for a thousand years or more,

twitching from state to state in the sway of nothing but electrical noise. *Might it embody consciousness?*

In real time, the answer is: *probably not*—the chance of any kind of coherence arising at random being so small. Real time, though, is only one possible reference frame; what about all the others? If the states the machine passed through can be re-ordered in time arbitrarily (with some states omitted—perhaps *most* omitted, if need be) then who knows what kind of elaborate order might emerge from the chaos?

Is that fatuous? As absurd, as empty, as claiming that every large-enough quantity of rock—contiguous or not—contains Michelangelo's *David*, and every warehouse full of paint and canvas contains the complete works of Rembrandt and Picasso—not in any mere latent form, awaiting some skilful forger to physically rearrange them, but *solely by virtue of the potential redefinition of the coordinates of space-time?*

For a statue or a painting, yes, it's a hollow claim—where is the observer who perceives the paint to be in contact with the canvas, the stone figure to be suitably delineated by air?

If the pattern in question is *not* an isolated object, though, but *a self-contained world*, complete with at least one observer to join up the dots ...

There's no doubt that it's possible. *I've done it*. I've assembled myself and my world—effortlessly—from the dust of randomly scattered states, from apparent noise in real time. Specially contrived noise, admittedly—but given enough of the real thing, there's no reason to believe that some subset of it wouldn't include patterns, embody relationships, as complex and coherent as the ones which underly me.

I return to the apartment, fighting off a sense of giddiness and unreality. *Do I still want to bail out?* No. *No!* I still wish that he'd never created me—but how can I declare that I'd happily wake and forget myself—wake and “reclaim” my life—when already I've come to an insight that he never would have reached himself?

The *djinn* looks tired and frayed; all the begging and bribery he must have been through to set this up seems to have taken its toll.

Squeak. “Experiment three, trial zero. Baseline data. All computations performed by processor cluster number four six two, Hitachi Supercomputer Facility, Tokyo.”

“One. Two. Three.” *Nice to know where I am, at last. Never visited Japan before.* “Four. Five. Six.” *And in my own terms, I still haven't. The view out the window is Sydney, not Tokyo. Why should I defer to external descriptions?* “Seven. Eight. Nine. Ten.”

Squeak. “Trial number one. Model partitioned into five hundred sections, run on five hundred processor clusters, distributed globally.”

I count. *Five hundred clusters*. Five only for the crudely modeled external world; all the rest are allocated to my body—and most to the brain, of course. I lift my hand to my eyes—and the information flow that grants me motor control and sight now traverses tens of thousands of kilometers of optical cable. This introduces no perceptible delays; each part of me simply hibernates when necessary, waiting for the requisite feedback from around the world. Moderately distributed processing is one thing, but *this* is pure lunacy, computationally and economically. I must be costing at least a hundred times as much as usual—not quite five hundred, since each cluster's capacity is only being partly used—and my model-time to real-time factor must be more like fifty than seventeen.

Squeak. “Trial number two. One thousand sections, one thousand clusters. “

Brain the size of a planet—and here I am, counting to ten. I recall the perennial—naive and paranoid—fear that all the networked computers of the world might one day spontaneously give birth to a global hypermind—but I am, almost certainly, the first planet-sized intelligence on Earth. I don’t feel much like a digital Gaia, though. I feel like an ordinary human being sitting in an ordinary armchair.

Squeak. “Trial number three. Model partitioned into fifty sections and twenty time sets, implemented on one thousand clusters.”

“One. Two. Three.” I try to imagine the outside world in my terms, but it’s almost impossible. Not only am I scattered across the globe, but widely separated machines are simultaneously computing different moments of model-time. Is the distance from Tokyo to New York now the length of my *corpus callosum*? Has the planet been shrunk to the size of my skull—and banished from time altogether, except for the fifty points that contribute to my notion of the Present?

Such a pathological transformation seems nonsensical—but in some hypothetical space traveler’s eyes, the whole planet is virtually frozen in time and flat as a pancake. Relativity declares, that this point of view is perfectly valid—but mine is not. Relativity permits continuous deformation, but no cutting and pasting. *Why?* Because it must allow for *cause and effect*. Influences must be localized, traveling from point to point at a finite velocity; chop up space-time and rearrange it, and the causal structure would fall apart.

What if you’re an observer, though, who has no *causal structure*? A self-aware pattern appearing by chance in the random twitches of a noise machine, your time coordinate dancing back and forth through causally respectable “real time”? Why should you be declared a second-class being, with no right to see the universe your way? What fundamental difference is there between so-called cause and effect, and any other internally consistent pattern of perceptions?

Squeak. “Trial number four. Model partitioned into fifty sections; sections and states pseudo-randomly allocated to one thousand clusters.”

“One. Two. Three.”

I stop counting, stretch my arms wide, stand. I wheel around once, to examine the room, checking that it’s still intact, complete. Then I whisper, “This is dust. *All dust.* This room, this moment, is scattered across the planet, scattered across five hundred seconds or more—and yet it remains whole. Don’t you see what that means?”

The *djinn* reappears, frowning, but I don’t give him a chance to chastise me.

“Listen! If I can assemble myself, this room—if I can construct my own coherent space-time out of nothing but scattered fragments—*then what makes you think that you’re not doing the very same thing?*”

“Imagine...a universe completely without structure, without topology. No space, no time; just a set of random events. I’d call them ‘isolated,’ but that’s not the right word; there’s simply *no such thing as distance*. Perhaps I shouldn’t even say ‘random,’ since that makes it sound like there’s some kind of natural order in which to consider them, one by one, and find them random—but there isn’t.

“What *are* these events? We’d describe them as points in space-time, and assign them coordinates—times and places—but if that’s not permitted, what’s left? Values of all the fundamental particle fields? Maybe even that’s assuming too much. Let’s just say that each event is a collection of numbers.

“Now, if the pattern that is me could pick itself out from the background noise of all the other

events taking place on this planet ... then why shouldn't the pattern we think of as 'the universe' assemble itself, find itself in exactly the same way?"

The *djinn's* expression hovers between alarm and irritation.

Squeak. "Paul ... I don't see the point of any of this. Space-time is a construct; the *real* universe is nothing but a sea of disconnected events...it's all just metaphysical waffle. An unfalsifiable hypothesis. What explanatory value does it have? what difference would it make?"

"*What difference?* We perceive—we *inhabit*—one arrangement of the set of events. But why should that arrangement be *unique*? There's no reason to believe that the pattern we've found is the only coherent way of ordering the dust. There must be billions of other universes coexisting with us, made of the very same stuff—just differently arranged. If *I* can perceive events thousands of kilometers and hundred of seconds apart to be side-by-side and simultaneous, there could be worlds, and creatures, built up from what we'd think of as points in space-time scattered all over the galaxy, all over the universe. We're one possible solution to a giant cosmic anagram ... but it would be ludicrous to think that we're the only one."

Squeak. "So where are all the left-over letters? If this primordial alphabet soup really is random, don't you think it's highly unlikely that we could structure the whole thing?"

That throws me, but only for a moment. "We *haven't* structured the whole thing. The universe is random, at the quantum level. Macroscopically, the pattern seems to be perfect; microscopically, it decays into uncertainty. We've swept the residue of randomness down to the lowest level. The anagram analogy's flawed; the building blocks are more like random pixels than random letters. Given a sufficient number of random pixels, you could construct virtually any image you liked—but under close inspection, the randomness would be revealed."

Squeak. "None of this is testable. How would we ever observe a planet whose constituent parts were scattered across the universe? Let alone communicate with its hypothetical inhabitants? I don't doubt that what you're saying has a certain—purely mathematical—validity: grind the universe down to a fine enough level, and I'm sure the dust could be rearranged in other ways that make as much sense as the original. If these rearranged worlds are inaccessible, though, it's all angels on the heads of pins."

"How can you say that? I've *been* rearranged! I've *visited* another world!"

Squeak. "If you did, it was an artificial world; created, not discovered."

"Found a pattern, created a pattern ... there's no real difference."

Squeak. "Paul, you know that everything you experienced was due to the way your model was programmed; there's no need to invoke *other worlds*. The state of your brain at every moment can be explained completely in terms of *this* arrangement of time and space."

"Of course! Your pattern hasn't been violated; the computers did exactly what was expected of them. That doesn't make my perspective any less valid, though. Stop thinking of explanations, causes and effects; there are only *patterns*. The scattered events that formed my experience had an internal consistency every bit as real as the consistency in the actions of the computers. And perhaps the computers didn't provide all of it."

Squeak. "What do you mean?"

"The gaps, in experiment one. What filled them in? What was I made of, when the processors weren't describing me? Well...it's a big universe. Plenty of dust to *be me*, in between descriptions. Plenty of events—nothing to do with your computers, maybe nothing to do with your planet or your

epoch—out of which to construct ten seconds of experience, consistent with everything that had gone before—and everything yet to come.”

Squeak. The *djinn* looks seriously worried now. “Paul, listen: you’re a Copy in a virtual environment under computer control. Nothing more, nothing less. These experiments prove that your internal sense of space and time is invariant—as expected. But your states are *computed*, your memories *have to be* what they would have been without manipulation. You haven’t visited any other worlds, you haven’t built yourself out of fragments of distant galaxies.”

I laugh. “Your stupidity is ... surreal. What the fuck did you *create me for*, if you’re not even going to *listen* to me? We’ve stumbled onto something of cosmic importance! Forget about farting around with the details of neural models; we have to devote all our resources to exploring this further. We’ve had a glimpse of the truth behind ... *everything*: space, time, the laws of physics. You can’t shrug that off by saying that my states were *inevitable*.”

Squeak. “Control and subject are still identical.”

I scream with exasperation. “Of *course* they are, you moron! That’s the whole point! Like acceleration and gravity in General Relativity, it’s the equivalent experience of two different observers that blows the old paradigm apart.”

Squeak. The *djinn* mutters, dismayed, “Elizabeth said this would happen. She said it was only a matter of time before you’d lose touch.”

I stare at him. “*Elizabeth?* You said you hadn’t even told her!”

Squeak. “Well, I have. I didn’t let you know, because I didn’t think you’d want to hear her reaction.”

“Which was?”

Squeak. “She wanted to shut you down. She said I was ... seriously disturbed, to even think about doing this. She said she’d find help for me”

“Yeah? Well, what would *she* know? Ignore her!”

Squeak. He frowns apologetically, an expression I recognize from the inside, and my guts turn to ice. “Paul, maybe I should pause you, while I think things over. Elizabeth *does* care about me, more than I realized. I should talk it through with her again.”

“No. Oh, shit, *no*.” *He won’t restart me from this point. Even if he doesn’t abandon the project, he’ll go back to the scan, and try something afferent, to keep me in line. Maybe he won’t perform the first experiments at all—the ones which gave me this insight. The ones which made me who I am.*

Squeak. “Only temporarily. I promise. Trust me.”

“Paul. Please.”

He reaches off-screen.

“*No!*”

There’s a hand gripping my forearm. I try to shake it off, but my arm barely moves, and a terrible aching starts up in my shoulder. I open my eyes, close them again in pain. I try again. On the fifth or sixth attempt, I manage to see a face through washed-out brightness and tears.

Elizabeth.

She holds a cup to my lips. I take a sip, splutter and choke, but then force some of the thin sweet liquid down.

She says, “You’ll be okay soon. Just don’t try to move too quickly.”

“Why are you here?” I cough, shake my head, wish I hadn’t. I’m touched, but confused. Why did my original lie, and claim that she wanted to shut me down, when in fact she was sympathetic enough to go through the arduous process of visiting me?

I’m lying on something like a dentist’s couch, in an unfamiliar room. I’m in a hospital gown; there’s a drip in my right arm, and a catheter in my urethra. I glance up to see an interface helmet, a bulky hemisphere of magnetic axon current inducers, suspended from a gantry, not far above my head. Fair enough, I suppose, to construct a simulated meeting place that looks like the room that her real body must be in; putting me in the couch, though, and giving me all the symptoms of a waking visitor, seems a little extreme.

I tap the couch with my left hand. “What’s the point of all this? You want me to know exactly what you’re going through? Okay. I’m grateful. And it’s good to see you.” I shudder with relief, and delayed shock. “Fantastic, to tell the truth.” I laugh weakly. “I honestly thought he was going to wipe me out. The man’s a complete lunatic. Believe me, you’re talking to his better half.”

She’s perched on a stool beside me. “Paul. Try to listen carefully to what I’m going to say. You’ll start to reintegrate the suppressed memories gradually, on your own, but it’ll help if I talk you through it all first. To start with, you’re not a Copy. You’re flesh and blood.”

I stare at her. “What kind of sadistic joke is that? Do you know how hard it was, how long it took me, to come to terms with the truth?”

She shakes her head. “It’s not a joke. I know you don’t remember yet, but after you made the scan that was going to run as Copy number five, you finally told me what you were doing. And I persuaded you not to run it—until you’d tried another experiment: putting yourself in its place. Finding out, first hand, what *it* would be forced to go through.

“And you agreed. You entered the virtual environment which the Copy would have inhabited—with your memories since the day of the scan suppressed, so you had no way of knowing that you were only a visitor.”

Her face betrays no hint of deception—but software can smooth that out. “I don’t believe you. How can I *be* the original? I *spoke to* the original. What am I supposed to believe? He was the Copy?”

She sighs, but says patiently, “Of course not. That would hardly spare the Copy any trauma, would it? The scan was never run. I controlled the puppet that played your ‘original’—software provided the vocabulary signature and body language, but I pulled the strings.”

I shake my head, and whisper, “Bremsstrahlung.” No interface window appears. I grip the couch and close my eyes, then laugh. “You say I agreed to this? What kind of masochist would do that? I’m going out of my mind! *I don’t know what I am!*”

She takes hold of my arm again. “Of course you’re still disoriented—but trust me, it won’t last long. And you *know* why you agreed. You were sick of Copies bailing out on you. One way or another, you have to come to terms with their experience. Spending a few days believing you were a Copy would make or break the project: you’d either end up truly prepared, at last, to give rise to a Copy who’d be able to cope with its fate—or you’d gain enough sympathy for their plight to stop creating them.”

A technician comes into the room and removes my drip and catheter. I prop myself up and look out through the windows of the room’s swing doors; I can see half a dozen people in the corridor. I

bellow wordlessly at the top of my lungs; they all turn to stare in my direction. The technician says, mildly, “Your penis might sting for an hour or two.”

I slump back onto the couch and turn to Elizabeth. “You wouldn’t pay for reactive crowds. I wouldn’t pay for reactive crowds. Looks like you’re telling the truth.”

People, glorious *people*: thousands of strangers, meeting my eyes with suspicion or puzzlement, stepping out of my way on the street—or, more often, clearly, consciously refusing to. I’ll never feel alone in a crowd again; I remember what *true* invisibility is like.

The freedom of the city is so sweet. I walked the streets of Sydney for a full day, exploring every ugly shopping arcade, every piss-stinking litter-strewn park and alley, until, with aching feet, I squeezed my way home through the evening rush-hour, to watch the real-time news.

There is no room for doubt: I am not in a virtual environment. Nobody in the world could have reason to spend so much money, simply to deceive me.

When Elizabeth asks if my memories are back, I nod and say, of course. She doesn’t grill me on the details. In fact, having gone over her story so many times in my head, I can almost imagine the stages: my qualms after the fifth scan, repeatedly putting off running the model, confessing to Elizabeth about the project, accepting her challenge to experience for myself just what my Copies were suffering.

And if the suppressed memories haven’t actually integrated, well, I’ve checked the literature, and there’s a 2.9 percent risk of that happening.

I have an account from the database service which shows that I consulted the very same articles before.

I reread and replayed the news reports that I accessed from inside; I found no discrepancies. In fact, I’ve been reading a great deal of history, geography, and astronomy, and although I’m surprised now and then by details that I’d never learnt before, I can’t say that I’ve come across anything that definitely contradicts my prior understanding.

Everything is consistent. Everything is explicable.

I still can’t stop wondering, though, what might happen to a Copy who’s shut down, and never run again. A normal human death is one thing—woven into a much vaster tapestry, it’s a process that makes perfect sense. From the internal point of view of a copy whose model is simply *halted*, though, there is no explanation whatsoever for this “death”—just an edge where the pattern abruptly ends.

If a Copy could assemble itself from dust scattered across the world, and bridge the gaps in its existence with dust from across the universe, why should it ever come to an *inconsistent* end? Why shouldn’t the pattern keep on finding itself? Or find, perhaps, a *larger* pattern into which it could merge?

Perhaps it’s pointless to aspire to know the truth. If I *was* a Copy, and “found” this world, this arrangement of dust, then the seam will be, *must* be, flawless. For the patterns to merge, both “explanations” must be equally true. If I was a Copy, then it’s also true that I was the flesh-and-blood Paul Durham, believing he was a Copy.

Once I had two futures. Now I have two pasts.

Elizabeth asked me yesterday what decision I’d reached: to abandon my life’s obsession, or to forge ahead, now that I know firsthand what’s involved. My answer disappointed her, and I’m not sure if I’ll ever see her again.

In this world.

Today, I'm going to be scanned for the sixth time. I can't give up now. I can't discover the truth—but that doesn't mean that nobody *else* can. If I make a Copy, run him for a few virtual days, then terminate him abruptly ... then *he*, at least, will know if his pattern of experience continues. Again, there will be an "explanation"; again, the "new" flesh-and-blood Paul Durham will have an extra past. Inheriting my memories, perhaps he will repeat the whole process again.

And again. And *again*. Although the seams will always be perfect, the "explanations" will necessarily grow ever more "contrived," less convincing, and the dust hypothesis will become ever more compelling.

I lie in bed in the predawn light, waiting for sunrise, staring into the future down this corridor of mirrors.

One thing nags at me. I could swear I had a dream—an elaborate fable, conveying some kind of insight—but my dreams are evanescent, and I don't expect to remember what it was.

WORTHLESS

Yes, I'm complacent now, with my well enough paid job, with a wife I can almost talk to, with a three-year-old son all dark eyes and tousled hair and endearing clumsiness. We go driving on Sunday afternoons, through suburbs just like our own, past houses just like our own, an endlessly recurring, mesmerising daydream under the flawless blue sky. And I whistle an old song of yours, even if I never dare let the words past my lips:

There's nothing wrong with The Family
That a flame-thrower can't fix
And there's nothing wrong with the salt of the Earth
That couldn't be cured with a well-aimed BRICK

I switch on the radio (when I have a chance), I scan the stations (now and then), listening for an echo of your voice. Wondering if you've found a new incarnation. Wondering if I'd recognise it, if you had. Oh, some brain-dead bitch has stolen one of your best riffs, and chants meaningless drivel over the top of an endlessly cycling sample—but my mind shuts her out, and my memory of you takes over:

Carve my name on your heart, forever
—with the blunt end of a feather
You said, "I'll stay with you for a lifetime of pain
(just so long as it's over by morning)."

I know what they say, the revisionists, the explainers: you were a glitch, an aberration; a bug in the software, nothing more. People could never have truly *wanted* to hear your "maudlin" voice, your "mealy mouthed whining," your "smothering self pity."

I did.

I still dream about you, I swear. Do you blame me, if I can't hold on to my vision of you, lost on these dizzying sunlit plains, numb with contentment, the way I could when I was desperate, lonely, crippled? When I knew exactly who I was.

I still want you back. Badly. Sometimes.

But apparently not often, or badly, enough.

When they started making music straight from the Azciak Polls, everybody howled about the Death of Art—as if the process was anything new, anything more than an efficient closure of what had been happening for years. Groups were already assembled on the basis of elaborate market research. The Azciak Probes were already revealing people's tastes in breakfast cereals, politicians, and rock stars. Why not scan the brains of the populace, discover precisely what music they'd be willing to pay for, and then manufacture it—all in a single, streamlined process, with no human intervention required? From the probes buried in a random sample of twenty thousand representative skulls, to the construction of the virtual bands (down to mock biographies, and all the right birthmarks and tattoos),

to the synthesis of photorealist computer-animated videos, accessible for a suitable fee ... the music industry had finally achieved its long-cherished goal: cutting out everyone but the middleman.

The system spewed out pap. People paid to hear it. Nothing had changed.

In 2008, I was sixteen years old, working in a fast-food franchise in Sydney's decaying red light district, scraping the fat off disassembled hamburger grillers with lukewarm water in the early hours of the morning. I lived alone, not quite starving on what I had left after paying the rent, too shy and misanthropic to take in a flatmate. Let alone a lover.

I was woken at four o'clock one Sunday afternoon, when the woman from Azciak called. I don't know what possessed me to let her in; usually I just waited in silence for doorknockers to go away. She didn't look much older than I was, and her uniform wasn't all that different from mine—but it fit a great deal better, and at least they didn't make her wear a fucking baseball cap.

I said, "Why should I let you put your shit inside my head?"

"So you can participate more fully in democracy." She'd been on a training course on the Gold Coast.

"Democracy is a placebo." I'd read graffiti in Darlinghurst.

"We'll pay you twenty dollars a week."

"Forget it."

"Hard currency: US dollars, yen, euros—whatever you like."

I signed.

I spent a day in hospital; they didn't need to cut me open, but the scanning equipment they used, as they threaded the microelectrodes through the blood vessels of my brain, was bigger than my entire flat. Then, under local anaesthetic, they slipped the interface chip into a shallow incision at the back of my neck.

When the engineers arrived to plug their little black box into my phone, they discovered that *I didn't have one*, so they ended up paying for that, as well.

Once a day, the black box interrogated the chip ultrasonically, downloading whatever it had gleaned about my opinions in the preceding twenty-four hours, then passed the data on to the central computer.

Surprise: my contribution to the Azciak Polls didn't tip any geopolitical scales. The parliament of whores kept fawning to the Great Powers, cutting spending and raising prices whenever the IMF said *jump*, voting as required in the UN each time another Third World country had to be bombed into submission. I served Amazonian beef and Idaho potatoes to the cheerful, shaven-headed psychopaths from the USS *Scheisskopf* when they flooded Kings Cross on R & R, dressed in their pigeon-shit-speckled camouflage, looking for something to fuck that wasn't full of shrapnel, just for a change.

I was one of twenty thousand people whose every desire was accessed and analysed day by day, cross-tabulated and disseminated to the most powerful decision makers in the country.

And I knew that it made no difference at all.

Three Azciak creations were big, that year. I saw them all on the video jukebox which sat in the corner of the restaurant (and which lapsed into McPromotional mode when it wasn't playing requests—a prospect which guaranteed a steady stream of customers more than willing to feed it their change.) Limboland sang about the transcendental power of *rhythm*; in their videos, they strode like giants over the urban wasteland, dispensing the stuff in the form of handfuls of rainbow-coloured

glitter to the infinitely grateful mortals below, who at once stopped starving/shooting up/fighting each other, and took up robotic formation dancing instead. Echolalia sighed and moaned about the healing power of love, as she slithered across a surreal landscape of oiled naked skin, pausing between verses to suck, stroke or screw some convenient protuberance. MC Liberty ranted about a world united by ... unity. And good posture: all we had to do was *walk tall*.

One freezing, grey afternoon, woken by screaming in the flat downstairs, I lay in bed for an hour, staring up at the crumbling white plaster of the ceiling, convinced (for the thousandth time) that I was finally going insane.

There's only one problem with living alone: every thought rebounds off the walls of your skull, unanswered—until the whole process of consciousness begins to seem like nothing so much as *talking to yourself*. As a child, I'd believed that God was constantly reading my mind—which might sound crazy, but if it wasn't true, then who was this monologue *for*? Of course I had imaginary friends and lovers, of course I invented companions to “share” the endless conversation running through my head—but sometimes that delusion broke down, and there was nothing to do but listen to my own rambling, and wonder how many pills it would take to shut me up for good.

I didn't even own a radio, but my neighbours were always more than generous with their own. And I heard you sing:

Don't you ever wonder
Who fills my empty bed?
Who keeps me cold in the darkest hour?
Who leaves the silence unbroken?
Don't you ever wonder
Whose heartbeat it is I don't hear?
Whose arms won't enfold me?
Who won't be beside me?
When life is unkind and unfair?
Won't you ever ASK ME
“Who's going to make tonight
The loneliest night of the year?”
Well, don't ask
You don't want to hear.
It's you.

My life was not transformed. I still wiped McVomit off the toilet floors every night, still fished the syringes out of the bowls (too buoyant to flush—and if they weren't removed quickly, people reused them). I still stared at the couples walking hand in hand in front of me; still lingered behind them for a step or two, in the hope that something radiating out from their bodies would penetrate my own icy flesh.

But I bought myself a radio, and I waded through all the saccharine lies about *peace* and *harmony*, about *strength* and *empowerment*, waiting to hear you sing about my pathetic, irrelevant life. And I think you know how sweet it was, to hear just one voice of acceptance, just one voice of affirmation, just one voice—at last—that rang true for *me*.

And on those sleepless afternoons when I lay alone, creating myself out of nothing, treading water with words, my thoughts no longer came echoing back to me, proof of my insanity. I knew exactly who I was speaking to, now, in the conversation that defined me.

I was speaking to you.

“The Loneliest Night of the Year” came in at number six, with a bullet. Not bad, my friend. Half a dozen more hits soon followed, knocking your human competitors right out of the charts. The patronising arseholes now claim that this was all some kind of self-fulfilling prophecy, that people bought whatever the Azciak computers churned out, simply because they knew it “had to be” what they wanted—even if, in fact, it wasn’t. That’s not what they said at the time, of course; their sycophantic paeans to your “freshness” and “candour” and “bleak audacity” ran for pages.

I saw “you” one night, on the jukebox screen—rendered, plausibly enough, as four young men with guitars, bass, and drums. If I’d fed a dollar into the machine, I could have had a printout of their “life stories”; for five, an autographed portrait of the band, the signatures authentic and unique; for ten, the same with a dedication. I didn’t, though. I watched them for a while; their expressions ranged from distraction to faint embarrassment—the way some human musicians look, when they know that you know they’re only miming.

So forgive me if I didn’t buy the tacky merchandise—but I saved up my Azciak payments and bought a second-hand CD player, and I hunted down a music shop which stocked your albums on “obsolete” disks, for a quarter of the price of the fashionable new ROMs.

Of course I thought I’d helped shape you. *You sang about my life*. I couldn’t have written a bar of the music, a word of the lyrics, myself—but I knew the computers could take care of those technical details. The wires in my head weren’t there to extract any kind of talent; they were there to uncover my deepest needs.

And they’d succeeded.

At the same time, I couldn’t let myself believe that I’d somehow conjured you up *on my own*, because—apart from the preposterous vanity of it—if I had, then I was still doing nothing but talking to myself. In any case, surely one person, alone, could never have swayed the populist Azciak software. Among the twenty thousand participants in the poll, there had to be others—hundreds, at least—for whom your words rang true as they did for me.

I phoned the woman who’d signed me up. “Oh no, we couldn’t possibly give you any *names*,” she said. “All our data is strictly confidential.”

At work, in a five-minute mid-shift break, I snuck into the manager’s office and called another branch of the Azciak organisation. The voice that replied sounded human to me, but the icon flagging a sales simulacrum lit up.

“You want to buy a direct mailing list? What selection parameters did you have in mind?”

“What selection parameters are there?”

A menu appeared on the flatscreen of the phone:

[1] Geographic

[2] Socioeconomic

[3] Ethnic

[4] Aesthetic

[5] Political

[6] Emotional

I hesitated, then hit 6. The rest was easy enough; I just filled in the profile requirements as if I was describing myself.

The charge was one thousand dollars. I typed in the number of the French Fries purchasing account, and the list was downloaded into the phone. I copied it onto a floppy disk, then erased it from the memory.

You sang:

Here you are again

Caring about the wrong things, again

Everyone else makes mistakes, I know

But at least they make THE RIGHT ONES

Every day, I saw children half my age walking the streets of Kings Cross, surviving on food scraps, fighting each other for the privilege of selling themselves to the tourists. Every day, I read of the deaths of hundreds of thousands of people—in famines, in civil wars, and the latest genocidal psychodramas, designed to bolster the delicate egos of the most powerful nations on Earth.

But I was powerless to change any of that. So I just closed my eyes and dreamt about *love*.

And a dream was all it would ever be. The truth was, I'd always known I was nothing, no one: an object in the shape of a human, not to be mistaken for the real thing.

The wonder of it was, I kept on existing, day after day, year after year. I woke every morning, and the whole bizarre joke—the illusion of humanity—still hadn't worn off. I had no choice but to eat and drink, to breathe, to shit, to earn money, to go through the motions—but I always knew that to try to do anything more would have been ridiculous.

I had as much right to be *loved* as I had to sprout wings and fly.

I chose a name from the list, almost at random—although when I saw that he lived in Adelaide, a twenty-hour bus ride away, I knew that was exactly what I'd wanted. Not that I'd have needed an excuse to keep my distance, if he'd lived next door. What would I have said to him? “I stole your name from a database. I know we have a lot in common. I'm an antisocial emotional cripple, a bisexual virgin, a basket case. How about lunch? No? Dinner, then? Fuck that, let's go to bed.”

His name was Ben, and I dreamt about him day and night—conscious of, but undeterred by, the ludicrous nature of my obsession. I felt only slightly guilty for trespassing on his privacy; as long as he remained unaware of the fact, I'd done him no tangible harm. Besides, I didn't even know what he looked like, so when I pictured “him,” tangled in the sheets beside me, it wasn't him at all. It was just another fantasy.

And yet. I could never quite forget that he was real—and that he was, *I knew*, every bit as desperate and lonely as I was. I'd imagined a thousand lovers before, and I'd shamelessly stolen the faces of a thousand strangers—without believing for a moment that I ever would meet, ever would speak to, ever would *touch*, the flesh-and-blood versions. It was unthinkable.

With Ben, it was not unthinkable.

Not quite.

And you sang:

Meet me on a dark street
Away from their laughter and lies
No, you don't want to see my ugly soul
But my hands can still keep you warm
Meet me on a quiet street
The only stranger in town
And we'll step behind the railway line
And see whose love is blind

Alone in my room, I listened, and dreamed, and told you my dreams. Did I dream about love because you sang about love, or was it the other way round? Did you sing to affirm my life, or did I live to affirm your songs?

I don't know. I still don't know.

My theft was discovered, of course, and it didn't take much investigating to find the culprit. My own name was on the stolen mailing list—and when the keystroke timing signature for the phone call in question was compared with the staff cash register records, only one person matched.

The manager didn't press charges, he just sacked me on the spot. (My *comrades* cheered.) I walked all the way home, giddy with freedom, intoxicated by every breath of the cool night air, staring up at the lights of Market Street's unrentable skyscrapers as if I'd never seen them before in my life.

I told myself: I must have planned it this way all along; one small shock to the system, that's all I needed, to snap me out this trance, to wake me from this sleep I've called *life*.

As I walked, I sang:

You never have lived
And you never will live
Because you've never wanted to
But in my arms
And in my bed
We'll find a substitute

First thing in the morning, I hocked my ancient CD player, put everything I owned into a suitcase (the Azciak black box included), and bought a ticket for Adelaide.

The bus driver said he liked both kinds of music—Country *and* Western—and he sure hoped that we did, too. Those of us who hadn't brought protection went through hell; I'd never thought I'd find myself ready to kill for a Walkman.

I still had your songs, though, etched into my memory, and the closer I drew to my destination, the more convinced I became that you were with me, guiding me. It didn't seem like such a strange idea; you had no body of your own, no senses of your own. Only the songs made you real, and if they were

in my head, then so were you.

Yes it's true, I travelled a thousand miles
Just to be beside you
And it's true, I gave up a "life" of my own
Just to follow your trail
And if all I've ever been, and all I've ever owned
Is no great price in your eyes
Won't you give me
One last smile
Before you walk away?

Farmland and bushland, forest and desert alike were all reduced to sepia by the bus's tinted windows—and in the late afternoon the landscape was swallowed completely by the glare of sunlight on the scratched glass.

When night fell, the driver regaled us with a non-stop selection of Nashville's greatest lullabies. I gritted my teeth and stared out the window. With the reading lights on all around me, I could see nothing but my own reflection; just after midnight, though, the last of them went out, and I watched the grey starlit desert pass by.

Spending money like a dying man, I took a taxi across the awakening city. I was sick with fear—but cushioned by a mixture of adrenaline and lack of sleep. Part of me knew that the whole journey, the whole idea, had been insane from the start, and wanted nothing more than to be back in my room, dissolving into a miasma of loneliness and sensory deprivation. But part of me argued, fearlessly: *How do you know you won't be welcome? If a stranger travelled half-way across the country to your door, wouldn't you take him in?*

The building was shabby, dilapidated, demoralising, and utterly familiar—and in a way, that filled me with hope, as if the more we had in common, the more likely he was to understand why I was here. I grew numb as I climbed the stairs, my senses retreating into my skull even as my feet kept working. I'd felt the same way as a child, when I'd climbed to the top of the swimming pool's diving tower. (I'd turned around and climbed all the way down again.)

What would I do, when he opened the door? I'd planned to speak a line from one of your songs, but I still hadn't made a choice—and by now, half your words had deserted me, and the rest seemed impossibly clumsy. If they were stilted even in my head, how would they sound on my lips?

When I reached the seventh floor, I didn't hesitate or retreat: I walked straight down the corridor—and right past his door. *What could I say to him?* I couldn't tell the truth, or anything like it—not straight away. I needed a pretext. I stood at the end of the corridor, frantically sifting clichés: *Looking for some other tenant. Given the wrong address. Just moved in downstairs, and wondering if I could borrow ...*

I couldn't do it. It made no difference how far I'd travelled, or how long I'd dreamt of this moment. I couldn't knock on that door.

If I ran into him, though, in the corridor, on the stairs ... if we struck up a conversation, I could tell him that I was new in town, searching for a place to stay. I'd come to this building to rent a room, but

there'd been some mistake, it had already been taken ...

And he'd look me in the eye and say: *I have plenty of room to spare. Let me show you.*

It was half past seven in the morning. Ben worked in a music shop; I knew that much from the stolen data. He'd be on his way, soon enough. All I had to do was wait.

So I stood by the stairwell, swaying, dizzy with fear. I knew this was my only chance. If I failed, I'd vanish from the face of the Earth. If I failed, my loneliness would open up its jaws and swallow me. If I failed, I'd die.

I still don't know, to this day, what it was you wanted from us. Some kind of vicarious happiness? Some kind of second-hand love? Out of twenty thousand people, then, why did you choose the loneliest, the saddest; why did you choose the ones with so little hope?

Unless in your heart, you knew that you were just like us. Just like me: a human-shaped object, nothing more. Not to be mistaken for the real thing.

The door opened, and Ben stepped out. I was suddenly very calm. He didn't look threatening, or unapproachable. I'd been afraid that he might be impossibly—unattainably—handsome; he wasn't. I knew I could talk to him. Maybe it was my imagination, but I would have sworn that I could make out the faint scar on the back of his neck, proof that I'd come to the right place, proof that I'd found the right person.

He didn't look at me as he approached; he stared at the ground, just as I would have done. Desperate for guidance, I imagined myself in his place, imagined a friendly stranger trying to strike up a conversation. Then the fog cleared from my brain, and I knew exactly what I'd feel: suspicion, then disbelief ... and then sheer panic. At the first sign of the threat of human contact, I'd recoil. *I'd flee.*

I kept silent. He walked past me, down the stairs.

I found an unvandalised phone booth, took the black box from my suitcase, and plugged it in. It came alive at once, red lights flashing, dragging the overdue data out of my head in one long, silent scream.

Afterwards, I walked aimlessly, until I stumbled across a small café. There were no other customers; I sat there sipping coffee, staring at the jukebox in the corner. It was playing an ad for Pepsi, or the latest song from Radical Doubt; I couldn't tell which.

I put a coin in the slot, and then knelt beside the machine—so close that the image on the screen became nothing but a blur of coloured light.

And you sang:

Dry your eyes

Don't be sad

You're worthless

Your tears mean nothing at all

If you live and you die

In a dream, in a lie

Who will ever be the wiser?

Close your eyes

Don't be sad

You're worthless

Your pain means nothing at all
Unseen and unknown
Alive but alone
Why end a life
That's no life at all?

You were right, of course. And I swallowed no pills; instead, I bought myself a map, walked out to the highway, and hitch-hiked all the way home.

That was your last song—before the Azciak people fixed the *glitch*, corrected the *aberration*. The official story (from the PR release, to the torrent of instant “biographies”, to the sleeve notes of the tasteful, black-lined, Memorial Collected Works boxed set): the lead singer of Worthless had overdosed on vodka and Nembutal, victim of a broken heart. I still have photos from the magazines of crowds of sobbing fans, carrying “your” picture aloft.

I never joined those tearful mobs. I never even mourned you in private. I don't know if you're still in there, somewhere; concealed, transformed, unrecognisable. It's not impossible, is it? (After all, would you recognise me?)

And if you're not? If you really have gone forever?

Then here I am again. Caring about the wrong things, again.

And talking to myself.

REIFICATION HIGHWAY

“It’s down there, Khali: the mother lode, the keystone, the reason for everything in crystalline form. Solid logic, just waiting to be mined ”

I gazed sceptically at the asteroid my mother, Elena, insisted on calling Chalmer’s Rock: a heavily cratered, reddish-grey oblate lump, one hundred and sixty kilometres wide, orbiting a K0 star unlisted on any of our catalogues—except for the one we’d bought from Chalmer himself, of course. Obscurity itself, made stone.

“The spectral analysis says nickel-iron, and assorted silicates.”

Elena nodded, without looking away from the screen—missing my sarcasm, or choosing to ignore it. “That’s right. This is the one. Size, composition, orbital parameters ... they all fit.”

“More or less. Like how many other pieces of debris in this system? And we might not even have the right star.”

Elena turned to me and laughed, convinced of her good fortune, refusing to be goaded into anger. “It’s the fourth-closest star to the coordinates. The age-corrected spectrum is a near-perfect match. And—” She hit a few keys and brought a contoured radar map of the asteroid’s surface onto the screen beside the real-time optical view, then she summoned up Chalmer’s own map of his Rock, and had the computer compare them. Aligned and superimposed, they did look similar, for what that was worth. “Seventy per cent of the topography coincides to within fifty metres. There are a couple of hundred craters missing, a couple of hundred extra ones here and there. If this universe contains the same object at all, *this is it.*”

I thought: *And one of those missing craters is certain to mean that the logic deposit is missing, too.*

It wasn’t just adolescent perversity; I had every reason to be pessimistic. Planets of reportedly unsurpassed beauty had turned into grey airless rocks, for me. Entire, allegedly glorious, civilizations had vanished, or collapsed into premature barbarism. One way or another, everything in the galaxy that I’d ever heard lauded had turned out to be a disappointment, once I’d reached a version of it, myself.

That’s the catch with FTL: travelling faster than light in one reference frame is the same as travelling backwards in time in another—and you can’t travel into your own past, only someone else’s alternative. If you speed away from a planet at sub-light relativistic velocity, and then wormhole-jump back towards it, you can arrive before you left ... but you don’t end up on the same world, with the chance to prevent your own departure. Every would-be closed time-like loop turns out to be a helix instead, winding its way across the multiverse, side-stepping any possibility of causality violation—and it makes no difference whether your intention was to travel back in time, or “merely” to cross a few hundred light years in an instant. There are no round trips—not even hypothetical ones made by joining up the paths of different travellers. Not only can you not go back, you can’t go where anyone you’ve ever met had been before you met them.

So, even if this “was” Chalmer’s Rock, it certainly wasn’t the one that the Robert Chalmer we’d done business with had personally visited, and gutted.

Which was why the information he’d sold us wasn’t—necessarily—worthless. And if he ever chose to “return” to the region, in the hope of making a second fortune, it was highly unlikely—

although not quite literally impossible—that he'd arrive to find that Elena and I had been there before him. Which was why he'd been willing to sell her the coordinates and other details for a microscopic fraction of the worth of the deposit he'd found the first time.

As for the likelihood of this particular version of the Rock containing anything of value—let alone the biggest logic deposit I'd heard of in all our travels—that was unknown. We'd made fifteen jumps to the region over a period of five ship years, and this was the first time we'd come across anything bearing even the slightest resemblance to the asteroid in question—so I could understand, begrudgingly, why Elena was hopeful. But the shape of the Rock alone couldn't tell us whether or not a nugget of reified logic was buried here; a few tens of kilometres, a few seconds of orbital motion, could have turned the crucial impact into a near miss, and the prize we were seeking could have sailed on for another ten thousand light years before encountering ordinary matter again.

Elena said, "It's down there. I'm sure it is."

I said, "I doubt it. But let's go see who's right."

The Rock had negligible gravity, about a hundredth of a gee—but fortunately, a slow enough spin at forty hours for centrifugal force to be orders of magnitude less. On a body with negative surface attraction we would have used remotes, and although I wasn't expecting to find anything, I was still glad to get out of the ship.

Stalker set down near the first, and most promising, of six suggestive mass anomalies. I followed Elena out onto the fissured red plain. We were on the night side, starlit, many-shadowed. My exoskin thickened in the vacuum, all but blotting out my sense of touch, but walking barefoot across the jagged ground on this space-cold mote, twenty thousand light years from Earth, still gave me a thrill of vulnerability. Twenty thousand light years from Earth, if there was an Earth; for all we knew, we might have been the only two humans in this universe.

I didn't feel lonely, though. I'd spent thirteen years crisscrossing the galaxy, leaving everyone but Elena behind with every jump. Nor did I feel intimidated by the void, Space was barren, life was rare, everything of beauty seemed to flee from me—but here I was, standing on this ugly rock, defying the odds with my presence. I opened my mouth, raised my membrane-sealed oesophagus to the stars, and yelled wordless electromagnetic defiance.

Elena set a surveying machine tracking across the surface, bombarding the rock below with neutrons, and looking for the gamma rays that came back in response—or rather, those that didn't. Reified logic wasn't made of atoms, and had no nuclei to absorb the neutrons, then decay. It experienced gravity, and electromagnetism—allowing it to embed in ordinary matter, and making it possible to handle—but it didn't feel the strong force, so neutrons passed right through it. A mixture of metallic nickel and iron in the right proportions might have the same density, but would return a characteristic gamma ray signature.

Elena hummed to herself. The bioelectronics in her lips and pharynx interpreted the action and broadcast the result to me; the receiving organs in the flesh of my ears made their own "acoustic" sense of the signal, giving it distance and direction. If the Rock had had an atmosphere, the effect would have been almost the same.

The surveyor announced its findings: nickel, iron, silicon, oxygen, magnesium, aluminium. Traces of uranium and gold. Gravimetrically, everything added up. The rock below us was denser than the average for the asteroid as a whole, but the anomaly was made of ordinary matter.

Elena said, “What did you expect? Success at the very first site?” Her sheathed eyes glistened in the starlight. I said nothing.

Stalker lifted, almost imperceptibly. I sat in the open airlock, holding on to a safety strap, swinging my legs and looking down as the Rock receded and turned slightly, then loomed towards us again.

We were equipped to take the asteroid apart if we found anything, even though we’d done very little mining in the past; there was no point in exploration if you weren’t ready to follow it through on the spot. But we were traders, really—exchanging gadgets, works of art, and invariant knowledge between worlds separated by distance and history, worlds whose ordinary inhabitants had good reason to stay put. We didn’t need a lot to survive; *Stalker* fed on stellar radiation, and our adapted bodies could recycle their own metabolites almost endlessly, phosphorylating ADP by an alternative pathway powered by alpha decay. Inside specialized liver cells, clusters of plutonium atoms were wrapped in giant multilayered enzymes, which stole energy from the alpha particles in small enough increments to avoid being torn apart. The repair mechanisms which kept us safe from cosmic ray damage dealt with any leakage, but there wasn’t much. We were about as independent as any living creatures could be.

So, what would we do with a Chalmer-sized fortune? Give up trading, and *settle down somewhere*? Elena had talked about that; I hated the idea. In any case, this kind of treasure hunt was no sane way to try to get rich. When Elena had swapped a cargo of rarely invented non-Turing computers for Chalmer’s record of his find, I’d been dumbstruck. The mining log was certified in ways that would have been difficult to fake—but genuine or not, it was still contingent information, tied to a specific history; the antithesis of invariant knowledge.

And, worst of all, it was insidious. We could spend our lives returning to this place again and again, never finding anything of value—but however many times that happened, the search would not be over. There’d always be the chance that if we came back *one more time*, our luck would change.

The second site was shinier, smoother than the first, probably melted by a more recent impact. We’d come down close to the terminator; a dazzling sliver of the nameless K0 sun showed on the horizon when I stood on my toes, although the light didn’t reach the ground. I crouched down to make the sun vanish, then stretched up again to find that it had set. A bright point of light just above the horizon might have been Chalmer’s “home world”—uninhabited here. “This” asteroid belt hadn’t been the boondocks, for him—every last pebble had been mined by the people of his planet, who’d colonized the system generations before. He’d made his fortune before making a single FTL jump, and he’d never told us why he’d chosen to leave everything he knew behind—but then, translated through an ancient common root language, it had been a stilted exchange.

I closed my eyes and willed the ground beneath us to be nothing but rook. *How could we ever give up travelling? How would we ever choose a planet to live on?* Much more than language diverged with variant history and colonial isolation. When I was seven years old, Elena had let slip that she’d had a *father*, and had had to explain what that meant—and why I hadn’t been conceived the same way. “Even if I ran into someone with whom I wished to have a child, I’d hardly be likely to be fertile with him, *in vivo*—not unless we pre-infected our gametes with translator viruses to patch up all the differences. Why bother?” I wasn’t quite Elena’s clone, though; her cells, transformed to produce male gametes, had been edited with alternative traits selected from a database she’d brought with her from her home world. My “father” was a composite, assembled from a digital version of the planet’s

entire gene pool.

The surveyor announced the results I'd been hoping for. Elena smiled. We moved on.

The third site was on the day side, peppered with small craters, and broken up by deep cracks. The surveyor abandoned its six-legged gait, and hovered above the ground on helium jets, blowing up a small red dust storm. I stayed in the airlock and watched, and Elena walked only as far from the ship as she had to, to stand apart from me and my expectations of failure.

If we did find the cousin of Chalmer's deposit, we *would* be rich. Solid logic was the one commodity that was valued almost everywhere—all the more so if it hadn't been discovered and exploited before, because then you could sell the accompanying technology as well. Nobody knew how the abstractions of the propositional calculus became reified in the first place; the formative process was generally assumed to date back to the Big Bang, although I'd heard of theorists insisting that even that cataclysm was insufficient. The unknown origin didn't keep anyone from using the stuff. Each kilogramme—magnetically restructured into a variant of its natural state—could bring a chosen nonstandard logic to bear upon a region extending a few cubic millimetres beyond its own boundaries. Applied to the right apparatus, the altered logic could undermine almost any law of physics—although most often, it was simply used to pump out a quantity of energy limited only by the ingenuity of the logic engineers. When exploited this way, it slowly decayed (although not before yielding far more than its mass equivalent of energy). I found that a little sad; in spite of all the paradoxes and wonders it could perform, most logic was simply burnt as fuel.

I'd once asked Elena, "How can logic be a *thing*?"

She'd laughed. "The test is, imagine removing it. If logic went away, would that change anything?"

"Of course."

"Then it's a thing. It exists, it makes a difference—whether or not you can hold it in your hand. Neutrinos are *things*, aren't they? A few billion might pass through your body unnoticed, but beta decay couldn't happen without them. And matter interacts with logic—reified or not—far more intimately than it interacts with anything else. Think of all the atoms in the universe, endlessly 'making sense.' *Why?* We hypothesize a few 'fundamental' laws, and then 'deduce' their consequences—but why should matter care about *deduction*? Why should P implying Q have the slightest effect on what happens in reality? *It does, though.* Even quantum physics obeys standard logic; so long as you don't try to express its results in terms of naïve macroscopic concepts, it gives rise to no inconsistencies, no contradictions.

"There's a certain pattern to events, a set of restrictions so pervasive that our entire reasoning process evolved around them. Logic is the *thing* which mediates that aspect of the world—and that's an effect far more powerful than any force."

"Then how can it end up less powerful—obeying gravity and electromagnetism?"

"Nobody knows. But ... nothing's immovable, nothing's infinitely strong. If logic influences matter, that's an interaction, a two-way process. It must be affected itself, however slightly. Maybe under extreme conditions, the effect can be strong enough to drag it halfway into the material world."

At the time, I'd nodded understanding—but thinking it all through again, there on the Rock, I wasn't so sure that I'd really grasped anything. Logic forced matter to behave "consistently" ... but what controlled the behaviour of logic—and allowed it to be reified? Another *thing* altogether? Or did logic act as its own metalogic, controlling itself? Could it do that? I had no idea—because I had no

idea what *thing* controlled whether or not it could.

You could always keep asking *why*. The succession of explanations and rules had to be either infinite, or circular—and yet somehow matter, logic, and however many levels of metalogic there were, still managed to get things done.

Watching the surveyor probing the ground, I was sure that I didn't want Elena to become wealthy, to stop trading, to anchor us to a single world. I didn't want our lives to change at all.

But I couldn't help half wishing for a chance to touch the solid reason why the universe made sense.

By the fifth site, Elena was so defiantly cheerful that I couldn't bear to look her in the eye. By the sixth, I was desperately trying to think of something I could say to cushion the blow—although I knew that anything I said would sound insincere.

When the surveyor announced its final negative verdict, Elena ordered it into its bay, and marched into the ship without a word to me. I followed at a prudent distance—but not so prudent as to risk being left behind.

In the control room, I found her sitting at the main console—but she was looking at a gravimetric map of the Rock, not plotting our next jump.

She mused, “If it's buried deep enough—deeper than Chalmer's version—it could be hard to detect from the surface.”

I said, “Buried how? It would have blown the whole asteroid apart before it dug a hole that deep.”

“It might have started off close to the surface of a smaller body. One of the bodies which eventually aggregated into *this*.”

I put a hand on her shoulder. “No, Elena. Think about it. In Chalmer's version, the deposit was near the surface of a body the size and shape of this one. If you're going to say that the impact might have occurred on a completely different asteroid, that's true ... and that asteroid might have ended up part of a larger one. But why should the final resting place of the deposit end up looking the same, with two such different scenarios?”

She stared at the map in silence. I wanted to tell her that it just didn't matter, that our lives were fine as they were, that the best thing by far would be to forget that we'd ever heard of Chalmer's Rock. *Write it off.*

She said, “There's some kind of cave system here.”

“Asteroids don't have *caves*.”

“Call it what you like.” She pointed to a pale blue zone on a hypothetical section through the Rock, close to one of its rotational poles. “The lower limit on the density is zero. There's an extensive hollow region here, however it formed.”

Gravimetric maps are full of ambiguities; the external field of a body isn't enough to reveal the precise mass distribution. Still, according to the mapping software, constrained by some plausible assumptions, Elena was probably right.

She traced the extent of the blue zone with her finger, following it to greater depths, and greater uncertainties. “It could go for tens of kilometres. If we collected data from in there, we'd have a far better picture of the whole Rock.” She turned to face me squarely. “Isn't that right?”

I sighed. Obtaining more data was pointless. The Rock had no secrets to yield; I was sure of that.

But I'd never gone spelunking on an asteroid before. We were *here* for one and only one visit; it

seemed a waste not to make the most of it.

And if this was what it took to make Elena understand that her search was in vain, then it would be time well spent.

The entrance was a hole about ten metres across, but the cavern beneath spread out rapidly to five or six times that width, before narrowing again: a near-spherical bubble, sliced open at the top. We descended, harnessed to a polymer cable unwinding from a winch I'd anchored to the rock with nanoware glue. Elena, a few metres below me, carried a portable surveying unit, constantly logging gravimetric data; I had a backpack full of pulleys for the cable, with my hands free to work the remote control of the winch. We could have gone in untethered, using helium jets alone—the gravity was so low that we needed occasional bursts from the jets pushing us *down* to make reasonable headway—but going ballistic in the bowels of an asteroid might have been a little rash, and I liked the security of a tangible connection to the surface.

The walls of the cavern were the same greyish-red as the rocks around the entrance. I'd hooked a light bulb to the cable just above me, the underside shielded so as not to dazzle us, and there was a second one below Elena, shielded on top. Everything around us was illuminated starkly; no shadows, no surprises.

Long before we reached the floor of the cavern, it was clear that there was an opening in it, about half the size of the top entrance, and some distance off-centre. When we touched down, I anchored two pulleys in the rock—one directly below the entrance hole, the other cantilevered over the centre of this second opening—and guided the cable onto them.

We descended into another spherical cavern, larger than the first. Below us was yet another opening. *What was this?* The fossil of a chain of intersecting bubbles, formed by gas coming out of solution in molten rock a billion years ago? My lithochemistry was hazy; I didn't really know if that was plausible or not.

I said, "This is something, Elena. This just about makes it worth being here."

She said, "We need to go much deeper than this, before we'll get any useful data." She stared at the screen on the surveying unit, which displayed an updated gravimetric map. "We'll have to go down three or four kilometres, at least."

Three or four kilometres sounded optimistic; we weren't carrying the means to blast our way through if we met with any obstructions. I kept waiting for us to hit a dead end, to reach the last cavern, but it seemed there was always one more, scarcely different from the ones before it—although the walls grew smoother, less rocky, more metallic-looking. By the seventh cavern, the cable told us we were five hundred metres deep, and the surveyor still read hollow space beneath us. I pictured a chain of bubbles stretching on down to the centre of the Rock, eighty kilometres below.

The eighth cavern was different, though.

The hole in the floor of the eighth cavern was dead centre, perfectly circular—and it didn't lead into a ninth. It was the top of a vertical shaft, a smooth cylindrical tunnel, which plunged straight down as far as we could see.

It was, almost certainly, an artefact. I was astonished—and delighted—but Elena looked crushed. Finally, she said, "Miners. Someone's been here before us. Someone's beat us to it."

"You think so?"

She laughed miserably. "Of course!" She crouched down and ran a finger along the tunnel wall,

pressing hard to feel the surface texture through the nerveless layers of her exoskin. “You think some natural process made *this*?”

I said, “If it’s a mine shaft, where are all the tailings?”

“I don’t know. Maybe they pumped them up to the surface, took them away to be refined somewhere. To extract every last fragment.”

We stood at the edge in silence. I thought: *Now that she knows that someone else besides Chalmer struck logic, she’s never going to stop searching, she’s never going to stop coming back.*

She said, “We might as well go down a bit and check it out. There could be some clues as to who it was, how they worked. What they found.”

I hesitated, then nodded. I set up two more pulleys, to keep the cable running smoothly, and then we began our final descent.

No two civilizations perform the same task in quite the same way. If we’d found anything of value, we would have seeded the Rock with nanoware replicators, and then stood back and let them digest and separate the entire asteroid ... but some cultures consider replicators too dangerous to use, even in the middle of nowhere in a universe you’re certain never to visit again. Mining by boring through the rock with macroscopic machinery seemed quaint, but it wasn’t unthinkable.

Of course, the tunnel might have been purely exploratory, rather than extractive—dug for the sake of data collection ... which revealed that the Rock had nothing worth taking. There was no evidence that any mining had gone on here; no cross-shafts full of discarded machinery, no evacuation instructions in incomprehensible languages. Just the one, unmarked vertical shaft, looking as if it went down forever.

A kilometre below the surface, I said, “Elena, this is crazy. We’re not going to find anything. And even if we did, it would be no more use to you than Chalmer’s log.”

She said, “Do you see that?”

I hit the STOP button on the controller, and the brakes brought us smoothly to a halt. “Do I see *what*?”

“On the wall.”

At first, it looked the same as ever to me; a dull metallic red-grey. Then I raised my hand to block the harsh light, and in the penumbra of its shadow, I made out a glistening, transparent patina, like a thin coating of ice.

I didn’t dare touch it. “Is that *it*? Logic?”

Elena said, “I don’t know. Logic crystals are blue, in bulk—but a thin layer might not show the colour.”

I absorbed that, then said, as gently as I could, “Then how do we know it’s not just frozen volatiles?”

She took an infrared spectroscopy probe from her backpack, and aimed it at the wall.

“What does it say?”

“Unidentified. It’s not any kind of ice.”

“*Unidentified*? But the logic spectrum is—?”

She looked up at me. “Known? On file? Of course. If it’s unidentified, it isn’t logic.”

“So ... we’ve found a completely novel molecule?”

That seemed unlikely—although perhaps the would-be miners had left a trace of some organic

substance peculiar to their own adapted metabolism. “What now?”

“Let’s go down a bit further. Slowly. See how far it extends. Whatever it is.”

I started the cable unwinding again. I thought: *The probe is broken—or confused by the thinness of the layer, or conflicting spectra from the rock beneath. The wall is coated with methane, carbon dioxide, water—nothing more exotic than that.*

I was wrong. As we descended, the substance took on colour; it started as a faint, uncertain tinge, then suddenly deepened into a vivid emerald green, strong enough to mask the colour of the rock. We stopped, so Elena could use the probe again—but the reading was unchanged.

I stared down the tunnel; still no end in sight. The green colour seemed to fade out just beneath us, though, giving way to the usual red-grey.

We continued—and the wall around us remained emerald green. A few metres below us, the tunnel appeared to be uncoated—but if I fixed my gaze on a point on the wall, its colour seemed to change as we approached it, and by the time it was level with my eyes it had taken on the same hue as we’d seen for the last twenty metres.

I pointed this out to Elena.

“Yes, I noticed. It must be some optical effect in the crystal—the colour depends on the angle of view.”

“But ... look above us! At the same angle to the surface, in the other direction, it still looks green!”

Elena looked up, then shrugged. “I don’t know, Khali. I expect it’s some trick of the light.” She sounded tired and dispirited. None of this had anything to do with the reason she was here; it was all just an annoying, confusing distraction.

I was baffled, but I couldn’t think of a serious explanation. I laughed. “Maybe we’re exuding the stuff. Maybe our exoskins are leaking—and this is nothing but frozen perspiration.” Elena ignored the joke; nothing I could say would cheer her up.

Soon after that, the emerald green gave way to a stretch of bright cherry red—not remotely like the rusty ferrous colours of the surface rock—and then, in rapid succession, bands of indigo, yellow, a darker green, a startling azure. Each time we stopped to investigate, the probe declared the substance unknown. The tunnel below still looked like bare rock—until we reached it—but above us was a strange mineralized rainbow, vanishing into the darkness.

When the coating changed to a glistening silver, it hardly seemed worth pausing, yet again; I was ready to sail right through, eager to reach the end of the tunnel, still hopeful that the miners, or whoever, might have left some interesting machinery behind.

Then Elena said, “Khali, do you see—?”

I hit the brakes.

The thin silver layer on the tunnel wall was growing before our eyes. Feathery needles appeared on the surface, branching out, thickening and overlapping until they formed a solid substrate, upon which the whole process began again. It was like a crystalline mass coming out of solution—but out of solution from *what?* I racked my brain for some half-sensible explanation. A transparent organometallic gas filling the tunnel, breaking down and depositing solid magnesium or aluminium? *Gas coming from where?* Some machine at the bottom of the tunnel, which had just happened to spring a leak as we arrived?

Even as I rotated my harness and reached out to touch the growing encrustation, my next guess was:

replicators, after all? The thought came too late for me to pull back, though; before I could think seriously about the perils of coming into contact with an unknown culture's nanoware, I'd grabbed a handful of the fine silver needles, and—

A wave of bittersweet hope flooded through me. Elena's insane pursuit of Chalmer's lode across the multiverse, her need to have this unreachable goal hovering forever on the horizon, suddenly made the most compelling sense.

I understood—

I let the crystals drop from my hand.

And the electrifying clarity of sharing Elena's private logic fell away with them.

I cried out in surprise, but I couldn't speak. My heart raced. I stared at the glittering mass condensing out of the vacuum onto the wall, precisely where we hung, and nowhere else; thickest and fastest around Elena—*What had happened here?* Something *had* struck this version of the Rock. Something much stranger than Chalmer's find. Something more primordial. It had ricocheted eight times within the rock, blasting out the caverns above us, before forming *this*.

A place where hope could solidify like logic.

And what else? What else within us had been reified? What coated the walls above us? I looked up at the crystalline rainbow we'd left in our wake, chromatograph of our souls.

Elena said, "Khali, we have to move. Quick, *take us up!*"

I heard her, but I was still in a daze. *Our souls?* Our brains were matter, nothing more; *hope* was a property of a system of neural pathways, ultimately explicable in terms of the simplest laws. But ... if matter could form such elaborate structures, perhaps logic could too. Levels of explanation corresponding to the emergence of "higher" laws.

I turned and gazed into the depths of the tunnel. Down there, what would be reified? Consciousness? Simpler animal drives? Organic growth? Finally, pure inanimate logic itself?

It was a horrifying prospect—but a strangely seductive one, too. Everything was a *thing*, after all; everything that made a difference. I said, "Take us up? No, take us down! We don't have to look for the mother lode any more. We can *become* the mother lode!"

Elena, thankfully, didn't understand what I meant. If she had, she might have found the suggestion tempting.

Instead, she hoisted herself up the cable, hand over hand, grabbed the control from me, and hit the button to winch us up.

I was hysterical and incoherent most of the way back to the surface. As we passed by the other layers, I tried to reach out and touch them—to discover what they were—but Elena pinned my arms to my side, and talked about abandoned mining replicators; mutated, unpredictable. I tried to tell her what I believed had happened, but I doubt that anything I said made the slightest sense. She hurried me across the floor of each cavern, deftly tugging the cable free and leaving the pulleys behind.

And outside the ship, it finally hit me: we'd left part of ourselves behind, too. Reasons, motives, emotions; whatever the arrangement of neurons inside our skulls, the mental phenomena they gave rise to had taken another—equally tangible—form in the tunnel. If manipulating primitive, solid logic could break the laws of physics, what would happen if we were separated from the reified abstractions of our own minds?

I said, "We have to go back. Scrape it all off. Take it with us."

Elena said, “You’re delirious. You’re infected.” She held me by the wrists, glancing with horror at my right hand.

I laughed. “You think I’m swarming with nanomachines? Then don’t take any risks. *Leave me here.*”

“Don’t be stupid, Khali. Come into the ship and get treated—”

“It’s not worth the risk, is it? I might contaminate everything. Leave me. Go make a jump. Leave me behind. I’ll live. Go find Chalmer’s lode. If you still want to.”

If you still want to.

I was a child. I was thirteen years old. I was in shock, I was hysterical. I didn’t know what I was doing—or at least, I could hardly be sure.

I pulled free. “I’m not getting into the ship. I’m staying.” I backed away, but not far. And I didn’t turn and run.

Elena said quietly, “Do what I say.”

I took a step backwards, not quite out of her reach, then said, “Do you really think you can make me?”

Elena gave no warning—or if she did, I managed to blind myself to it, because I know I didn’t flinch. She moved in a blur; punching me in the face, knocking me to the ground. The exoskin over one cheekbone ruptured, spraying red mist in front of my eyes. It must have resealed in less than a second, but by then I’d lost consciousness—and given up any chance of explaining what she’d be leaving behind.

WANG'S CARPETS

Waiting to be cloned one thousand times and scattered across ten million cubic light-years, Paolo Venetti relaxed in his favorite ceremonial bathtub: a tiered hexagonal pool set in a courtyard of black marble flecked with gold. Paolo wore full traditional anatomy, uncomfortable garb at first, but the warm currents flowing across his back and shoulders slowly eased him into a pleasant torpor. He could have reached the same state in an instant, by decree—but the occasion seemed to demand the complete ritual of verisimilitude, the ornate curlicued longhand of imitation physical cause and effect.

As the moment of diaspora approached, a small gray lizard darted across the courtyard, claws scabbling. It halted by the far edge of the pool, and Paolo marveled at the delicate pulse of its breathing, and watched the lizard watching him, until it moved again, disappearing into the surrounding vineyards. The environment was full of birds and insects, rodents and small reptiles—decorative in appearance, but also satisfying a more abstract aesthetic: softening the harsh radial symmetry of the lone observer; anchoring the simulation by perceiving it from a multitude of viewpoints. Ontological guy lines. No one had asked the lizards if they wanted to be cloned, though. They were coming along for the ride, like it or not.

The sky above the courtyard was warm and blue, cloudless and sunless, isotropic. Paolo waited calmly, prepared for every one of half a dozen possible fates.

An invisible bell chimed softly, three times. Paolo laughed, delighted.

One chime would have meant that he was still on Earth: an anticlimax, certainly—but there would have been advantages to compensate for that. Everyone who really mattered to him lived in the Carter-Zimmerman polis, but not all of them had chosen to take part in the diaspora to the same degree; his Earth-self would have lost no one. Helping to ensure that the thousand ships were safely dispatched would have been satisfying, too. And remaining a member of the wider Earth-based community, plugged into the entire global culture in real-time, would have been an attraction in itself.

Two chimes would have meant that this clone of Carter-Zimmerman had reached a planetary system devoid of life. Paolo had run a sophisticated—but non-sapient—self-predictive model before deciding to wake under those conditions. Exploring a handful of alien worlds, however barren, had seemed likely to be an enriching experience for him—with the distinct advantage that the whole endeavor would be untrammelled by the kind of elaborate precautions necessary in the presence of alien life. C-Z's population would have fallen by more than half—and many of his closest friends would have been absent—but he would have forged new friendships, he was sure.

Four chimes would have signaled the discovery of intelligent aliens. Five, a technological civilization. Six, spacefarers.

Three chimes, though, meant that the scout probes had detected unambiguous signs of life—and that was reason enough for jubilation. Up until the moment of the pre-launch cloning—a subjective instant before the chimes had sounded—no reports of alien life had ever reached Earth. There'd been no guarantee that any part of the diaspora would find it.

Paolo willed the polis library to brief him; it promptly rewired the declarative memory of his simulated traditional brain with all the information he was likely to need to satisfy his immediate curiosity. This clone of C-Z had arrived at Vega, the second closest of the thousand target stars, twenty-seven light-years from Earth. Paolo closed his eyes and visualized a star map with a thousand

lines radiating out from the sun, then zoomed in on the trajectory which described his own journey. It had taken three centuries to reach Vega—but the vast majority of the polis's twenty thousand inhabitants had programmed their exoselves to suspend them prior to the cloning, and to wake them only if and when they arrived at a suitable destination. Ninety-two citizens had chosen the alternative: experiencing every voyage of the diaspora from start to finish, risking disappointment, and even death. Paolo now knew that the ship aimed at Fomalhaut, the target nearest Earth, had been struck by debris and annihilated *en route*. He mourned the ninety-two, briefly. He hadn't been close to any of them, prior to the cloning, and the particular versions who'd willfully perished two centuries ago in interstellar space seemed as remote as the victims of some ancient calamity from the era of flesh.

Paolo examined his new home star through the cameras of one of the scout probes—and the strange filters of the ancestral visual system. In traditional colors, Vega was a fierce blue-white disk, laced with prominences. Three times the mass of the sun, twice the size and twice as hot, sixty times as luminous. Burning hydrogen fast—and already halfway through its allotted five hundred million years on the main sequence.

Vega's sole planet, Orpheus, had been a featureless blip to the best lunar interferometers; now Paolo gazed down on its blue-green crescent, ten thousand kilometers below Carter-Zimmerman itself. Orpheus was terrestrial, a nickel-iron-silicate world; slightly larger than Earth, slightly warmer—a billion kilometers took the edge off Vega's heat—and almost drowning in liquid water. Impatient to see the whole surface firsthand, Paolo slowed his clock rate a thousandfold, allowing C-Z to circumnavigate the planet in twenty subjective seconds, daylight unshrouding a broad new swath with each pass. Two slender ocher-colored continents with mountainous spines bracketed hemispheric oceans, and dazzling expanses of pack ice covered both poles—far more so in the north, where jagged white peninsulas radiated out from the midwinter arctic darkness.

The Orphean atmosphere was mostly nitrogen—six times as much as on Earth; probably split by UV from primordial ammonia—with traces of water vapor and carbon dioxide, but not enough of either for a runaway greenhouse effect. The high atmospheric pressure meant reduced evaporation—Paolo saw not a wisp of cloud—and the large, warm oceans in turn helped feed carbon dioxide back into the crust, locking it up in limestone sediments destined for subduction.

The whole system was young, by Earth standards, but Vega's greater mass, and a denser protostellar cloud, would have meant swifter passage through most of the traumas of birth: nuclear ignition and early luminosity fluctuations; planetary coalescence and the age of bombardments. The library estimated that Orpheus had enjoyed a relatively stable climate, and freedom from major impacts, for at least the past hundred million years.

Long enough for primitive life to appear—

A hand seized Paolo firmly by the ankle and tugged him beneath the water. He offered no resistance, and let the vision of the planet slip away. Only two other people in C-Z had free access to this environment—and his father didn't play games with his now-twelve-hundred-year-old son.

Elena dragged him all the way to the bottom of the pool, before releasing his foot and hovering above him, a triumphant silhouette against the bright surface. She was ancestor-shaped, but obviously cheating; she spoke with perfect clarity, and no air bubbles at all.

“Late sleeper! I've been waiting seven weeks for this!”

Paolo feigned indifference, but he was fast running out of breath. He had his exoself convert him into an amphibious human variant—biologically and historically authentic, if no longer the definitive

ancestral phenotype. Water flooded into his modified lungs, and his modified brain welcomed it.

He said, “Why would I want to waste consciousness, sitting around waiting for the scout probes to refine their observations? I woke as soon as the data was unambiguous.”

She pummeled his chest; he reached up and pulled her down, instinctively reducing his buoyancy to compensate, and they rolled across the bottom of the pool, kissing.

Elena said, “You know we’re the first C-Z to arrive, anywhere? The Fomalhaut ship was destroyed. So there’s only one other pair of us. Back on Earth.”

“So?” Then he remembered. Elena had chosen not to wake if any other version of her had already encountered life. Whatever fate befell each of the remaining ships, every other version of him would have to live without her.

He nodded soberly, and kissed her again. “What am I meant to say? You’re a thousand times more precious to me, now?”

“Yes.”

“Ah, but what about the you-and-I on Earth? Five hundred times would be closer to the truth.”

“There’s no poetry in five hundred.”

“Don’t be so defeatist. Rewire your language centers.”

She ran her hands along the sides of his ribcage, down to his hips. They made love with their almost-traditional bodies—and brains; Paolo was amused to the point of distraction when his limbic system went into overdrive, but he remembered enough from the last occasion to bury his self-consciousness and surrender to the strange hijacker. It wasn’t like making love in any civilized fashion—the rate of information exchange between them was minuscule, for a start—but it had the raw insistent quality of most ancestral pleasures.

Then they drifted up to the surface of the pool and lay beneath the radiant sunless sky.

Paolo thought: *I’ve crossed twenty-seven light-years in an instant. I’m orbiting the first planet ever found to hold alien life. And I’ve sacrificed nothing—left nothing I truly value behind. This is too good, too good.* He felt a pang of regret for his other selves—it was hard to imagine them faring as well, without Elena, without Orpheus—but there was nothing he could do about that, now. Although there’d be time to confer with Earth before any more ships reached their destinations, he’d decided—prior to the cloning—not to allow the unfolding of his manifold future to be swayed by any change of heart. Whether or not his Earth-self agreed, the two of them were powerless to alter the criteria for waking. The self with the right to choose for the thousand had passed away.

No matter, Paolo decided. The others would find—or construct—their own reasons for happiness. And there was still the chance that one of them would wake to the sound of *four chimes*.

Elena said, “If you’d slept much longer, you would have missed the vote.”

The vote? The scouts in low orbit had gathered what data they could about Orphean biology. To proceed any further, it would be necessary to send microprobes into the ocean itself—an escalation of contact which required the approval of two-thirds of the polis. There was no compelling reason to believe that the presence of a few million tiny robots could do any harm; all they’d leave behind in the water was a few kilojoules of waste heat. Nevertheless, a faction had arisen which advocated caution. The citizens of Carter-Zimmerman, they argued, could continue to observe from a distance for another decade, or another millennium, refining their observations and hypotheses before intruding ... and those who disagreed could always sleep away the time, or find other interests to pursue.

Paolo delved into his library-fresh knowledge of the “carpets”—the single Orphean lifeform

detected so far. They were free-floating creatures living in the equatorial ocean depths—apparently destroyed by UV if they drifted too close to the surface. They grew to a size of hundreds of meters, then fissioned into dozens of fragments, each of which continued to grow. It was tempting to assume that they were colonies of single-celled organisms, something like giant kelp—but there was no real evidence yet to back that up. It was difficult enough for the scout probes to discern the carpets’ gross appearance and behavior through a kilometer of water, even with Vega’s copious neutrinos lighting the way; remote observations on a microscopic scale, let alone biochemical analyses, were out of the question. Spectroscopy revealed that the surface water was full of intriguing molecular debris—but guessing the relationship of any of it to the living carpets was like trying to reconstruct human biochemistry by studying human ashes.

Paolo turned to Elena. “What do you think?”

She moaned theatrically; the topic must have been argued to death while he slept. “The microprobes are harmless. They could tell us exactly what the carpets are made of, without removing a single molecule. What’s the risk? *Culture shock?*”

Paolo flicked water onto her face, affectionately; the impulse seemed to come with the amphibian body. “You can’t be sure that they’re not intelligent.”

“Do you know what was living on Earth, two hundred million years after it was formed?”

“Maybe cyanobacteria. Maybe nothing. This isn’t Earth, though.”

“True. But even in the unlikely event that the carpets are intelligent, do you think they’d notice the presence of robots a millionth their size? If they’re unified organisms, they don’t appear to react to anything in their environment—they have no predators, they don’t pursue food, they just drift with the currents—so there’s no reason for them to possess elaborate sense organs at all, let alone anything working on a sub-millimeter scale. And if they’re colonies of single-celled creatures, one of which happens to collide with a microprobe and register its presence with surface receptors ... what conceivable harm could that do?”

“I have no idea. But my ignorance is no guarantee of safety.”

Elena splashed him back. “The only way to deal with your *ignorance* is to vote to send down the microprobes. We have to be cautious, I agree—but there’s no point *being here* if we don’t find out what’s happening in the oceans, right now. I don’t want to wait for this planet to evolve something smart enough to broadcast biochemistry lessons into space. If we’re not willing to take a few infinitesimal risks, Vega will turn red giant before we learn anything.”

It was a throwaway line—but Paolo tried to imagine witnessing the event. In a quarter of a billion years, would the citizens of Carter-Zimmerman be debating the ethics of intervening to rescue the Orpheans—or would they all have lost interest, and departed for other stars, or modified themselves into beings entirely devoid of nostalgic compassion for organic life?

Grandiose visions for a twelve-hundred-year-old. The Fomalhaut clone had been obliterated by one tiny piece of rock. There was far more junk in the Vegan system than in interstellar space; even ringed by defenses, its data backed up to all the far-flung scout probes, this C-Z was not invulnerable just because it had arrived intact. Elena was right; they had to seize the moment—or they might as well retreat into their own hermetic worlds and forget that they’d ever made the journey.

Paolo recalled the honest puzzlement of a friend from Ashton-Laval: *Why go looking for aliens? Our polis has a thousand ecologies, a trillion species of evolved life. What do you hope to find, out there, that you couldn’t have grown at home?*

What had he hoped to find? Just the answers to a few simple questions. Did human consciousness bootstrap all of space-time into existence, in order to explain itself? Or had a neutral, pre-existing universe given birth to a billion varieties of conscious life, all capable of harboring the same delusions of grandeur—until they collided with each other? Anthrocosmology was used to justify the inward-looking stance of most polises: if the physical universe was created by human thought, it had no special status which placed it above virtual reality. It might have come first—and every virtual reality might need to run on a physical computing device, subject to physical laws—but it occupied no privileged position in terms of “truth” versus “illusion.” If the ACs were right, then it was no more *honest* to value the physical universe over more recent artificial realities than it was honest to remain flesh instead of software, or ape instead of human, or bacterium instead of ape.

Elena said, “We can’t lie here forever; the gang’s all waiting to see you.”

“Where?” Paolo felt his first pang of homesickness; on Earth, his circle of friends had always met in a real-time image of the Mount Pinatubo crater, plucked straight from the observation satellites. A recording wouldn’t be the same.

“I’ll show you.”

Paolo reached over and took her hand. The pool, the sky, the courtyard vanished—and he found himself gazing down on Orpheus again ... nightside, but far from dark, with his full mental palette now encoding everything from the pale wash of ground-current long-wave radio, to the multicolored shimmer of isotopic gamma rays and back-scattered cosmic-ray bremsstrahlung. Half the abstract knowledge the library had fed him about the planet was obvious at a glance, now. The ocean’s smoothly tapered thermal glow spelt *three-hundred Kelvin* instantly—as well as back-lighting the atmosphere’s telltale infrared silhouette.

He was standing on a long, metallic-looking girder, one edge of a vast geodesic sphere, open to the blazing cathedral of space. He glanced up and saw the star-rich dust-clogged band of the Milky Way, encircling him from zenith to nadir; aware of the glow of every gas cloud, discerning each absorption and emission line, Paolo could almost feel the plane of the galactic disk transect him. Some constellations were distorted, but the view was more familiar than strange—and he recognized most of the old signposts by color. He had his bearings, now. Twenty degrees away from Sirius—south, by parochial Earth reckoning—faint but unmistakable: the sun.

Elena was beside him—superficially unchanged, although they’d both shrugged off the constraints of biology. The conventions of this environment mimicked the physics of real macroscopic objects in free-fall and vacuum, but it wasn’t set up to model any kind of chemistry, let alone that of flesh and blood. Their new bodies were human-shaped, but devoid of elaborate microstructure—and their minds weren’t embedded in the physics at all, but were running directly on the processor web.

Paolo was relieved to be back to normal; ceremonial regression to the ancestral form was a venerable C-Z tradition—and being human was largely self-affirming, while it lasted—but every time he emerged from the experience, he felt as if he’d broken free of billion-year-old shackles. There were polises on Earth where the citizens would have found his present structure almost as archaic: a consciousness dominated by sensory perception, an illusion of possessing solid form, a single time coordinate. The last flesh human had died long before Paolo was constructed, and apart from the communities of Gleisner robots, Carter-Zimmerman was about as conservative as a transhuman society could be. The balance seemed right to Paolo, though—acknowledging the flexibility of software, without abandoning interest in the physical world—and although the stubbornly corporeal

Gleisners had been first to the stars, the C-Z diaspora would soon overtake them.

Their friends gathered round, showing off their effortless free-fall acrobatics, greeting Paolo and chiding him for not arranging to wake sooner; he was the last of the gang to emerge from hibernation.

“Do you like our humble new meeting place?” Hermann floated by Paolo’s shoulder, a chimeric cluster of limbs and sense-organs, speaking through the vacuum in modulated infrared. “We call it Satellite Pinatubo. It’s desolate up here, I know—but we were afraid it might violate the spirit of caution if we dared pretend to walk the Orphean surface.”

Paolo glanced mentally at a scout probe’s close-up of a typical stretch of dry land, an expanse of fissured red rock. “More desolate down there, I think.” He was tempted to touch the ground—to let the private vision become tactile—but he resisted. Being elsewhere in the middle of a conversation was bad etiquette.

“Ignore Hermann,” Liesl advised. “He wants to flood Orpheus with our alien machinery before we have any idea what the effects might be.” Liesl was a green-and-turquoise butterfly, with a stylized human face stippled in gold on each wing.

Paolo was surprised; from the way Elena had spoken, he’d assumed that his friends must have come to a consensus in favor of the microprobes—and only a late sleeper, new to the issues, would bother to argue the point. “What effects? The carpets—”

“Forget the carpets! Even if the carpets are as simple as they look, we don’t know what else is down there.” As Liesl’s wings fluttered, her mirror-image faces seemed to glance at each other for support. “With neutrino imaging, we barely achieve spatial resolution in meters, time resolution in seconds. We don’t know anything about smaller lifeforms.”

“And we never will, if you have your way.” Karpal—an ex-Gleisner, human-shaped as ever—had been Liesl’s lover, last time Paolo was awake.

“We’ve only been here for a fraction of an Orphean year! There’s still a wealth of data we could gather non-intrusively, with a little patience. There might be rare beachings of ocean life—”

Elena said dryly, “Rare indeed. Orpheus has negligible tides, shallow waves, very few storms. And anything beached would be fried by UV before we glimpsed anything more instructive than we’re already seeing in the surface water.”

“Not necessarily. The carpets seem to be vulnerable—but other species might be better protected, if they live nearer to the surface. And Orpheus is seismically active; we should at least wait for a tsunami to dump a few cubic kilometers of ocean onto a shoreline, and see what it reveals.”

Paolo smiled; he hadn’t thought of that. A tsunami might be worth waiting for.

Liesl continued, “What is there to lose, by waiting a few hundred Orphean years? At the very least, we could gather baseline data on seasonal climate patterns—and we could watch for anomalies, storms and quakes, hoping for some revelatory glimpses.”

A few hundred Orphean years? A *few terrestrial millennia*? Paolo’s ambivalence waned. If he’d wanted to inhabit geological time, he would have migrated to the Lokhande polis, where the Order of Contemplative Observers watched Earth’s mountains erode in subjective seconds. Orpheus hung in the sky beneath them, a beautiful puzzle waiting to be decoded, demanding to be understood.

He said, “But what if there *are* no ‘revelatory glimpses’? How long do we wait? We don’t know how rare life is—in time, or in space. If this planet is precious, *so is the epoch it’s passing through*. We don’t know how rapidly Orphean biology is evolving; species might appear and vanish while we agonize over the risks of gathering better data. The carpets—and whatever else—could die out before

we'd learnt the first thing about them. What a waste that would be!"

Liesl stood her ground.

"And if we damage the Orphean ecology—or culture—by rushing in? That wouldn't be a waste. It would be a tragedy."

Paolo assimilated all the stored transmissions from his Earth-self—almost three hundred years' worth—before composing a reply. The early communications included detailed mind grafts—and it was good to share the excitement of the diaspora's launch; to watch—very nearly firsthand—the thousand ships, nanomachine-carved from asteroids, depart in a blaze of fusion fire from beyond the orbit of Mars. Then things settled down to the usual prosaic matters: Elena, the gang, shameless gossip, Carter-Zimmerman's ongoing research projects, the buzz of interpolis cultural tensions, the not-quite-cyclic convulsions of the arts (the perceptual aesthetic overthrows the emotional, again ... although Valladas in Konishi polis claims to have constructed a new synthesis of the two).

After the first fifty years, his Earth-self had begun to hold things back; by the time news reached Earth of the Fomalhaut clone's demise, the messages had become pure audiovisual linear monologues. Paolo understood. It was only right; they'd diverged, and you didn't send mind grafts to strangers.

Most of the transmissions had been broadcast to all of the ships, indiscriminately. Forty-three years ago, though, his Earth-self had sent a special message to the Vega-bound clone.

"The new lunar spectroscope we finished last year has just picked up clear signs of water on Orpheus. There should be large temperate oceans waiting for you, if the models are right. So ... good luck." Vision showed the instrument's domes growing out of the rock of the lunar farside; plots of the Orphean spectral data; an ensemble of planetary models. "Maybe it seems strange to you—all the trouble we're taking to catch a glimpse of what you're going to see in close-up, so soon. It's hard to explain: I don't think it's jealousy, or even impatience. Just a need for independence.

"There's been a revival of the old debate: should we consider redesigning our minds to encompass interstellar distances? One self spanning thousands of stars, not via cloning, but through acceptance of the natural time scale of the light-speed lag. Millennia passing between mental events. Local contingencies dealt with by non-conscious systems." Essays, pro and con, were appended; Paolo ingested summaries. "I don't think the idea will gain much support, though—and the new astronomical projects are something of an antidote. We have to make peace with the fact that we've stayed behind ... so we cling to the Earth—looking outwards, but remaining firmly anchored.

"I keep asking myself, though: where do we go from here? History can't guide us. Evolution can't guide us. The C-Z charter says *understand and respect the universe* ... but in what form? On what scale? With what kind of senses, what kind of minds? We can become anything at all—and that space of possible futures dwarfs the galaxy. Can we explore it without losing our way? Flesh humans used to spin fantasies about aliens arriving to 'conquer' Earth, to steal their 'precious' physical resources, to wipe them out for fear of competition' ... as if a species capable of making the journey wouldn't have had the power, or the wit, or the imagination, to rid itself of obsolete biological imperatives. *Conquering the galaxy* is what bacteria with spaceships would do—knowing no better, having no choice.

"Our condition is the opposite of that: we have no end of choices. That's why we need to find alien life—not just to break the spell of the anthrocosmologists. We need to find aliens who've faced

the same decisions—and discovered how to live, what to become. We need to understand what it means to inhabit the universe.”

Paolo watched the crude neutrino images of the carpets moving in staccato jerks around his dodecahedral room. Twenty-four ragged oblongs drifted above him, daughters of a larger ragged oblong which had just fissioned. Models suggested that shear forces from ocean currents could explain the whole process, triggered by nothing more than the parent reaching a critical size. The purely mechanical break-up of a colony—if that was what it was—might have little to do with the life cycle of the constituent organisms. It was frustrating. Paolo was accustomed to a torrent of data on anything which caught his interest; for the diaspora’s great discovery to remain nothing more than a sequence of coarse monochrome snapshots was intolerable.

He glanced at a schematic of the scout probes’ neutrino detectors, but there was no obvious scope for improvement. Nuclei in the detectors were excited into unstable high-energy states, then kept there by fine-tuned gamma-ray lasers picking off lower-energy eigenstates faster than they could creep into existence and attract a transition. Changes in neutrino flux of one part in ten-to-the-fifteenth could shift the energy levels far enough to disrupt the balancing act. The carpets cast a shadow so faint, though, that even this near-perfect vision could barely resolve it.

Orlando Venetti said, “You’re awake.”

Paolo turned. His father stood an arm’s length away, presenting as an ornately clad human of indeterminate age. Definitely older than Paolo, though; Orlando never ceased to play up his seniority—even if the age difference was only twenty-five percent now, and falling.

Paolo banished the carpets from the room to the space behind one pentagonal window, and took his father’s hand. The portions of Orlando’s mind which meshed with his own expressed pleasure at Paolo’s emergence from hibernation, fondly dwelt on past shared experiences, and entertained hopes of continued harmony between father and son. Paolo’s greeting was similar, a carefully contrived “revelation” of his own emotional state. It was more of a ritual than an act of communication—but then, even with Elena, he set up barriers. No one was totally honest with another person—unless the two of them intended to permanently fuse.

Orlando nodded at the carpets. “I hope you appreciate how important they are.”

“You know I do.” He hadn’t included that in his greeting, though. “First alien life.” *C-Z humiliates the Gleisner robots, at last*—that was probably how his father saw it. The robots had been first to Alpha Centauri, and first to an extrasolar planet—but first life was Apollo to their Sputniks, for anyone who chose to think in those terms.

Orlando said, “This is the hook we need, to catch the citizens of the marginal polises. The ones who haven’t quite imploded into solipsism. This will shake them up—don’t you think?”

Paolo shrugged. Earth’s transhumans were free to implode into anything they liked; it didn’t stop Carter-Zimmerman from exploring the physical universe. But thrashing the Gleisners wouldn’t be enough for Orlando; he lived for the day when C-Z would become the cultural mainstream. *Any* polis could multiply its population a billionfold in a microsecond, if it wanted the vacuous honor of outnumbering the rest. Luring other citizens to migrate was harder—and persuading them to rewrite their own local charters was harder still. Orlando had a missionary streak: he wanted every other polis to see the error of its ways, and follow C-Z to the stars.

Paolo said, “Ashton-Laval has intelligent aliens. I wouldn’t be so sure that news of giant seaweed

is going to take Earth by storm.”

Orlando was venomous. “Ashton-Laval intervened in its so-called ‘evolutionary’ simulations so many times that they might as well have built the end products in an act of creation lasting six days. They wanted talking reptiles, and—*mirabile dictu!*—they got talking reptiles. There are self-modified transhumans in *this polis* more alien than the aliens in Ashton-Laval.”

Paolo smiled. “All right. Forget Ashton-Laval. But forget the marginal polises, too. We choose to value the physical world. That’s what defines us—but it’s as arbitrary as any other choice of values. Why can’t you accept that? It’s not the One True Path which the infidels have to be bludgeoned into following.” He knew he was arguing half for the sake of it—he desperately wanted to refute the anthrocosmologists, himself—but Orlando always drove him into taking the opposite position. Out of fear of being nothing but his father’s clone? Despite the total absence of inherited episodic memories, the stochastic input into his ontogenesis, the chaotically divergent nature of the iterative mind-building algorithms.

Orlando made a beckoning gesture, dragging the image of the carpets halfway back into the room. “You’ll vote for the microprobes?”

“Of course.”

“Everything depends on that, now. It’s good to start with a tantalizing glimpse—but if we don’t follow up with details soon, they’ll lose interest back on Earth very rapidly.”

“Lose interest? It’ll be fifty-four years before we know if anyone paid the slightest attention in the first place.”

Orlando eyed him with disappointment, and resignation. “If you don’t care about the other polises, think about C-Z. This helps us, it strengthens us. We have to make the most of that.”

Paolo was bemused. “The charter is the charter. What needs to be strengthened? You make it sound like there’s something at risk.”

“What do you think a thousand lifeless worlds would have done to us? Do you think the charter would have remained intact?”

Paolo had never considered the scenario. “Maybe not. But in every C-Z where the charter was rewritten, there would have been citizens who’d have gone off and founded new polises *on* the old lines. You and I, for a start. We could have called it Venetti-Venetti.”

“While half your friends turned their backs on the physical world? While Carter-Zimmerman, after two thousand years, went solipsist? You’d be happy with that?”

Paolo laughed. “No—but it’s not going to happen, is it? *We’ve found life*. All right, I agree with you: this strengthens C-Z. The diaspora might have ‘failed’... but it didn’t. We’ve been lucky. I’m glad, I’m grateful. Is that what you wanted to hear?”

Orlando said sourly, “You take too much for granted.”

“And you care too much what I think! I’m not your ... heir.” Orlando was first-generation, scanned from flesh—and there were times when he seemed unable to accept that the whole concept of generation had lost its archaic significance. “You don’t need me to safeguard the future of Carter-Zimmerman on your behalf. Or the future of transhumanity. You can do it in person.”

Orlando looked wounded—a conscious choice, but it still encoded something. Paolo felt a pang of regret—but he’d said nothing he could honestly retract.

His father gathered up the sleeves of his gold and crimson robes—the only citizen of C-Z who could make Paolo uncomfortable to be naked—and repeated as he vanished from the room: “You take

too much for granted.”

The gang watched the launch of the microprobes together—even Liesl, though she came in mourning, as a giant dark bird. Karpal stroked her feathers nervously. Hermann appeared as a creature out of Escher, a segmented worm with six human-shaped feet—on legs with elbows—given to curling up into a disk and rolling along the girders of Satellite Pinatubo. Paolo and Elena kept saying the same thing simultaneously; they’d just made love.

Hermann had moved the satellite to a notional orbit just below one of the scout probes—and changed the environment’s scale, so that the probe’s lower surface, an intricate landscape of detector modules and attitude-control jets, blotted out half the sky. The atmospheric-entry capsules—ceramic teardrops three centimeters wide—burst from their launch tube and hurtled past like boulders, vanishing from sight before they’d fallen so much as ten meters closer to Orpheus. It was all scrupulously accurate, although it was part real-time imagery, part extrapolation, part *faux*. Paolo thought: *We might as well have run a pure simulation ... and pretended to follow the capsules down.* Elena gave him a guilty/admonishing look. *Yeah—and then why bother actually launching them at all? Why not just simulate a plausible Orphean ocean full of plausible Orphean lifeforms? Why not simulate the whole diaspora?* There was no crime of heresy in C-Z; no one had ever been exiled for breaking the charter. At times it still felt like a tightrope walk, though, trying to classify every act of simulation into those which contributed to an understanding of the physical universe (good), those which were merely convenient, recreational, aesthetic (acceptable) ... and those which constituted a denial of the primacy of real phenomena (time to think about emigration).

The vote on the microprobes had been close: seventy-two percent in favor, just over the required two-thirds majority, with five percent abstaining. (Citizens created since the arrival at Vega were excluded ... not that anyone in Carter-Zimmerman would have dreamt of stacking the ballot, perish the thought.) Paolo had been surprised at the narrow margin; he’d yet to hear a single plausible scenario for the microprobes doing harm. He wondered if there was another, unspoken reason which had nothing to do with fears for the Orphean ecology, or hypothetical culture. *A wish to prolong the pleasure of unraveling the planet’s mysteries?* Paolo had some sympathy with that impulse—but the launch of the microprobes would do nothing to undermine the greater long-term pleasure of watching, and understanding, as Orphean life evolved.

Liesl said forlornly, “Coastline erosion models show that the northwestern shore of Lambda is inundated by tsunami every ninety Orphean years, on average.” She offered the data to them; Paolo glanced at it, and it looked convincing—but the point was academic now. “We could have waited.”

Hermann waved his eye-stalks at her. “Beaches covered in fossils, are they?”

“No, but the conditions hardly—”

“No excuses!” He wound his body around a girder, kicking his legs gleefully. Hermann was first-generation, even older than Orlando; he’d been scanned in the twenty-first century, before Carter-Zimmerman existed. Over the centuries, though, he’d wiped most of his episodic memories, and rewritten his personality a dozen times. He’d once told Paolo, “I think of myself as my own great-great-grandson. Death’s not so bad, if you do it incrementally. Ditto for immortality.”

Elena said, “I keep trying to imagine how it will feel if another C-Z clone stumbles on something infinitely better—like aliens with wormhole drives—while we’re back here studying rafts of algae.” The body she wore was more stylized than usual—still humanoid, but sexless, hairless and smooth,

the face inexpressive and androgynous.

“If they have wormhole drives, they might visit us. Or share the technology, so we can link up the whole diaspora.”

“If they have wormhole drives, where have they been for the last two thousand years?”

Paolo laughed. “Exactly. But I know what you mean: *first alien life* ... and it’s likely to be about as sophisticated as seaweed. It breaks the jinx, though. Seaweed every twenty-seven light-years. Nervous systems every fifty? Intelligence every hundred?” He fell silent, abruptly realizing what she was feeling: electing not to wake again after first life was beginning to seem like the wrong choice, a waste of the opportunities the diaspora had created. Paolo offered her a mind graft expressing empathy and support, but she declined.

She said, “I want sharp borders, right now. I want to deal with this myself.”

“I understand.” He let the partial model of her which he’d acquired as they’d made love fade from his mind. It was non-sapient, and no longer linked to her—but to retain it any longer when she felt this way would have seemed like a transgression. Paolo took the responsibilities of intimacy seriously. His lover before Elena had asked him to erase all his knowledge of her, and he’d more or less complied—the only thing he still knew about her was the fact that she’d made the request.

Hermann announced, “Planetfall!” Paolo glanced at a replay of a scout probe view which showed the first few entry capsules breaking up above the ocean and releasing their microprobes. Nanomachines transformed the ceramic shields (and then themselves) into carbon dioxide and a few simple minerals—nothing the micrometeorites constantly raining down onto Orpheus didn’t contain—before the fragments could strike the water. The microprobes would broadcast nothing; when they’d finished gathering data, they’d float to the surface and modulate their UV reflectivity. It would be up to the scout probes to locate these specks, and read their messages, before they self-destructed as thoroughly as the entry capsules.

Hermann said, “This calls for a celebration. I’m heading for the Heart. Who’ll join me?”

Paolo glanced at Elena. She shook her head. “You go.”

“Are you sure?”

“Yes! Go on.” Her skin had taken on a mirrored sheen; her expressionless face reflected the planet below. “I’m all right. I just want some time to think things through, on my own.”

Hermann coiled around the satellite’s frame, stretching his pale body as he went, gaining segments, gaining legs. “Come on, come on! Karpal? Liesl? Come and celebrate!”

Elena was gone. Liesl made a derisive sound and flapped off into the distance, mocking the environment’s airlessness. Paolo and Karpal watched as Hermann grew longer and faster—and then in a blur of speed and change stretched out to wrap the entire geodesic frame. Paolo demagnetized his feet and moved away, laughing; Karpal did the same.

Then Hermann constricted like a boa, and snapped the whole satellite apart.

They floated for a while, two human-shaped machines and a giant worm in a cloud of spinning metal fragments, an absurd collection of imaginary debris, glinting by the light of the true stars.

The Heart was always crowded, but it was larger than Paolo had seen it—even though Hermann had shrunk back to his original size, so as not to make a scene. The huge muscular chamber arched above them, pulsating wetly in time to the music, as they searched for the perfect location to soak up the atmosphere. Paolo had visited public environments in other polises, back on Earth; many were

designed to be nothing more than a perceptual framework for group emotion-sharing. He'd never understood the attraction of becoming intimate with large numbers of strangers. Ancestral social hierarchies might have had their faults—and it was absurd to try to make a virtue of the limitations imposed by minds confined to wetware—but the whole idea of mass telepathy as an end in itself seemed bizarre to Paolo ... and even old-fashioned, in a way. Humans, clearly, would have benefited from a good strong dose of each other's inner life, to keep them from slaughtering each other—but any civilized transhuman could respect and value other citizens without the need to have *been them*, firsthand.

They found a good spot and made some furniture, a table and two chairs—Hermann preferred to stand—and the floor expanded to make room. Paolo looked around, shouting greetings at the people he recognized by sight, but not bothering to check for identity broadcasts from the rest. Chances were he'd met everyone here, but he didn't want to spend the next hour exchanging pleasantries with casual acquaintances.

Hermann said, "I've been monitoring our modest stellar observatory's data stream—my antidote to Vegan parochialism. Odd things are going on around Sirius. We're seeing electron-positron annihilation gamma rays, gravity waves ... and some unexplained hot spots on Sirius B." He turned to Karpal and asked innocently, "What do you think those robots are up to? There's a rumor that they're planning to drag the white dwarf out of orbit, and use it as part of a giant spaceship."

"I never listen to rumors." Karpal always presented as a faithful reproduction of his old human-shaped Gleisner body—and his mind, Paolo gathered, always took the form of a physiological model, even though he was five generations removed from flesh. Leaving his people and coming into C-Z must have taken considerable courage; they'd never welcome him back.

Paolo said, "Does it matter what they do? Where they go, how they get there? There's more than enough room for both of us. Even if they shadowed the diaspora—even if they came to Vega—we could study the Orpheans together, couldn't we?"

Hermann's cartoon insect face showed mock alarm, eyes growing wider, and wider apart. "Not if they dragged along a white dwarf! Next thing they'd want to start building a Dyson sphere." He turned back to Karpal. "You don't still suffer the urge, do you, for ... *astrophysical* engineering?"

"Nothing C-Z's exploitation of a few megatons of Vegan asteroid material hasn't satisfied."

Paolo tried to change the subject. "Has anyone heard from Earth, lately? I'm beginning to feel unplugged." His own most recent message was a decade older than the time lag.

Karpal said, "You're not missing much; all they're talking about is Orpheus ... ever since the new lunar observations, the signs of water. They seem more excited by the mere possibility of life than we are by the certainty. And they have very high hopes."

Paolo laughed. "They do. My Earth-self seems to be counting on the diaspora to find an advanced civilization with the answers to all of transhumanity's existential problems. I don't think he'll get much cosmic guidance from kelp."

"You know there was a big rise in emigration from C-Z after the launch? Emigration, and suicides." Hermann had stopped wriggling and gyrating, becoming almost still, a sign of rare seriousness. "I suspect that's what triggered the astronomy program in the first place. And it seems to have stanchd the flow, at least in the short term. Earth C-Z detected water before any clone in the diaspora—and when they hear that we've found life, they'll feel more like collaborators in the discovery because of it."

Paolo felt a stirring of unease. *Emigration and suicides? Was that why Orlando had been so gloomy?* After three hundred years of waiting, how high had expectations become?

A buzz of excitement crossed the floor, a sudden shift in the tone of the conversation. Hermann whispered reverently, “First microprobe has surfaced. And the data is coming in now.”

The non-sapient Heart was intelligent enough to guess its patrons’ wishes. Although everyone could tap the library for results, privately, the music cut out and a giant public image of the summary data appeared, high in the chamber. Paolo had to crane his neck to view it, a novel experience.

The microprobe had mapped one of the carpets in high resolution. The image showed the expected rough oblong, some hundred meters wide—but the two-or-three-meter-thick slab of the neutrino tomographs was revealed now as a delicate, convoluted surface—fine as a single layer of skin, but folded into an elaborate space-filling curve. Paolo checked the full data: the topology was strictly planar, despite the pathological appearance. No holes, no joins—just a surface which meandered wildly enough to look ten thousand times thicker from a distance than it really was.

An inset showed the microstructure, at a point which started at the rim of the carpet and then—slowly—moved toward the center. Paolo stared at the flowing molecular diagram for several seconds before he grasped what it meant.

The carpet was not a colony of single-celled creatures. Nor was it a multi-cellular organism. It was a *single molecule*, a two-dimensional polymer weighing twenty-five million kilograms. A giant sheet of folded polysaccharide, a complex mesh of interlinked pentose and hexose sugars hung with alkyl and amide side chains. A bit like a plant cell wall—except that this polymer was far stronger than cellulose, and the surface area was twenty orders of magnitude greater.

Karpal said, “I hope those entry capsules were perfectly sterile. Earth bacteria would gorge themselves on this. One big floating carbohydrate dinner, with no defenses.”

Hermann thought it over. “Maybe. If they had enzymes capable of breaking off a piece—which I doubt. No chance we’ll find out, though: even if there’d been bacterial spores lingering in the asteroid belt from early human expeditions, every ship in the diaspora was double-checked for contamination *en route*. We haven’t brought smallpox to the Americas.”

Paolo was still dazed. “But how does it assemble? How does it ... grow?” Hermann consulted the library and replied, before Paolo could do the same.

“The edge of the carpet catalyzes its own growth. The polymer is irregular, aperiodic—there’s no single component which simply repeats. But there seem to be about twenty thousand basic structural units—twenty thousand different polysaccharide building blocks.” Paolo saw them: long bundles of cross-linked chains running the whole two-hundred-micron thickness of the carpet, each with a roughly square cross-section, bonded at several thousand points to the four neighboring units. “Even at this depth, the ocean’s full of UV-generated radicals which filter down from the surface. Any structural unit exposed to the water converts those radicals into more polysaccharide—and builds another structural unit.”

Paolo glanced at the library again, for a simulation of the process. Catalytic sites strewn along the sides of each unit trapped the radicals in place, long enough for new bonds to form between them. Some simple sugars were incorporated straight into the polymer as they were created; others were set free to drift in solution for a microsecond or two, until they were needed. At that level, there were only a few basic chemical tricks being used ... but molecular evolution must have worked its way up from a few small autocatalytic fragments, first formed by chance, to this elaborate system of twenty

thousand mutually self-replicating structures. If the “structural units” had floated free in the ocean as independent molecules, the “lifeform” they comprised would have been virtually invisible. By bonding together, though, they became twenty thousand colors in a giant mosaic.

It was astonishing. Paolo hoped Elena was tapping the library, wherever she was. A colony of algae would have been more “advanced”—but this incredible primordial creature revealed infinitely more about the possibilities for the genesis of life. Carbohydrate, here, played every biochemical role: information carrier, enzyme, energy source, structural material. Nothing like it could have survived on Earth, once there were organisms capable of feeding on it—and if there were ever intelligent Orpheans, they’d be unlikely to find any trace of this bizarre ancestor.

Karpal wore a secretive smile.

Paolo said, “What?”

“Wang tiles. The carpets are made out of Wang tiles.”

Hermann beat him to the library, again.

“*Wang* as in twentieth-century flesh mathematician, Hao Wang. *Tiles* as in any set of shapes which can cover the plane. Wang tiles are squares with various shaped edges, which have to fit complementary shapes on adjacent squares. You can cover the plane with a set of Wang tiles, as long as you choose the right one every step of the way. Or in the case of the carpets, grow the right one.”

Karpal said, “We should call them Wang’s Carpets, in honor of Hao Wang. After twenty-three hundred years, his mathematics has come to life.”

Paolo liked the idea, but he was doubtful. “We may have trouble getting a two-thirds majority on that. It’s a bit obscure ...”

Hermann laughed. “Who needs a two-thirds majority? If we want to call them Wang’s Carpets, we can call them Wang’s Carpets. There are ninety-seven languages in current use in C-Z—half of them invented since the polis was founded. I don’t think we’ll be exiled for coining one private name.”

Paolo concurred, slightly embarrassed. The truth was, he’d completely forgotten that Hermann and Karpal weren’t actually speaking Modern Roman.

The three of them instructed their exoselves to consider the name adopted: henceforth they’d hear “carpet” as “Wang’s Carpet”—but if they used the term with anyone else, the reverse translation would apply.

Paolo sat and drank in the image of the giant alien: the first lifeform encountered by human or transhuman which was not a biological cousin. The death, at last, of the possibility that Earth might be unique.

They hadn’t refuted the anthrocosmologists yet, though. Not quite. If, as the ACs claimed, human consciousness was the seed around which all of space-time had crystallized—if the universe was nothing but the simplest orderly explanation for human thought—then there was, strictly speaking, no need for a single alien to exist, anywhere. But the physics which justified human existence couldn’t help generating a billion other worlds where life could arise. The ACs would be unmoved by Wang’s Carpets; they’d insist that these creatures were physical, if not biological, cousins—merely an unavoidable byproduct of anthropogenic, life-enabling physical laws.

The real test wouldn’t come until the diaspora—or the Gleisner robots—finally encountered conscious aliens: minds entirely unrelated to humanity, observing and explaining the universe which human thought had supposedly built. Most ACs had come right out and declared such a find impossible; it was the sole falsifiable prediction of their hypothesis. Alien consciousness, as opposed

to mere alien life, would always build itself a separate universe—because the chance of two unrelated forms of self-awareness concocting exactly the same physics and the same cosmology was infinitesimal—and any alien biosphere which seemed capable of evolving consciousness would simply never do so.

Paolo glanced at the map of the diaspora, and took heart. *Alien life already*—and the search had barely started; there were nine hundred and ninety-eight target systems yet to be explored. And even if every one of them proved no more conclusive than Orpheus ... he was prepared to send clones out farther—and prepared to wait. Consciousness had taken far longer to appear on Earth than the quarter-of-a-billion years remaining before Vega left the main sequence—but the whole point of being here, after all, was that Orpheus wasn't Earth.

Orlando's celebration of the microprobe discoveries was a very first-generation affair. The environment was an endless sunlit garden strewn with tables covered in *food*, and the invitation had politely suggested attendance in fully human form. Paolo politely faked it—simulating most of the physiology, but running the body as a puppet, leaving his mind unshackled.

Orlando introduced his new lover, Catherine, who presented as a tall, dark-skinned woman. Paolo didn't recognize her on sight, but checked the identity code she broadcast. It was a small polis, he'd met her once before—as a man called Samuel, one of the physicists who'd worked on the main interstellar fusion drive employed by all the ships of the diaspora. Paolo was amused to think that many of the people here would be seeing his father as a woman. The majority of the citizens of C-Z still practiced the conventions of relative gender which had come into fashion in the twenty-third century—and Orlando had wired them into his own son too deeply for Paolo to wish to abandon them—but whenever the paradoxes were revealed so starkly, he wondered how much longer the conventions would endure. Paolo was same-sex to Orlando, and hence saw his father's lover as a woman, the two close relationships taking precedence over his casual knowledge of Catherine as Samuel. Orlando perceived himself as being male and heterosexual, as his flesh original had been ... while Samuel saw himself the same way ... and each perceived the other to be a heterosexual woman. If certain third parties ended up with mixed signals, so be it. It was a typical C-Z compromise: nobody could bear to overturn the old order and do away with gender entirely (as most other polises had done) ... but nobody could resist the flexibility which being software, not flesh, provided.

Paolo drifted from table to table, sampling the food to keep up appearances, wishing Elena had come. There was little conversation about the biology of Wang's Carpets: most of the people here were simply celebrating their win against the opponents of the microprobes—and the humiliation that faction would suffer, now that it was clearer than ever that the “invasive” observations could have done no harm. Liesl's fears had proved unfounded; there was no other life in the ocean, just Wang's Carpets of various sizes. Paolo, feeling perversely even-handed after the fact, kept wanting to remind these smug movers and shakers: *There might have been anything down there. Strange creatures, delicate and vulnerable in ways we could never have anticipated. We were lucky, that's all.*

He ended up alone with Orlando almost by chance; they were both fleeing different groups of appalling guests when their paths crossed on the lawn.

Paolo asked, “How do you think they'll take this, back home?”

“It's first life, isn't it? Primitive or not. It should at least maintain interest in the diaspora, until the

next alien biosphere is discovered.” Orlando seemed subdued; perhaps he was finally coming to terms with the gulf between their modest discovery, and Earth’s longing for world-shaking results. ‘And at least the chemistry is novel. If it had turned out to be based on DNA and protein, I think half of Earth C-Z would have died of boredom on the spot. Let’s face it, the possibilities of DNA have been simulated to death.’”

Paolo smiled at the heresy. “You think if nature hadn’t managed a little originality, it would have dented people’s faith in the charter? If the solipsist polises had begun to look more inventive than the universe itself ...”

“Exactly.”

They walked on in silence, then Orlando halted, and turned to face him.

He said, “There’s something I’ve been wanting to tell you. My Earth-self is dead.”

“*What?*”

“Please, don’t make a fuss.”

“But ... why? Why would he—?” *Dead* meant suicide; there was no other cause—unless the sun had turned red giant and swallowed everything out to the orbit of Mars.

“I don’t know why. Whether it was a vote of confidence in the diaspora”—Orlando had chosen to wake only in the presence of alien life—“or whether he despaired of us sending back good news, and couldn’t face the waiting, and the risk of disappointment. He didn’t give a reason. He just had his exoself send a message, stating what he’d done.”

Paolo was shaken. If a clone of *Orlando* had succumbed to pessimism, he couldn’t begin to imagine the state of mind of the rest of Earth C-Z.

“When did this happen?”

“About fifty years after the launch.”

“My Earth-self said nothing.”

“It was up to me to tell you, not him.”

“I wouldn’t have seen it that way.”

“Apparently, you would have.”

Paolo fell silent, confused. How was he supposed to mourn a distant version of Orlando, in the presence of the one he thought of as real? Death of one clone was a strange half-death, a hard thing to come to terms with. His Earth-self had lost a father; his father had lost an Earth-self. What exactly did that mean to *him*?

What Orlando cared most about was Earth C-Z. Paolo said carefully, “Hermann told me there’d been a rise in emigration and suicide—until the spectroscope picked up the Orphean water. Morale has improved a lot since then—and when they hear that it’s more than just water ...”

Orlando cut him off sharply. “You don’t have to talk things up for me. I’m in no danger of repeating the act.”

They stood on the lawn, facing each other. Paolo composed a dozen different combinations of mood to communicate, but none of them felt right. He could have granted his father perfect knowledge of everything he was feeling—but what exactly would that knowledge have conveyed? In the end, there was fusion, or separateness. There was nothing in between.

Orlando said, “Kill myself—and leave the fate of transhumanity in your hands? You must be out of your fucking mind.”

They walked on together, laughing.

Karpal seemed barely able to gather his thoughts enough to speak. Paolo would have offered him a mind graft promoting tranquillity and concentration—distilled from his own most focused moments—but he was sure that Karpal would never have accepted it. He said, “Why don’t you just start wherever you want to? I’ll stop you if you’re not making sense.”

Karpal looked around the white dodecahedron with an expression of disbelief. “You live here?”
“Some of the time.”

“But this is your base environment? No trees? No sky? No *furniture*?”

Paolo refrained from repeating any of Hermann’s naïve-robot jokes. “I add them when I want them. You know, like ... music. Look, don’t let my taste in decor distract you.”

Karpal made a chair and sat down heavily.

He said, “Hao Wang proved a powerful theorem, twenty-three hundred years ago. Think of a row of Wang Tiles as being like the data tape of a Turing Machine.” Paolo had the library grant him knowledge of the term; it was the original conceptual form of a generalized computing device, an imaginary machine which moved back and forth along a limitless one-dimensional data tape, reading and writing symbols according to a given set of rules.

“With the right set of tiles, to force the right pattern, the next row of the tiling will look like the data tape after the Turing Machine has performed one step of its computation. And the row after that will be the data tape after two steps, and so on. For any given Turing Machine, there’s a set of Wang Tiles which can imitate it.”

Paolo nodded amiably. He hadn’t heard of this particular quaint result, but it was hardly surprising. “The carpets must be carrying out billions of acts of computation every second ... but then, so are the water molecules around them. There are no physical processes which don’t perform arithmetic of some kind.”

“True. But with the carpets, it’s not quite the same as random molecular motion.”

“Maybe not.”

Karpal smiled, but said nothing.

“What? You’ve found a pattern? Don’t tell me: our set of twenty thousand polysaccharide Wang Tiles just happens to form the Turing Machine for calculating pi.”

“No. What they form is a universal Turing Machine. They can calculate anything at all—depending on the data they start with. Every daughter fragment is like a program being fed to a chemical computer. Growth executes the program.”

“Ah.” Paolo’s curiosity was roused—but he was having some trouble picturing where the hypothetical Turing Machine put its read/write head. “Are you telling me only one tile changes between any two rows, where the ‘machine’ leaves its mark on the ‘data tape’ ...?” The mosaics he’d seen were a riot of complexity, with no two rows remotely the same.

Karpal said, “No, no. Wang’s original example worked exactly like a standard Turing Machine, to simplify the argument ... but the carpets are more like an arbitrary number of different computers with overlapping data, all working in parallel. This is biology, not a designed machine—it’s as messy and wild as, say ... a mammalian genome. In fact, there are mathematical similarities with gene regulation: I’ve identified Kauffman networks at every level, from the tiling rules up; the whole system’s poised on the hyperadaptive edge between frozen and chaotic behavior.”

Paolo absorbed that, with the library’s help. Like Earth life, the carpets seemed to have evolved a

combination of robustness and flexibility which would have maximized their power to take advantage of natural selection. Thousands of different autocatalytic chemical networks must have arisen soon after the formation of Orpheus—but as the ocean chemistry and the climate changed in the Vegan system’s early traumatic millennia, the ability to respond to selection pressure had itself been selected for, and the carpets were the result. Their complexity seemed redundant, now, after a hundred million years of relative stability—and no predators or competition in sight—but the legacy remained.

“So if the carpets have ended up as universal computers ... with no real need anymore to respond to their surroundings ... what are they *doing* with all that computing power?”

Karpal said solemnly, “I’ll show you.”

Paolo followed him into an environment where they drifted above a schematic of a carpet, an abstract landscape stretching far into the distance, elaborately wrinkled like the real thing, but otherwise heavily stylized, with each of the polysaccharide building blocks portrayed as a square tile with four different colored edges. The adjoining edges of neighboring tiles bore complementary colors—to represent the complementary, interlocking shapes of the borders of the building blocks.

“One group of microprobes finally managed to sequence an entire daughter fragment,” Karpal explained, “although the exact edges it started life with are largely guesswork, since the thing was growing while they were trying to map it.” He gestured impatiently, and all the wrinkles and folds were smoothed away, an irrelevant distraction. They moved to one border of the ragged-edge carpet, and Karpal started the simulation running.

Paolo watched the mosaic extending itself, following the tiling rules perfectly—an orderly mathematical process, here: no chance collisions of radicals with catalytic sites, no mismatched borders between two new-grown neighboring “tiles” triggering the disintegration of both. Just the distillation of the higher-level consequences of all that random motion.

Karpal led Paolo up to a height where he could see subtle patterns being woven, overlapping multiplexed periodicities drifting across the growing edge, meeting and sometimes interacting, sometimes passing right through each other. Mobile pseudoattractors, quasi-stable waveforms in a one-dimensional universe. The carpet’s second dimension was more like time than space, a permanent record of the history of the edge.

Karpal seemed to read his mind. “One dimensional. Worse than flatland. No connectivity, no complexity. What can possibly happen in a system like that? Nothing of interest, right?”

He clapped his hands and the environment exploded around Paolo. Trails of color streaked across his sensorium, entwining, then disintegrating into luminous smoke.

“Wrong. Everything goes on in a multidimensional frequency space. I’ve Fourier-transformed the edge into over a thousand components, and there’s independent information in all of them. We’re only in a narrow cross-section here, a sixteen-dimensional slice—but it’s oriented to show the principal components, the maximum detail.”

Paolo spun in a blur of meaningless color, utterly lost, his surroundings beyond comprehension. “You’re a *Gleisner robot*, Karpal! *Only* sixteen dimensions! How can you have done this?”

Karpal sounded hurt, wherever he was. “Why do you think I came to C-Z? I thought you people were flexible!”

“What you’re doing is ...” *What?* Heresy? There was no such thing. Officially. “Have you shown this to anyone else?”

“Of course not. Who did you have in mind? Liesl? *Hermann?*”

“Good. I know how to keep my mouth shut.” Paolo invoked his exoself and moved back into the dodecahedron. He addressed the empty room. “How can I put this? The physical universe has three spatial dimensions, plus time. Citizens of Carter-Zimmerman inhabit the physical universe. Higher dimensional mind games are for the solipsists.” Even as he said it, he realized how pompous he sounded. It was an arbitrary doctrine, not some great moral principle.

But it was the doctrine he’d lived with for twelve hundred years.

Karpal replied, more bemused than offended, “It’s the only way to see what’s going on. The only sensible way to apprehend it. Don’t you want to know what the carpets are actually like?”

Paolo felt himself being tempted. Inhabit a *sixteen-dimensional slice of a thousand-dimensional frequency space*? But it was in the service of understanding a real physical system—not a novel experience for its own sake.

And nobody had to find out.

He ran a quick—non-sapient—self-predictive model. There was a ninety-three percent chance that he’d give in, after fifteen subjective minutes of agonizing over the decision. It hardly seemed fair to keep Karpal waiting that long.

He said, “You’ll have to loan me your mind-shaping algorithm. My exoself wouldn’t know where to begin.”

When it was done, he steeled himself, and moved back into Karpal’s environment. For a moment, there was nothing but the same meaningless blur as before.

Then everything suddenly crystallized.

Creatures swam around them, elaborately branched tubes like mobile coral, vividly colored in all the hues of Paolo’s mental palette—Karpal’s attempt to cram in some of the information that a mere sixteen dimensions couldn’t show? Paolo glanced down at his own body—nothing was missing, but he could see *around* it in all the thirteen dimensions in which it was nothing but a pinprick; he quickly looked away. The “coral” seemed far more natural to his altered sensory map, occupying sixteen-space in all directions, and shaded with hints that it occupied much more. And Paolo had no doubt that it was “alive”—it looked more organic than the carpets themselves, by far.

Karpal said, “Every point in this space encodes some kind of quasi-periodic pattern in the tiles. Each dimension represents a different characteristic size—like a wavelength, although the analogy’s not precise. The position in each dimension represents other attributes of the pattern, relating to the particular tiles it employs. So the localized systems you see around you are clusters of a few billion patterns, all with broadly similar attributes at similar wavelengths.”

They moved away from the swimming coral, into a swarm of something like jellyfish: floppy hyperspheres waving wispy tendrils (each one of them more substantial than Paolo). Tiny jewel-like creatures darted among them. Paolo was just beginning to notice that nothing moved here like a solid object drifting through normal space; motion seemed to entail a shimmering deformation at the leading hypersurface, a visible process of disassembly and reconstruction.

Karpal led him on through the secret ocean. There were helical worms, coiled together in groups of indeterminate number—each single creature breaking up into a dozen or more wriggling silvers, and then recombining ... although not always from the same parts. There were dazzling multicolored stemless flowers, intricate hypercones of “gossamer-thin” fifteen-dimensional petals—each one a hypnotic fractal labyrinth of crevices and capillaries. There were clawed monstrosities, writhing

knots of sharp insectile parts like an orgy of decapitated scorpions.

Paolo said, uncertainly, “You could give people a glimpse of this in just three dimensions. Enough to make it clear that there’s ... *life* in here. This is going to shake them up badly, though.” Life—embedded in the accidental computations of Wang’s Carpets, with no possibility of ever relating to the world outside. This was an affront to Carter-Zimmerman’s whole philosophy: if nature had evolved “organisms” as divorced from reality as the inhabitants of the most inward-looking polis, where was the privileged status of the physical universe, the clear distinction between truth and illusion?

And after three hundred years of waiting for good news from the diaspora, how would they respond to this back on Earth?

Karpal said, “There’s one more thing I have to show you.”

He’d named the creatures squids, for obvious reasons. *Distant cousins of the jellyfish, perhaps?* They were prodding each other with their tentacles in a way which looked thoroughly carnal—but Karpal explained, “There’s no analog of light here. We’re viewing all this according to ad hoc rules which have nothing to do with the native physics. All the creatures here gather information about each other by contact alone—which is actually quite a rich means of exchanging data, with so many dimensions. What you’re seeing is communication by touch.”

“Communication about what?”

“Just gossip, I expect. Social relationships.”

Paolo stared at the writhing mass of tentacles.

“You think they’re *conscious*?”

Karpal, point-like, grinned broadly. “They have a central control structure with more connectivity than the human brain—and which correlates data gathered from the skin. I’ve mapped that organ, and I’ve started to analyze its function.”

He led Paolo into another environment, a representation of the data structures in the “brain” of one of the squids. It was—mercifully—three-dimensional, and highly stylized, built of translucent colored blocks marked with icons, representing mental symbols, linked by broad lines indicating the major connections between them. Paolo had seen similar diagrams of transhuman minds; this was far less elaborate, but eerily familiar nonetheless.

Karpal said, “Here’s the sensory map of its surroundings. Full of other squids’ bodies, and vague data on the last known positions of a few smaller creatures. But you’ll see that the symbols activated by the physical presence of the other squids are linked to these”—he traced the connection with one finger—“representations. Which are crude miniatures *of this whole structure* here.”

“This whole structure” was an assembly labeled with icons for memory retrieval, simple tropisms, short-term goals. The general business of being and doing.

“The squid has maps, not just of other squids’ bodies, but their minds as well. Right or wrong, it certainly tries to know what the others are thinking about. And”—he pointed out another set of links, leading to another, less crude, miniature squid mind—“it thinks about its own thoughts as well. I’d call that *consciousness*, wouldn’t you?”

Paolo said weakly, “You’ve kept all this to yourself? You came this far, without saying a word —?”

Karpal was chastened. “I know it was selfish—but once I’d decoded the interactions of the tile patterns, I couldn’t tear myself away long enough to start explaining it to anyone else. And I came to

you first because I wanted your advice on the best way to break the news.”

Paolo laughed bitterly. “The best way to break the news that *first alien consciousness* is hidden deep inside a biological computer? That everything the diaspora was trying to prove has been turned on its head? The best way to explain to the citizens of Carter-Zimmerman that after a three-hundred-year journey, they might as well have stayed on Earth running simulations with as little resemblance to the physical universe as possible?”

Karpal took the outburst in good humor. “I was thinking more along the lines of the *best way to point out* that if we hadn’t traveled to Orpheus and studied Wang’s Carpets, we’d never have had the chance to tell the solipsists of Ashton-Laval that all their elaborate invented lifeforms and exotic imaginary universes pale into insignificance compared to what’s really out here—and which only the Carter-Zimmerman diaspora could have found.”

Paolo and Elena stood together on the edge of Satellite Pinatubo, watching one of the scout probes aim its maser at a distant point in space. Paolo thought he saw a faint scatter of microwaves from the beam as it collided with iron-rich meteor dust. *Elena’s mind being diffracted all over the cosmos?* Best not think about that.

He said, “When you meet the other versions of me who haven’t experienced Orpheus, I hope you’ll offer them mind grafts so they won’t be jealous.”

She frowned. “Ah. Will I or won’t I? I can’t be bothered modeling it. I expect I will. You should have asked me before I cloned myself. No need for jealousy, though. There’ll be worlds far stranger than Orpheus.”

“I doubt it. You really think so?”

“I wouldn’t be doing this if I didn’t believe that.” Elena had no power to change the fate of the frozen clones of her previous self—but everyone had the right to emigrate.

Paolo took her hand. The beam had been aimed almost at Regulus, UV-hot and bright, but as he looked away, the cool yellow light of the sun caught his eye.

Vega C-Z was taking the news of the squids surprisingly well, so far. Karpal’s way of putting it had cushioned the blow: it was only by traveling all this distance across the real, physical universe that they could have made such a discovery—and it was amazing how pragmatic even the most doctrinaire citizens had turned out to be. Before the launch, “alien solipsists” would have been the most unpalatable idea imaginable, the most abhorrent thing the diaspora could have stumbled upon—but now that they were here, and stuck with the fact of it, people were finding ways to view it in a better light. Orlando had even proclaimed, “*This* will be the perfect hook for the marginal polises. ‘Travel through real space to witness a truly alien virtual reality.’ We can sell it as a synthesis of the two world views.”

Paolo still feared for Earth, though—where his Earth-self and others were waiting in hope of alien guidance. Would they take the message of Wang’s Carpets to heart, and retreat into their own hermetic worlds, oblivious to physical reality?

And he wondered if the anthrocosmologists had finally been refuted ... or not. Karpal had discovered alien consciousness—but it was sealed inside a cosmos of its own, its perceptions of itself and its surroundings neither reinforcing nor conflicting with human and transhuman explanations of reality. It would be millennia before C-Z could untangle the ethical problems of daring to try to make contact ... assuming that both Wang’s Carpets, and the inherited data patterns of the squids,

survived that long.

Paolo looked around at the wild splendor of the star-choked galaxy, felt the disk reach in and cut right through him. *Could all this strange haphazard beauty be nothing but an excuse for those who beheld it to exist? Nothing but the sum of all the answers to all the questions humans and transhumans had ever asked the universe—answers created in the asking?*

He couldn't believe that—but the question remained unanswered.

So far.

TAP

“I want you to find out who killed my mother, Ms O’Connor. Will you do that?”

Helen Sharp’s voice was unsteady with anger; she seemed almost as psyched up as if she’d come here to confront the killer, face-to-face. Under the circumstances, though, the very act of insisting that there *was* a killer was like shouting a defiant accusation from the rooftops—which must have taken some courage, even if she had no idea whom she was accusing.

I said carefully, “The coroner returned an open finding. I’m not a lawyer, but I imagine Third Hemisphere would still settle out of court for a significant—”

“*Third Hemisphere* have no case to answer! And sure, maybe they’d pay up anyway—just to avoid the publicity. But as it happens, I’m not interested in *legalized blackmail*.” Her eyes flashed angrily; she made no effort to conceal her outrage. No doubt her lawyers had already given her exactly the same advice; it didn’t look like the idea would ever grow on her. She was thirty-two—only five years younger than me—but she radiated so much stubborn idealism that I found it hard not to think of her as belonging to another generation entirely.

I raised one hand in a conciliatory gesture. “Fine. It’s your decision. But I suggest you don’t sign anything that limits your options—and don’t make any public declarations of absolution. After six months paying my expenses, you might change your mind. Or I might even turn up something that will change it for you. Stranger things have happened.” Though nothing much stranger than a next-of-kin declining to screw a multinational for all it was worth.

Sharp said impatiently, “The TAP implant was *not* responsible. There’s no evidence to suggest that it was.”

“No, and there’s no evidence to suggest foul play, either.”

“That’s why I’m hiring you. To find it.”

I glanced irritably at the north-facing window; the allegedly smart pane was ablaze with sunlight, rendering most of the office almost as hot as the sweltering streets of Kings Cross below.

Grace Sharp had been dead for a month. I’d been following the case informally, like everyone else in Sydney, out of sheer morbid curiosity. On the evening of January 12, she’d been at work in her study, apparently alone. The immediate cause of death had been a myocardial infarction, but the autopsy had also shown signs of a powerful adrenaline surge. That could have resulted from the pain and stress of a heart attack already in progress—or it could have come first, triggered by an unknown external shock.

Or, the Total Affect Protocol chip in her brain might have flooded her body with adrenaline for no good reason at all.

Sharp had been sixty-seven—in reasonable health for her age, but old enough to blur the boundaries of the possible. Forensic pathologists had struggled at the inquest to allocate probabilities to the three alternatives, but there’d been no clear front-runner. Which was no doubt distressing for the relatives—and no doubt left them vulnerable to the fantasy that there had to be a simple answer out there somewhere, just waiting to be found.

Helen Sharp said, “The *media consensus* is that my mother was composing a poem just before she died—and she thought a word in TAP so ‘powerful’ that it killed her on the spot.” Her tone was venomous. “Do they seriously imagine that ninety thousand sane people would put something in their

brains which was *capable* of doing that? Or that the manufacturers would sell a device which would leave them open to billions of dollars worth of compensation claims? Or that the government licensing authorities—”

I said, “Licensed pharmaceuticals have killed plenty of people. Implants are even harder to test. And ‘fail-safe’ software written to the most rigorous military specifications has crashed aircraft—”

She seized on the analogy triumphantly. “And how do you know that? Because the aircraft’s black box proved it! Well, the TAP implant has its own black box: an independent chip which logs all its actions. *And there was no record of any malfunction.* No record of the implant triggering an adrenaline release at *any* level—let alone a fatal dose.”

“Maybe the black box glitched, too. You say it’s independent—but if there’s enough connectivity to let it know everything the implant does, the combined system might still be vulnerable to some kind of shared failure mode that the designers never anticipated.”

Sharp clenched her fists in frustration. “That’s not—literally—impossible,” she conceded. “But I don’t believe it’s likely.”

“All right. What do you think happened?”

Sharp composed herself, with the air of someone weary of repeating the same message, gathering up her strength with a promise to herself that this would be the last time.

She said, “My mother *was* working on a new poem that night—the black box makes that clear. But the time of death can’t be determined precisely—and it could have been as much as fifteen minutes after the last recorded use of the implant. I believe she was interrupted. I believe someone broke into the apartment and killed her.

“I don’t know how they did it. Maybe they just terrorized her—without laying a finger on her—and that was enough to bring on the heart attack.” Her voice was flat, deliberately emotionless. “Or maybe they gave her a transdermal dose of a powerful stimulant. There are dozens of chemicals which could have triggered a heart attack, without leaving a trace. She wasn’t found for almost nine hours. There are carbohydrate analogs of stimulatory neuropeptides which are degraded into glucose and water on a time scale of *minutes*.”

I resisted the urge to cite the lack of evidence for an intruder; it would have been a waste of breath. “Why, though? Why would anyone want to kill her?”

She hesitated. “I’m not sure how much you know about TAP.”

“Assume the worst.”

“Well ... it’s been wrongly described as just about everything from ‘telepathy’ to ‘computerized Esperanto’ to ‘the multimedia standard for the brain’. Sure, it began with a fusion of language and VR—but it’s been growing for almost fifteen years now. There’s still a word for <<dog>>”—she sketched the angle-brackets with her fingers, and I picked up on the convention later—“which might as well be *hundo*—and another for <<your beloved golden Labrador standing on the beach shaking the water from its coat before licking your face>> ... which will evoke all that and more in all five senses, if you let it.

“But at the leading edge, now, we’re creating words for concepts, emotions, states of mind, which might once have defied description altogether. With TAP, ultimately there’s *nothing* a human being can experience which needs to remain ... ineffable, mysterious, incommunicable. Nothing is beyond discussion. Nothing is beyond analysis. Nothing is ‘unspeakable’. And a lot of people find that prospect threatening; it turns a lot of old power structures on their head.”

If that cliché came true every time it was invoked, *power structures* would be oscillating faster than mains current. Helen Sharp was pushing seven on my paranoia index; on top of all her understandable grief and frustration, she belonged to a technosubculture which was poorly understood by the mainstream, frequently misrepresented—and which clearly liked to think of itself as a “dangerously” iconoclastic elite.

I said, “I know there are people who find TAP users ... unacceptable. But what’s going to drive them to extremes like murder, all of a sudden? In fifteen years, has anyone, anywhere, been killed simply for having the implant?”

“Not to my knowledge. But—”

“Then surely—”

“But I can tell you exactly what’s changed. I can tell you why the conflict has just entered a whole new phase.”

That got my attention. “Go on.”

“You know it’s against the law to install a TAP implant in anyone younger than eighteen years old?”

“Of course.” The same restriction applied to all neural hardware, other than therapeutic chips which restored normal function to the injured or congenitally disabled.

“Early in March, a couple here in Sydney will commence legal proceedings with the aim of ensuring that they’re free to install the implant in all their future children—at the age of three months.”

I was momentarily speechless. These plans had clearly been kept within a very tight circle of supporters; the saturation media coverage of the inquest hadn’t mentioned so much as a rumour. After a month of intense journalistic scrutiny, I hadn’t expected the TAP-heads to have any surprises left.

I said, “Legal proceedings on what basis?”

“That they’re entitled to raise their family using whatever language they choose. That’s guaranteed in Federal legislation: there’s a 2011 bill which brings into force most of the provisions of the 2005 UN Covenant on Human Rights. They’ll be seeking a ruling from the High Court which invalidates the relevant sections of the New South Wales criminal code—which is far more difficult, from a legal point of view, than trying to defend themselves against a prosecution after the fact ... but it does save them the trouble of having to find a surgeon willing to risk martyrdom.”

Sharp smiled faintly. “The same Federal law was invoked about a year ago, by a signing couple who were being pressured by Community Services to give their son a hearing implant. The parents won the first round—and it looks like there isn’t going to be an appeal. But a pro-implant case was always going to be much harder, of course. And *signing* is positively respectable, compared to TAP.”

“I assume the police know all this?”

“Of course. They don’t appear to be particularly interested, though—and I wasn’t able to raise it at the inquest. Legally speaking, I suppose it really is just static.”

“But you think—”

“I think a death widely attributed to the TAP implant would transform the prospects of the challenge succeeding from merely poor to ... politically impossible. I think there are people who’d consider *that* to be a result worth killing for.”

Sharp fixed her gaze on me for a moment, and then nodded slightly, almost sympathetically—as if I’d just uttered a word which expressed all the conflicting emotions running through my head: <<*Neural hardware in the skull of a three-month-old child—just to indulge its parents’*

whims—would be an obscenity. But ... if the ubiquitous hearing implants which grant English-before-sign are no “whim”, why is one which grants TAP-before-English? And if Grace Sharp *was* murdered to sway the odds against the challenge, her self-righteous killers belong in prison, regardless—and my own knee-jerk revulsion at the prospect of infant TAP-heads only goes to show that it could easily have been a powerful enough motive.>>

She said, “And I think you’re going to take the case.”

I started work that afternoon, reviewing the technical literature on the TAP implant—the closest thing to an objective account of its capabilities I was likely to find. Like most people, I imagined I already understood all the salient features—but it turned out that I’d swallowed more misinformation from the nets than I’d realized.

The two chips—the implant proper and the black box, both less than a millimetre wide—sat at the back of the skull, sharing access to a fine web of conductive polymer threads which wrapped the brain, making billions of quasi-synaptic contacts with the visual and auditory cortex, and Wernicke’s speech area in the temporal lobe. Other threads penetrated deeper, some as far as the limbic system. TAP could always be spoken or written, but bandwidth requirements made modulated infrared the medium of choice, so the implant was linked, via the spinal cord, to bioengineered IR transceiver cells in the skin of the palms.

Merely installing the implant didn’t grant instant fluency in TAP; the language still had to be learnt. A complete, “preloaded” vocabulary would never have worked; the precise meaning of most words in TAP could only be encoded in context, once the implant resided in a particular user’s brain. The implant’s own electronic neural net was ninety percent blank at installation, containing only a specialized language acquisition system and a simple “bootstrap” vocabulary. And though the learning process left its mark mostly within the implant itself—along with some relatively minor changes to the regions of the brain where a second natural language would have been encoded—it was meaningless to talk about either brain or chip “knowing TAP”, in isolation. An experienced user who exchanged his or her old implant for a new one straight from the factory would have been dragged back almost to square one (in practice, all the data from the old hardware would be copied to the new)—but equally, an experience-enriched implant placed in a novice’s brain would have been as unusable as a slice of someone else’s cerebral cortex.

These observations applied strictly to adults, of course. Despite several dozen theoretical papers—most of them cautiously optimistic—no one really knew how a young child’s brain would interact with the implant.

A TAP user could interpret a standard VR sensorium—but there was, deliberately, no provision for interacting in the conventional way with a nonexistent environment. Immersive VR implants temporarily paralysed the organic body and diverted motor impulses from the brain into a fully computerized somatic model: a virtual body which could function as part of the virtual environment—subject to the environment’s rules. In contrast, a TAP user’s idea of *interaction* was more along the lines of rethinking the whole sensorium and spitting it back out, or responding with something entirely different—arguing with the whole premise, instead of passively accepting it. A VR user had little choice but to suspend disbelief, or quit—a full-sense environment, surreal or not, was always compelling—but a TAP user could deal with the same kind of information with as much or as little detachment as he or she desired. Words in TAP—which included the entire sensorium-

descriptor vocabulary of VR—could evoke images ten thousand times more vivid and precise than the densest poetic English ... or they could be held at arm's length and scrutinized dispassionately, as easily as any English-speaker could contemplate the phrase “a flash of blinding radiance” or “the overpowering stench of ammonia” without experiencing anything of the kind. In the jargon of the implant's designers—English words, predating TAP itself—every TAP word could be *scanned* (understood analytically), or *played* (experienced subjectively)—or interpreted in a manner lying anywhere at all between those two extremes.

In one respect, though, TAP could be more immersive than the most authoritarian VR: it could induce emotional states directly. VR was confined to pure sense data (albeit often manipulative in the extreme), but in Total Affect Protocol there were words for <<fear>>, <<euphoria>>, <<sadness>> (or rather, nuanced subtypes of these crude English categories)—and the implant could reach deep into the limbic system and trigger these states as easily as any VR chip could generate the illusion of an unambiguously blue sky.

The user's power to keep the language at a distance remained, of course—and the TAP word for <<crippling despair>> could only induce the “referent state” if a conscious effort was made to *play* it. And though TAP's formal grammar ruled out nothing, low-level filters stood guard against potentially stupefying linguistic singularities—such as <<the desire to play this word forever>>—or anything physiologically dangerous.

Still, although the literature was blithely reassuring on this point, in the end it came down to a question of trusting the manufacturers and the regulators. I didn't doubt that, in theory, a TAP chip could be designed which was no more likely than the unmodified human brain to strike the user dead if the word for <<fatal adrenaline rush>> accidentally came to mind—but whether or not Third Hemisphere had achieved that level of safety—for every conceivable user—was another matter.

Grace Sharp had been the oldest of the ninety thousand TAP speakers on the planet, and reputedly one of the most proficient—but whether *proficiency* implied more risk, from a greater vocabulary, or less, due to better control of the language, I couldn't say.

By half past seven, I'd had enough of wading through papers on distortion-free affect-compression algorithms. I closed the office and headed for the station.

I could still smell the day's heat wafting up from Victoria Road, but there was a faint hint of a breeze from the east. The gaudy advertizing holograms never looked quite as tacky at dusk as they did at dawn, although the colours were just as washed-out; maybe it was really all down to the mood on the streets. A few sweat-stained commuters were still on their way home, radiating palpable relief—and a few freshly laundered revellers were already arriving, full of hopeful energy. Somehow, dawn in Kings Cross never looked hopeful.

I passed a gaggle of saffron-robed monks from the Darlinghurst Temple, out hunting for alms, on the other side of the street. James didn't seem to be among them—though it was hard to tell: they all looked interchangeable to me, and my strongest memories of him didn't encompass the terminal, shaven-headed stage. Even when I recalled the night he announced that he was leaving me and Mick for a life devoted to selfless contemplation—“There's no point arguing, Kath,” he'd explained, with an expression of transcendent smugness, “I'm not enslaved by the illusions of language anymore.”—even then, strangely enough, I pictured him as he'd looked ten years before. Buddhism had been growing ever more fashionable throughout the country for most of my lifetime—taking the

place of retreating Christianity, as if the “vacuum” left behind needed to be filled by something equally absurd—but in the last ten years the Federal government had started supporting the monasteries in a big way, with a program of “community spiritual development” grants. Maybe they were hoping to save on social security payments.

I hesitated outside the station, thinking: *A single TAP word could capture this moment—perfectly encoding my entire sensorium, and everything I’m thinking and feeling.* A word I could speak, write, recall. Study at a distance—*scan*—or *play*, relive completely. Inflect and modify. Quote exactly (or not) to the closest friend or the most distant stranger.

I had to admit that it was a deeply unsettling notion: a language which could encompass, if not the universe itself, then everything we could possibly experience of it. At any given moment, there were “only” ten to the power three thousand subjectively distinguishable states of the human brain. A mere ten thousand bits of information: quite a mouthful, encoded as syllables—but only a millisecond flash in infrared. A TAP user could effectively narrate his or her entire inner life, with one hundred percent fidelity, in real time. Leopold Bloom, eat your heart out.

I boarded the southbound train, the skin on the back of my neck still tingling. The carriage was packed, so I stood strap-hanging with my eyes closed, letting the question spin in the darkness of my skull: *Who, or what, killed Grace Sharp?* Work was never something I could switch on and off—and unless I reached the stage where part of me was thinking about the case every waking moment, the chances were I’d make no progress at all.

Helen Sharp believed in some faceless conspiracy against TAP as a first language, driven by sheer linguistic xenophobia—though the real opposition might also be motivated, in part, by perfectly valid concerns about the unknown developmental consequences for a child growing up with TAP.

The serious media favoured a simple failure of technology; several worthy editorials had rewritten the Sharp case as a cautionary tale about the need for improved quality control in biomedical engineering. Meanwhile, the tabloids had gleefully embraced the idea of the <<death>> word, quasi-mystical enough to give their anti-tech subscribers a frisson of self-righteousness at the poetic justice of a TAP-head thinking herself into oblivion ... and their pro-tech ones a frisson of awe at the sheer Power of the Chip.

And it was still possible that Grace Sharp had simply had a heart attack, all by herself. No assassins, no fatal poetry, no glitch.

So far, I could only agree with the coroner: I wasn’t prepared to rule anything out.

By the time I arrived home, Mick had already eaten and retreated to his room to play *Austro-Hungarian Political Intrigues in Space*. He’d been running the scenario for almost six months, along with a dozen friends—some in Sydney, some in Beijing, some in Sao Paulo. They’d graciously let me join in once, as a minor character with an unpronounceable name, but I’d become terminally bored after ten minutes and engineered my own death as swiftly as possible. I had nothing against role-playing games, *per se* ... but this was the most ludicrous one I’d encountered since *Postmodernism Ate My Love Child*. Still, every twelve-year-old needed something truly appalling to grow out of—something to look back on in a year’s time with unconditional embarrassment. The books I’d read, myself (and adored, at the time) had been no better.

I knocked on his door, and entered. He was lying on his bed with the headset on and his hands above his head, making minimalist gestures with both control gloves: driving a software puppet body

which had no sense of touch, or balance, or proprioception. He was moving its limbs with actions which had nothing to do with moving his own ... but he was seeing and hearing everything through the puppet's eyes and ears.

Most of the studies I'd read had suggested that the earlier a child took up VR (headset-and-glove, of course, not implant-based), the fewer side-effects it had on real-life coordination and body image. The skills of moving real and virtual bodies didn't seem to compete for limited neural resources; they could be learnt in parallel, as easily as two languages. Only adults got confused between the two (and did better with VR implants, which let them pretend they were using their physical bodies). The research suggested that an hour a day in VR was no more harmful than an hour a day of any other equally unnatural activity: violin practice, ballet, karate.

I still worried, though.

The room monitor flagged my presence. At a convenient break in the action, Mick slipped off the headset to greet me, doing his best to hide his impatience.

I said, "School?"

He shrugged. "Bland-out. Work?"

"I've got a murder case."

His face lit up. "Resonant! What class weapon?"

"Unkind words."

"¿Que?"

"It's a joke." I almost started to explain, but it didn't seem fair to hold up the other players. "You'll quit at nine, okay? I don't want to have to check on you."

"Mmmm." Deliberately noncommittal.

I said calmly, "I can program it, or you can stick to the rules voluntarily. It's your choice."

He scowled. "It's no choice, if it makes no difference."

"Very profound. But I happen to disagree." I walked over to him and brushed the hair from his eyes; he gave me his I-wish-you-wouldn't-but-you're-forgiven-this-time look.

Mick said suddenly, "Unkind words? You mean Grace Sharp?"

I nodded, surprised.

"Some *guru* last week was prating about her TAPping herself to death." He seemed greatly amused—and it struck me that "guru" was several orders of magnitude more insulting than anything I would have dared to say in front of my mother, at his age. At least put-downs were getting more elegant; my generation's equivalents had relied almost exclusively on references to excrement or genitalia. Mick and his contemporaries weren't at all prudish—they just found the old scatological forms embarrassingly childish.

I said, "You don't believe in the <<death>> word?"

"Not some *banana skin land mine* you make yourself, by accident."

I pondered that. "But if it exists at all, don't you think it'd be easier to fight if it came from outside, than if you stumbled on it in your own thoughts?"

He shook his head knowingly. "TAP's not like that. You can't invent random words in your head—you can't try out random bit-patterns. You can imagine things, you can free-associate, but ... *not all the way to death, without seeing it coming.*"

I laughed. "So when did you read up on this?"

"Last week. The story sounded flash, so I went context mining." He glanced at his terminal and

made some slight hand movements; a cluster of icons for Universal Resource Locators poured into an envelope with my name on it, which darted into the outgoing mail box. “References.”

“Thanks. I wasted the whole afternoon—I should have come home early and picked your brains instead.” I was only half joking.

I sat on the edge of the bed. “If she didn’t stumble on the word herself, though ... I don’t see how anyone could have spoken it to her: as far as the police could tell, she’d had no visitors—or communications—for hours. And if someone broke into the apartment, they left no trace.”

“How about ... ?” Mick gestured with one gloved thumb at the shelf above his bed.

“What?” I parsed the clutter of objects slowly. “Ah.”

He’d set up an IR link with his friend Vito, who lived in an apartment block across the park; they could exchange data twenty-four hours a day without either family paying a cent to the fibre barons. The collimated beam of the five-dollar transceiver passed effortlessly through both their bedroom windows.

“You think someone outside the apartment ... shot her in the palm with a <<death>> word?” The notion conjured up bizarre images: a figure taking aim with a gunless night-sight; Grace Sharp with outstretched arms and infrared stigmata.

“Maybe. Split the fee, if I’m right?”

“Sure. Minus rent, food, clothes, communications—”

Mick mimed violin playing. I feigned a swipe at his head. He glanced at the terminal; his friends were losing patience.

I said, “I’d better leave you to it.”

He smiled, held up his hand in a farewell gesture like a diver about to submerge, then slipped the headset back on. I lingered in the room for a few seconds, feeling profoundly strange.

Not because I felt that I was losing touch with my son. I wasn’t. But the fact that we could comprehend each other at all suddenly seemed like the most precarious voodoo. Natural language had endured, fundamentally unchanged, through a thousand social and technological revolutions ... but TAP made it look like some Stone Age tool, a flake of crudely shaped obsidian in an era when individual atoms could be picked up and rearranged at whim.

And maybe in the long run, all the trial-and-error and misunderstandings, all the folk remedies of smiles and gestures, all the clumsy imperfect well-meaning attempts to bridge the gap, would be swept away by the dazzling torrent of communication without bounds.

I closed the door quietly on my way out.

The next morning I started going through the transcripts of the inquest—which included a 3D image of Sharp’s study. The body had been found around 8:20 AM by a domestic aid who came three times a week—Sharp, although generally fit, had suffered from severe arthritis in her hands. Paramedics had removed the body before the police became involved, but they’d snapped the scene first as a routine procedure.

The apartment was on the 25th floor, and the study had a large window facing west. The curtains were shown fully open—although there was nothing in the transcripts, one way or the other, about the possibility that the man who’d found the body, or even the paramedics, might have opened them to let in some light. I grafted the image into the local council’s plan of the suburb, and did some crude ray-tracing from where the forensic software suggested Sharp had been standing before she fell. A bullet

would have left directional information—but a burst of IR could have come from any location with a clear line of sight. Given the uncertainty in her position, and the size of the window, the possibilities encompassed the windows and balconies of sixty-three apartments. Most were beyond the range of cheap hobbyists' IR equipment—but I looked up skin-transceiver sensitivity, attenuation in the atmosphere, and beam spread parameters, then started checking product catalogues. There were several models of communications lasers which would have done the job—and the cheapest was only three hundred dollars. Not the kind of thing you could buy from an electronics retailer, but there were no formal restrictions on purchase or ownership. It wasn't a weapon, after all.

The world's greatest TAP poet, shot by a word? It was a seductive idea—and I was surprised that the tabloids hadn't seized on it, weeks ago—but in the cold light of morning, I was finding it increasingly difficult to believe that Grace Sharp had died from anything but natural causes. The building had excellent security; the forensic team had found no sign of an intruder. The testimony of the black box wasn't watertight, but on balance it probably *did* exonerate the implant. And Helen Sharp herself had been convinced that the <<death>> word was impossible.

I spent the morning slogging through the rest of the transcripts, but there was nothing very illuminating. The experts had washed their hands of Grace Sharp's death. I didn't blame them: if the evidence supported no clear verdict, the honest thing to do was to say so. At most inquests, though, *someone* managed to slip a speculation or two into the proceedings: a pathologist's gut-level hunch, an engineer's unprovable intuition. A few lines I could wave accusingly in their face when I cornered them in their office—prompting them to spill the whole elaborate, unofficial hypothesis they'd been nurturing in their head for months. But there wasn't a single foothold here, a single indiscretion I could pursue; every witness had been cautious to a fault.

So I had nowhere else to go: I steeled myself and went trawling through the archives for the enemies of TAP.

Media releases (mainly from politicians and religious figures), letters and essays in edited publications, and postings to net forums gave me about seventeen thousand individuals who'd had something disparaging to say to the world about TAP. The search algorithm was multilingual, but I didn't trust it to pick up irony reliably, so even this crude first grab had to be taken with a mountain of salt. Twelve percent of the forum postings were anonymous—and the random sample I inspected made it clear that they came from the most vehement opponents—but I put them aside; textual analysis of a few gigabytes of invective could wait for barrel-scraping time.

Clustering software picked up some fairly predictable connections. Two-thirds of the people I'd found were officially speaking on behalf of—or explicitly mentioned their membership or approval of—one of ninety-six organizations: political, religious, or cultural.

The software drew ninety-six star-diagrams. The biggest cluster was for Natural Wisdom: a quasi-green lobby group set up for the sole purpose of opposing the use of neural hardware. Most members were European, but there was a significant Australian presence. Second largest was The Fountain of Righteousness, a U.S.-based fundamentalist Christian coalition; they had half a dozen local affiliate churches. Cluster size didn't necessarily measure the strength of opposition, though; the Roman Catholic church ranked a mere thirtieth—but only because it was so rigidly hierarchical, with a relatively small list of appointed spokesmen. Most Islamic authorities weren't keen on neural hardware, either—but many predominantly Islamic countries had simply outlawed the technology, largely defusing it as an issue. Islam's best showing was for a UK group, and that was ranked fifty-

seventh.

I cut the data set down to Australia only. Nineteen organizations remained—and the top six rankings stayed the same, for what that was worth. There was something of the flavour of a witch-hunt to this whole analysis; I wasn't publicly accusing anyone of anything—I wasn't libelling Natural Wisdom as murderous thugs for daring to speak out against the implant—but this kind of crude fishing expedition always made me feel distinctly uneasy.

Still, if these were the people who'd feel most threatened by the prospect of children growing up with TAP ... who among them could have known about the impending High Court challenge?

I scanned the membership databases of legal and paralegal associations, and the mailing lists of relevant journals, scooping up anyone who gave an address care of Huntingdale and Partners—the firm who were preparing the “infant implant” brief.

There was zero overlap with the anti-TAP set—which was no great surprise. I imagined the police would have gone at least this far, and they'd had better resources: they could have pulled the whole Huntingdale workforce from taxation records, with no chance of so much as a clerical assistant falling through the cracks.

I gazed at the screen, dispirited. All I had to show for a day's work were sixty-three apartments with a view of Grace Sharp's study, and seventeen thousand people who'd done nothing more incriminating than put themselves on the record as opponents of TAP.

The only thing left to try was intersecting the two.

Finding apartment numbers to match the physical locations in the building plans was the hardest part; architects and developers didn't have to file anything so petty when they had their projects approved. I was actually beginning to contemplate doing the necessary legwork myself, when I discovered that someone had done it for me: an *ad hoc* consortium of sellers of insurance, fire-alarms, security equipment and climate control had commissioned a database for the entire metropolitan area, to help them target their junk mail. The suburb I needed only cost fifty bucks—complete with email tags.

I cross-matched with the anti-TAP set.

A single name appeared.

John Dallaporta belonged to none of my organisational clusters, and I had only one piece of data on his attitude to TAP: a short essay he'd written, seven years before, decrying the implant's potential to “erode the richness of our ancient and beautiful tongues” and “invade the still, mysterious spaces of our minds”. The essay had appeared in a secondary English teachers' netzine; I summoned up the whole issue, and flipped through its innocuous contents. The majority of the articles dealt with working conditions, and concerns arising out of new technology; there was also an earnest—almost painfully respectful—discussion of strategies for coping with parents who forbade their children contact with the filthy/sexist/atheistic/elitist/ superstitious/obsolete works of Shakespeare, *et al.* Not the kind of venue you'd seriously expect to lead you to a man who slaughtered his ideological enemies.

I reread Dallaporta's essay carefully. It was passionate, but hardly inflammatory; he sounded very much like just one more plaintive, insecure technophobe letting off steam, to a no doubt largely sympathetic audience. I was inclined to be sympathetic, myself—in all honesty, the implant made my skin crawl—but there was a self-serving undercurrent which detracted from the force of his arguments. Certainly, portraying *English* as an endangered language was ridiculous, when more

people were speaking it than at any other time in history.

And though I could picture Dallaporta outside the court with a placard, once the challenge to the implant legislation began, I found it hard to imagine the author of these moderate words killing Grace Sharp in cold blood—and harder still to imagine him discovering the means to do it.

I was growing tired of desk work, but I spent the next few hours studying the fragmentary portrait of the man offered by the net. He was forty-seven years old, divorced five years, with two daughters in their mid-teens. Presumably his ex-wife had custody of both children, since all the data suggested that he lived alone. He'd been a teacher in government high schools all his working life; in his late twenties, he'd published some poetry in literary journals, but unless he'd adopted an undocumented pseudonym, there'd been nothing since. He seemed to belong to no organization but the State School Teachers' Union, and if he subscribed to any religion, no marketing demographer had yet managed to pin it down.

So much for the electronic profile. I didn't believe for a moment that he could have killed Grace Sharp—but I wasn't prepared to rule it out until I'd met him in the flesh.

I found a calendar of events for the Laurence Brereton Memorial High School. There was a parent-teacher night in three days' time.

I arrived late enough not to have to loiter outside for too long before catching sight of a few departing parents, still wearing their name badges. I got a good look at the style and the materials used—but I was even luckier than that: one man dropped his badge into a recycling bin right before my eyes. I'd come prepared with a variety of cardboard samples, safety pins and clips, but all I had to do was fish out this discarded one, match the font on my notepad's printer, and spray my own—borrowed—name onto the blank side.

No one challenged me as I entered the crowded hall and walked straight past the desk where parents were queuing up to register their attendance and collect their badges. I spotted a row of work stations dispensing guidance; I walked up to one and tried to make an enquiry, but it was too clever by far: the only entry point was “parent's name”—apparently all it needed in order to highlight every relevant teacher on a personalized map of the hall. I stood back and watched other people use the software, until Dallaporta's name appeared.

It seemed an odd time of year for an event like this; Mick's high school had held an orientation night before the start of term, but they hadn't yet invited me back. The buzz of conversation around me sounded remarkably amiable, though; maybe it was a good strategy to drag the parents in as early as this, and try to nip any problems in the bud.

John Dallaporta was tall and slender, clean-shaven, slightly balding. He was being talked at loudly by someone's proud father—and though his eyes were glazed, and his smile a little wooden, he didn't strike me as a man who'd been sleepless with guilt for the past five weeks.

When the father departed, I approached purposefully. Dallaporta offered his hand and said smoothly, “Good to see you, Ms. Stone.” He hesitated. “I'm sorry, but I don't think I—”

I smiled disarmingly. “No, you don't teach my daughter. But I wanted to speak to you, and this seemed like too good an opportunity to pass up. I hope you don't mind.”

“Not at all. But I should explain: I'm not the head of department this year. It rotates between the senior teachers, so Carol Bailey—” He glanced around, then pointed her out. “Do you see—?”

I shook my head apologetically. “It's not a departmental matter. I just wanted to meet you. I read an

essay you wrote, a few years ago: *The Bit-Stream of the Rose*. And I liked what you had to say there, very much. So when I realized you were teaching in my daughter's new school ... "

Dallaporta eyed me curiously, a little bemused, but he betrayed no obvious unease or suspicion. "That's so long ago now, I'm surprised you remember it at all. Let alone the name of the author."

"Of course I remember! And I just hope the rest of the department share your values on those ... issues. I used to teach English, myself. I *know* the kind of pressures you're facing. And of course I want my own children to be *technologically literate*—but some of us have to take a stand, or who knows what 'technologically literate' will *mean*, in twenty years' time?"

Dallaporta nodded affably, but now I could see muscles tightening at the sides of his jaws—the ones which contract when you're trying too hard not to let anything show. *Proving what?* Nothing at all—except that he had stronger feelings about TAP than he cared to discuss with a total stranger in a crowded hall.

I kept pushing. "When I started high school, myself, if you didn't have your own PC on your desk at home, you were marginalized. These days the work stations come for free—if you sign up for a thousand-a-month worth of 'vital' net access. And any child who can't interview Afghani nomads for a geography assignment—or get a live feed from the latest Venus probe via JPL—might as well quit and go work at McDonalds. *When does it stop?* When my grandchildren are twelve, what will 'entry level' be, for them?"

Dallaporta laughed, not quite naturally. "I wouldn't dare hazard a guess. But I have faith in people. In common sense."

I made direct eye contact, trying to decide if he was genuinely rattled—or just didn't trust himself to get on the soapbox, even for such an obviously sympathetic listener.

"Common sense? I hope you're right. I've heard some rumours lately which don't bear thinking about—"

Dallaporta blanched visibly. *Meaning he knew about the court case? And now assumed that I had some connection to whoever had given him the news?* I offered him a conspiratorial smile: *Relax, I'm a friend, we're on the same side.*

I said, "Look, I didn't mean to take up so much of your time. But it was so nice to meet you, finally." I held out my hand, and Dallaporta shook it, slipping back onto autopilot with obvious relief.

I walked out into the warm evening. There was a real Lydia Stone, with a daughter who'd just started Year 8; Dallaporta might check the records, but I didn't think he was likely to confront the girl's teachers and ask them to sketch an identikit for comparison.

I glanced up at the washed-out sky, at the handful of visible stars—and thought once more: *this moment would be a single word, in TAP*. <<The scent of cut grass from the playing fields, the rumble of suburban traffic, the melancholy yellow lights of the hall beside the darkness of the empty classrooms.>> *A moment skewered like a butterfly? A ten-thousand-bit digital corpse of the world, shedding dead pixels in the mind's eye?* Or a moment captured like a mood perfectly evoked by a phrase of music? No one had ever felt the need to murder a composer, just to safeguard the languages which couldn't compete on equal terms with fugues and sonatas. No one had ever taken a human life just to stop eccentric parents bombarding their offspring with Bach and Mozart in the womb. What made TAP so much more threatening? The fact that it could evoke images and emotions beyond the reach of any symphony? The fact that it was so much *better*?

I'd actually meant most of what I'd said to Dallaporta—but the more I thought about the issues, the

more ambivalent I became. No one was trying to “force” TAP onto anyone, except their own children—and to raise a child at all was to impose a set of choices, one way or another. Actively or passively. Consciously, or through sheer conformity or neglect. The prospect of TAP-heads meddling with their children’s brains—just so they could share an artificial language—still filled me with instinctive, visceral outrage ... but was it any more virtuous for the rest of us to insist that no child be given the implant until their brains were fully formed in the ten-thousand-year-old mould of our own Stone Age preconceptions? Weren’t *both sides* just attempting to shape future generations in their own image?

And putting aside prejudice, instinct, and nostalgia ... *which first language really would provide the best tools for dealing with the modern world?*

That was a good question. It just wasn’t the one I was being paid to answer.

I planted a dozen small recording devices in pay phones near Dallaporta’s apartment, and the school. Which was highly illegal—but both less risky, and more likely to succeed (if he was actually guilty of anything), than trying to bug his home. I’d sampled his voice at the parent-teacher night, so the bugs could discard everyone else’s conversations. I cycled by and queried them daily.

I finally tracked down Tom Davies, Grace Sharp’s domestic aid—a TAP-head himself. The curtains of the study were always left open, he said. Grace liked to work looking out across the skyline; she’d chosen the apartment for the view.

I couldn’t help asking, sarcastically, “Wouldn’t it have been cheaper just to visit some rich friend’s apartment—and memorize the TAP words for everything she saw?”

He laughed. “Of course. And she could have written scenery *in her head* to put any ten-million-dollar harbour view to shame.”

“So why didn’t she?”

“Do you know how Grace defined ‘reality’?”

“No.”

“The ten thousand bits that are left when you’ve argued everything else out of existence.”

After weeks of persistent harassment, I persuaded Maxine Ho, one of Third Hemisphere’s senior engineers, to talk to me off the record. She stuck to the official line, though: the <<death>> word was impossible. Whatever Grace Sharp had imagined, or whatever TAP sequence some would-be assassin had confronted her with, all the safeguards operated on a separate level, independent of the language protocol—and when the implant had been examined after the autopsy, there’d been no trace of damage or corruption to the relevant hardware or software.

“Of course a neural implant can kill you. A pacemaker can kill you. *A work station* can kill you. Any piece of technology can fail. But if someone died sitting at a work station—and when I took it apart there was no sign of a loose wire or a break in the insulation—I wouldn’t say: ‘She must have been running the legendary <<death>> program, which instructed the machine to electrocute her.’ I’d go looking for another cause of death.”

It was a specious analogy. Perfectly functioning TAP implants routinely sent signals to the hypothalamus, which in turn stimulated the adrenal gland; perfectly functioning work stations weren’t set up to dispense electric shocks at any dose.

Still, I thought she was being basically straight with me. If she believed that the implant had failed

at all, she believed it was a one-in-a-million glitch: less a design flaw than a tragic proof of the intrinsic unpredictability of any real device out in the real world—the kind of thing which would have been excused as “natural causes” if an equally robust biological system had failed.

On March 5th, the High Court challenge to the implant restrictions became public knowledge. The case wasn't scheduled to be heard until September—but the reaction to the news was immediate.

Helen Sharp had been right about one thing: her mother's death was seized upon by almost every commentator as proof that a successful challenge would amount to the legalization of infanticide. Not that Their Honours could be influenced by emotive editorials—perish the thought—but even if they weren't, it was clear that the Federal government would be ready with the necessary amendments within days of any decision which put the State criminal law in doubt. I set my knowledge miner digging, but reasoned debate about the merits of the case—the actual merits, not the legal ones—could barely be found outside obscure neurolinguistics journals. (TAP speakers' netzines were in TAP, and I had no translation software.)

The night the news broke, Mick declared, “I want one.”

“Then you'll just have to wait six years, won't you?”

“Not if they win.”

“If they win, you'd better start mowing lawns and washing windows. Six years should do it either way.”

He accepted that without protest—but then asked innocently, “So what's *your* favourite medium?”

“Text. And I know: I'm a boring old fart, but you're still not—” He wore a pained expression—and not just because “old fart” was cringe-inducing baby-talk. I'd missed the point.

“I'm sorry. What were you going to say?”

Mick spoke carefully. “How'd you like it if every time you picked up a book, you had to swallow everything the writer said? If you couldn't stop mid-sentence and think: ‘This is ... *bullshit.*’ If you lost the power to argue in your head with every word.”

“I'd hate it.”

He said, “That's where VR's heading. Without TAP.”

I was taken aback by the bleakness of this forecast—but it rang true. Without a language as powerful as the medium, there was little room for argument, little room for doubt. Just unearned suspension of disbelief.

I reached over to the cable which snaked from his headset to the work station, and looped it absentmindedly around one finger. I said, “If it's as bad as that, then stop using it. It's your choice.”

One look answered that; he didn't need to elaborate. *Why should he be forced to abandon his own favourite medium? Why shouldn't he have the chance to salvage it, reinvigorate it, instead?* Present at the birth of spoken language, would I have fought to abolish it, like some fanatical Zen terrorist afraid of its power to deceive? Or would I have fought to enrich it, to balance that power with scepticism and analysis?

I said lamely, “There's more to life than VR.”

Mick grinned triumphantly. “Exactly. But there *isn't* more to life than TAP.”

I took on other cases: runaway children, minor computer fraud—routine work, but at least it gave me the satisfaction of swift results. Helen Sharp could no longer afford to keep me on full-time—and

I'd virtually run out of productive ways to spend her money, anyway. If her mother had died from some unrepeatable glitch, biological or otherwise, nobody would ever prove it. So I offered no false hopes, and worked on the assumption that in a few more months, she'd come to her senses and tell me that the case was closed.

Then, in the middle of April, one of my pay phone bugs finally spoke.

I was dutifully cycling past, checking them all in the pouring rain, though I no longer seriously expected anything. When my notepad chimed the code for success, I almost dropped it into a storm drain.

Playing back the recording on the bike, in the rain, would have been impossible. Playing it back on a crowded train would have been stupid—I didn't have the headphones—but I was tempted. By the time I reached the office, I'd convinced myself I'd hear nothing but a service call: Dallaporta complaining that his home connection was out of order.

I was wrong.

Dallaporta whispered urgently, "You have to help me. I need your advice." It was a monologue; he was leaving a message. "I didn't get rid of it, on the night. I thought: it's not illegal—so why not keep it, just in case?" My skin crawled. He didn't elaborate, but I could guess exactly what he meant: *Just in case it becomes expedient, at some time in the unforeseeable future, to kill another prominent TAP-head.*

He inhaled deeply, as if trying to calm himself. "That was ... *insane*, I know. I wasn't thinking straight. But now ... *I can't just throw it in the river!* What if the police are watching me? What if they're going through my garbage?" That was unlikely, but I was grateful for his paranoia—and his incompetence: whispering into a public phone with (I imagined) a hand shielding lips and mouthpiece wouldn't have done him much good if he *had* been under police surveillance.

"I've wiped the code, now." *Shit.* "I followed the instructions, I'm sure it worked. But I have to get rid of the machine. I need to know the best way—the safest way—to do it. *Please.* Call me back at the usual place."

I decoded the number he'd called, from the tones—but it was a commercial message rerouting service—and one that was far too classy to be bribed or hacked.

I sat at the desk, still dripping, trying to decide what to do next. The humidity control system in the north window was pumping water vapour into the room; I'd never get dry unless I went and stood out in the hall for an hour.

Everything I had so far would be less than useless to the police; the illegality of the phone bugs aside, every connection between Dallaporta and Grace Sharp's death remained pure speculation. And I wasn't even sure I had enough to convince Helen Sharp, who didn't believe in <<death>> words. Nothing Dallaporta had said proved that he'd been talking about an infrared communications laser—and the crucial data it had transmitted was probably lost forever, now.

But it sounded like I still had a very slim chance to photograph "the machine", *in situ*.

The message had been left at 6:23 that morning. I glanced at my watch; school would be out in two hours. I had no way of knowing how long it would take for Dallaporta's backers (Natural Wisdom? The Fountain of Righteousness?) to come to his rescue—assuming they didn't just decide to abandon him—but I couldn't risk waiting another day.

I knew I'd be cutting it fine, but I didn't seem to have much choice.

There were six hundred apartments in Dallaporta's building—and the sheer weight of numbers had its advantages. I stood across the street behind a bus shelter and waited for someone to approach the main entrance. When a young man appeared, key in hand, I dashed across the road and caught up with him, breathless, soaked, umbrella-less, fumbling. He let me through without a moment's hesitation. I hung back in the lobby shaking water from my coat so I wouldn't have to talk to him in the elevator; I hadn't had time to prepare any plausible lies, and if he'd so much as asked me how long I'd lived in the building, I probably would have been struck dumb.

Dallaporta's apartment, 1912, had a reinforced security door with an impressive-looking deadlock. I found a utilities room at the end of the corridor, and picked *its* lock easily enough. There was a hatch in the ceiling—and even a ladder standing in a corner of the room. I rechecked the plans of the building on my notepad: not every apartment had a ceiling hatch; 1911 did, 1912 didn't.

I climbed into the ceiling and crawled across the dusty beams as quietly as I could, hoping I hadn't lost my bearings. I lay above apartment 1911, just listening, for almost five minutes—then I realized I'd never be certain it was empty. A baby sleeping, an adult quietly reading ... I didn't even know who lived there, I hadn't had time to find out.

Cursing silently, I crawled back to the utilities room, brushed myself down, and went and rang the bell to 1911.

I rang three times. No one was home.

I retraced my path, lifted the hatch, lowered a rope into the apartment. My forearms ached as I descended; I hadn't done an illegal entry since before Mick was born. The old buzz was tinged with new anxieties: *I was too old for this cat-burglar shit—and I couldn't afford to lose my licence.* But I felt a kind of defiant euphoria, too—*because* everything was harder, *because* I had so much more to lose.

And it would all be one word, in TAP ...

The balconies of the two apartments were separated by less than a metre, but they were flush with the outside wall of the building—no overhang at all. I climbed up onto the waist-high foot's-width concrete guard wall, steadied myself by pressing up with my left hand against the balcony's ceiling—then with the right, reached across the naked brickwork of the outside wall and into Dallaporta's balcony. I was lucky; I was on the side of the building facing away from the wind.

I moved a foot across, too, embraced the brickwork tightly, shifted the centre of mass of my body a few crucial centimetres—fighting down momentary panic—and within seconds, my right hand and foot were lodged securely between Dallaporta's guard wall and ceiling, and it was far easier to go forward than back. I jumped shakily down onto his cluttered balcony, just missing a pot plant. I glanced at the street, nineteen storeys below—and pictured Mick at my funeral, still refusing to talk to his father. There was a chance that someone had seen me cross, but there was nothing I could do about that—and the downpour seemed to shift the odds in my favour: I could barely make out Grace Sharp's building at all, through the curtain of rain.

A sliding glass door separated the balcony from the apartment. It fitted loosely between a ceiling track and a guide rail buried in the concrete floor; it was probably designed to be lifted right out, for ease of replacement—but only when it was unlocked. There was no question of trying to pick the lock; there was no keyhole—just a catch operated by a lever on the other side of the door. By pressing on the glass with both gloved hands, though, I could get enough purchase to raise and tilt the whole door slightly. After almost ten minutes—with my wrists going numb—I managed to work the

catch free.

I opened the door a few centimetres, then paused at the threshold, scanning the room for burglar alarms. It was clear.

As I moved into the apartment, I heard footsteps in the corridor, then a key going into the lock. I retreated to the balcony, but it was too late to start climbing back the way I'd come; I would have been in full view. I slid the door closed—I couldn't re-lock it—then dropped to the floor behind a pile of junk.

I heard at least two people enter the apartment, then turn left into the corridor which led out of the living room. I took a button-sized video camera, and stuck it to the frame of Dallaporta's bike, which was leaning against the wall of the balcony. I checked the image on my notepad, then tweaked the direction until I had a clear view of most of the room.

I dropped out of sight again just in time. The intruders—a man and a woman, neither of whom I'd seen before—returned, carrying a cardboard carton about thirty centimetres long. I zoomed in; the labelling suggested a presentation bottle of Scotch. Dallaporta's friends clearly didn't share his paranoia; they *knew* the police weren't watching the apartment. He wanted the laser to disappear—and they'd obligingly turned up to remove it.

The woman said, "You think he wiped it properly?"

The man hesitated. "I wouldn't count on it." I wondered why they hadn't automated the process—but then, it would have been impossible to predict exactly when the opportunity to use the code on Grace Sharp would arise, or how many attempts it would take to hit the target.

"Well, I'm not walking out of here carrying incriminating—"

The man groaned—but he opened the carton. I recognized the laser from the catalogues I'd scanned; most of the bulk was in the precision optics, which doubled as a kind of telescope for checking alignment—the unit was meant for inner city rooftop-to-rooftop communications. There was a small device about the size of a matchbox plugged in to the data port; the man hit a button on the side of the box, and peered at a tiny LCD display.

"Hey, the Jackal got it right. I'm impressed." He laughed. "*I thought: Why not keep it, just in case?*" The poor cretin really thought he had the <<death>> word—and he could go on playing kill-the-TAP-head for as long as he liked."

The woman said dryly, "Don't be so ungrateful. If he'd known what he was doing, he wouldn't have done it at all."

They left. I pocketed the camera and crossed back to 1911 immediately, not wanting to be in sight when they reached the street. In the ceiling, I had to force myself not to rush; if I was careless, I could still get caught.

In five minutes, I was out of the building. I circled the block, then spiralled out through the surrounding streets, on the slim chance of catching sight of them again.

After half an hour I gave up, and went into a coffee shop to replay the video. I should have been jubilant: I had a clear shot of a communications laser, and a soundtrack with two people discussing *the killing of TAP-heads*.

The only catch was, it didn't sound like they believed in <<death>> words any more than Maxine Ho or Helen Sharp.

I invited Helen Sharp to my office. I showed her Dallaporta's essay, and the geometry of the

buildings. I played back the phone call, and the scene in his apartment.

I said, “You’re the TAP expert. You want to tell me what’s going on?”

She sat in silence for a long time before replying.

“There is one possibility.”

“Which is?”

“My mother had the earliest model implant. Right to the end. She never had an upgrade—she didn’t trust them to transfer her vocabulary properly. She was afraid she’d lose everything she’d learnt.”

“And you think ... the old models *did* have a <<death>> word?”

“No. But they could be microprogrammed externally.”

“You’ve lost me.” That wasn’t quite true, but I wanted her to spell it out. I wasn’t sure how much I really *did* know about the implant—how much the glowing technical reports might have misled me.

Sharp looked terrible—the fact that she’d just laid eyes on the people who’d arranged the death of her mother was finally sinking in—but she explained patiently: “The basic hardware of any neural net computer is just ... a big array of interconnected RISC processors. The chip is mass-produced as a commodity—hundreds of millions of them a year—and used in tens of thousands of different devices. All the specific characteristics are added by the *microcode*: low-level instructions which customize the processors to make them behave in certain useful ways. The main software then takes that level for granted—as if it’s all hardwired into the silicon. But it’s not.

“When they released the first consumer model of the TAP implant, Third Hemisphere were worried that there might be some undiscovered flaw in the microcode. If they’d had to take all the implants out of people’s skulls to correct it, that would have been a PR nightmare. So they left a routine in the microcode which gave it the power to accept updates in infrared—to modify any part of itself, given the right sequence of external instructions.”

“So there was a special TAP word which could get at all the infrastructure? A word which said: <<Replace the old microcode with *X*>>?”

“*No!* It *wasn’t* a TAP word—it was a reserved sequence, right outside the language protocol! It was meaningless in TAP, it could never have been spoken. That was the whole point!”

It seemed like a minor distinction to me—but I could understand why she attached so much importance to it. *The language itself* hadn’t killed her mother. The poet hadn’t died from a word, after all.

I said, “If that’s what happened, though ... why didn’t the engineers who examined your mother’s implant find any evidence of it? And if you *knew* all this—”

Sharp snapped back angrily, “*I didn’t know she still had the old microcode!*” She looked away. “Nine or ten years ago, Third Hemisphere tried to persuade her to accept a new implant—for free. They’d finally discovered a bug in the original microcode—a minor one, nothing dangerous, but they wanted everyone to start using the later models. They were confident enough about *those* that they weren’t externally programmable anymore.

“She wouldn’t accept it. She didn’t want a new implant, she didn’t want surgery. So they offered to update the microcode, to fix the bug—and close the trap door in the process, because I think that was also making them nervous. TAP users could never have spoken the code, even if they’d wanted to—but every consumer device on the planet was starting to put out a flood of infrared. There was always a tiny risk of triggering the modification program by accident.

“I thought she’d had the new microcode for the last ten years. She told me she’d accepted the offer.

The records Third Hemisphere supplied to the coroner stated that she had—and the engineer’s report confirmed that.”

I said, “But if she’d actually refused it, like she’d refused the new implant—because she was afraid it might affect her skills with the language ... then Dallaporta’s message might have done it all in one hit? Opened the trapdoor, undermined the black box, triggered a massive adrenaline release—then overwritten the evidence by substituting the version she was meant to have had all along?”

“Yes.”

“So who’d know enough to program all that?” *Natural Wisdom? The Fountain of Righteousness?* Hardly—though they could always have brought in outside expertise.

Sharp was adamant: “Only one of Third Hemisphere’s own software engineers could do it. Someone who’d been involved in the TAP project from the start.”

“But they’d have nothing to gain, surely? Why discredit your own work, your own product?”

The *product* belonged to Third Hemisphere, though—not to any group of employees.

And people did move on.

I scanned fifteen years’ worth of implant manufacturers’ publications; they were full of PR releases gloating about heads successfully hunted.

In March 2008, a firm called Cogent Industries had poached a software engineer named Maria Remedios from Third Hemisphere. That in itself proved nothing, of course—nor did the fact that an earlier article named her as a senior participant in the TAP project.

Cogent did have something to gain, though. They specialized in Virtual Reality hardware—both immersive neural implants, and headset-based units. Third Hemisphere wasn’t so much a direct competitor as the source of an entire antithetical philosophy: VR was sold to publishers and advertizers as the path to unconditional suspension of disbelief; TAP was about questioning *everything*, analysing *everything*. The day every VR user spoke TAP, the most ingeniously crafted—and manipulative—VR experience would disintegrate into a laughable trick with smoke and mirrors. And if that wasn’t exactly an imminent threat, Grace Sharp’s death had certainly made it more remote than ever.

They could have chosen Dallaporta by the same means I’d used to find him myself: a search for passionate opponents of TAP who also happened to have a clear view of Grace Sharp’s study. And whoever had made contact with him could have claimed to be a member of Natural Wisdom, or some other anti-implant group; he’d hardly have cooperated if he’d known the truth. When they’d told him about the High Court challenge—no doubt conjuring up images of a whole generation “lost to TAP”—Grace Sharp’s death must have begun to sound like a necessary evil. *One old woman, for the sake of all those children. Death by her own obscene technological perversion of language. Nothing more than poetic justice.*

And Maria Remedios? Had Third Hemisphere treated her badly, left her holding a grudge—or had her new employers pressured her into it? Even if she’d had grave second thoughts about TAP—and recoiled at the prospect of the implant being given to children—helping to murder an innocent woman seemed like a grotesquely disproportionate response. She could have joined the public campaign against the implant; as one of its creators, the media would have given her all the coverage she desired. And though Dallaporta might have caved in to “moral” arguments offered under false

pretences, Remedios could hardly have failed to understand that Cogent's motives were entirely commercial.

Nine tenths of the picture seemed to have fallen perfectly into place—but it was clear that I was missing something crucial. And too much even of that nine tenths was still pure guesswork. For a start, I had to establish solid evidence of a link between Dallaporta and Cogent Industries—which was going to be tricky, since he didn't even know it existed, himself.

I checked the faces of the man and woman I'd seen in Dallaporta's apartment against all the trade magazine shots of Cogent's employees.

No match.

I fed the Cogent employee names, along with my seventeen thousand TAP-haters, into the cluster analysis software—looking for a connection, however tenuous.

There was none.

So much for the easy options.

I sent Dallaporta a message, via a rerouting service, asking if we could “continue our discussion”. The real Lydia Stone was ex-directory—and using a different number than the one she'd given the school would only prove that she was exercising suitable caution.

Three hours later, Dallaporta called me back. He was polite, but very nervous. I said I had some news which would be of interest to him; he didn't actually scream at me to *shut up in case the line was being bugged*, but his body language made it clear that if I so much as mentioned TAP he'd hang up immediately.

I said, “Can I meet you somewhere? We really need to talk, face to face.”

He hesitated. He badly wanted me to vanish from his life—but he needed to know what my “news” was. *Why had I taken an interest in him? One old essay was hardly enough to explain it, so ... how many people in the anti-TAP crusade knew what he'd done? And what did I know about Grace Sharp's death which no one had bothered to tell him?*

Of course he was paranoid. The inquest was long over, the laser had been magicked away—but the fact remained: he'd stood on his balcony on a summer evening and shot a perfect stranger dead. Nothing could ever be the same again.

He said flatly, “Tomorrow night, at the school. Nine o'clock.”

I rehearsed the story in my head as I crossed the football field—which was brightly floodlit for some reason, though there wasn't a soul around. *A friend of a friend in a certain law firm had heard that Helen Sharp had discovered something in her mother's computer files—something which had prompted her to start proceedings to try to gain access to Third Hemisphere's records.*

I was sure that Dallaporta would pass the rumour on to his benefactors; the hardest part would be ensuring that he didn't mention “my” name. So long as he remained tight-lipped about his source of information, they'd have to take him seriously.

Helen Sharp was preparing a forged—paper—letter from her mother to Third Hemisphere, explicitly stating that she did not wish to accept the microcode update. I was confident that we had enough leverage now to persuade Third Hemisphere to play along, and bury the bait in the appropriate warehouse.

Maria Remedios would know at once what the “evidence” had to be. Cogent, acting on her advice, would try to arrange its disappearance. This time, they'd be caught red-handed.

At least, that was the theory.

Dallaporta had said he'd be in the "Resources Centre"—which these days apparently meant a large room full of work stations. I'd found a map of the school in an online brochure, so I knew exactly where to go. The door was open, though the lights were out—and as I approached the threshold I could see that all the machines inside had been switched on and connected to some net service or other. *More of Dallaporta's paranoia?* Maybe he thought this was an ideal source of interference for the police surveillance teams who were following him everywhere—though the sound from most of the work stations was turned down to a whisper.

I peered into the greyness of the room, dazzled and distracted by the multitude of images: swarms of tiny red and silver fish weaving through a coral reef; a polychrome computer animation of air flow around some kind of zeppelin; a portrait of a Florentine prince sprouting a speech balloon full of modern Italian; a dead silver-haired twentieth century guru emitting platitudes about the nature of truth. An old music video was playing by the door; the singer droned: "This is the way, step insi-ide."

I smiled uneasily at the coincidence and walked into the room—resisting the urge to shout a greeting, mocking Dallaporta's elaborate "precautions". It seemed far more diplomatic to play along. I stage whispered, "It's me. Where are you?"

No reply.

It was hard to get my eyes accustomed to the darkness with forty or fifty bright screens in view; I had no reason whatsoever to look at any of the images—but it was remarkably difficult to keep looking away. I walked slowly towards the far end of the room, irritated but prepared not to show it. I called out again, a little louder; there was still no reply.

An animated supernova erupted just ahead of me—and the sudden blue-white radiance revealed a man slumped in a chair beside the screen. I moved closer, and inspected the body by the light of the dying sun.

Dallaporta had a small-calibre pistol in his hand, and a neat hole in his temple. I put two fingers to his neck; he was certainly dead, but still warm.

I felt a flicker of guilt break through the numbness of shock—but this wasn't the time to agonize over the way I'd treated him. He'd killed Grace Sharp, and he hadn't been prepared to live with that. If the fear of whatever I'd been about to tell him had been enough to drive him to suicide, he would have done it sooner or later, regardless.

I took out my notepad to call the police.

Then the supernova faded, and a new image took its place.

An apartment building, swept by rain. The camera zoomed in on a figure climbing between two of the balconies. The magnification kept increasing, relentlessly—and by the time the woman turned and showed her face, it filled the screen.

My stomach tightened. I glanced back to the neat, too-professional hole in Dallaporta's skull, reassessing everything. *But ... who could have videoed me?* If Cogent's people had known I was on the balcony, why had they walked straight in?

The image changed again. *Me, planting one of the phone bugs.*

I laughed in disbelief. They'd all but slaughtered this man in front of my eyes—and now they were trying to blackmail me into silence with a couple of petty misdemeanours?

"There are small traces of your skin under his fingernails." The voice came from a metre behind

me; I started, but I didn't actually jump. "Not enough for him to have left a mark on you, but enough for DNA analysis."

I turned around slowly. The man was about my age, and only a little taller. He wasn't pointing a gun at me, but he looked suspiciously relaxed.

"The police will find out that Helen Sharp hired you—but they'll have no grounds for a warrant to compel you to supply them with tissue samples. Not if they don't see this." He gestured at the screen.

I said, "And why would they imagine I'd want to fake this man's suicide? Breaking into his apartment proves nothing—"

"I think *that* depends on whether someone tips them off about the hundred thousand dollars in your Swiss bank account. Grace's close-knit linguistic community must have done a little whip-around, and bought themselves some justice for the man with the <<death>> word."

That shut me up. If the account really existed ... that was breathtaking. *Had Cogent been watching me all along, setting this up?*

He smiled. "If you're good, you can keep the hundred grand, of course. No tax; the whole thing's organized beautifully through a holding company in Macao."

I didn't have the presence of mind even to be tempted; I was still trying to come to terms with the whole Byzantine scheme.

I said, "Forget it." I walked straight past him, towards the doorway. I reached it, heart racing, then turned and looked back; I couldn't see him anymore, but I didn't think he'd moved a centimetre. Killing me would create too many problems, too many holes in their beautifully scripted VR experience—and the odds were stacked against me even if I did go straight to the police.

I said, "So what did you expect me to tell Helen Sharp? 'Screw your mother, the case is closed—and please don't ask any questions, I'm late for my flight to Macao'?"

"You'll think of something. Believe me, you don't want to fight us."

I laughed angrily. "One pissy little VR company, and you think you can pull all the strings?"

The man said, "I'm not working for Cogent. They have *no idea* you've even taken an interest in them."

I peered into the darkness between the rows of screens. "Some VR industry consortium, then." For some reason I'd started shaking; I think it was rage. "You're still not above the law."

"Oh, there's more to life than Virtual Reality." He sounded amused.

"Yeah? *Who, then?*"

There was silence for a while, then I could see him approaching. "I can't tell you that. But there are some people you can meet—if you want to—who might help you put your doubts to rest."

"Who?"

"Maria Remedios. And her daughter."

"I thought you didn't work for Cogent—"

"*She* works for Cogent. I don't. Though you could say it's my job to watch over them both."

The further we drove from Dallaporta's corpse, the more compromised I knew I'd become—but I couldn't walk away from a chance to learn what it was I'd missed all along. Even if the revelation was intended to guarantee my silence.

"Remedios was one of the first volunteers to test the TAP implant," the man explained casually. "First she'd helped design it—and then she got to experience the results first hand. I think she must

have found the reality exhilarating, in a lot of ways—but very frustrating, too.”

“Why frustrating?”

“Even with neural hardware, learning an exotic new language is always difficult. For an adult.”

I didn’t reply. He continued, “She managed to find a good neurosurgeon willing to give her daughter the implant. Not here, though. Overseas. Which simplified things, really—it was easier to turn a blind eye.”

That chilled me. “And you let her go ahead and do it? Just so you could see the results?”

He laughed. “Well, not me personally. But that was the general idea.”

And the results? I thought back to some of the more pessimistic technical papers I’d read on the subject. Maybe natural languages—which had co-evolved with human intelligence—were crucial for the early stages of intellectual development ... and even if relatively “artificial” latecomers like sign made perfect substitutes, maybe TAP was just too different to perform the role of organizing the neural structures which made higher thinking possible. And maybe the fact that so much of the language was encoded in *the chip*, instead of the brain, meant that vital conceptual networks were missing—or at least, inaccessible to other regions of the cerebral cortex which needed them in order to mature.

It still made no sense, though. If the daughter was living proof that the implant would do unspeakable damage to the infant brain, why not just publicize that fact? *Why had Grace Sharp died to win a court case which could have been won by simply disclosing the truth?*

Maria Remedios lived in a modestly comfortable house on the north shore. My escort had phoned ahead; she was expecting us. As I followed him down the hallway, she met my eyes; there was unconcealed shame in her steady gaze—but a strange, almost proud defiance behind it. I looked away, confused. If she’d crippled her own child with the TAP implant, no wonder she’d left Third Hemisphere—but why was she so beholden to Dallaporta’s killers that she’d let them use her to manipulate Cogent? Had they threatened to imprison her? To put her child in an institution?

We ended up in the living room, but Remedios didn’t invite us to take a seat. The man said, “So, what’s she been up to? Still spending every last waking moment on the nets?”

Remedios shot him a poisonous look, and didn’t bother replying. I thought he was being cruelly sarcastic. Then he turned to me and explained, “Incoming data only, I’m afraid. We wouldn’t want her airing her grievances to the world.”

Remedios left the room. I heard her say, “Jane? Ms O’Connor’s here.” Then she returned, with a young girl in blue-and-white striped pyjamas, maybe eight years old.

Jane greeted me and shook my hand solemnly—or mock-solemnly. One look at her knowing grey eyes, and I knew I’d made exactly the wrong guess about the implant’s effects.

“I was hoping I’d be allowed to meet you,” she said. “Uncle Daniel’s been complaining about you for weeks.” She glanced at the man, without obvious malice—more like a chess player regarding a formidable adversary. “And he doesn’t often let me have visitors.”

I didn’t know what to say. “Uncle Daniel” interjected helpfully, “I think Ms O’Connor is still in the dark, Jane. She doesn’t understand—”

“Why anyone would want to keep me prisoner? Why anyone would go to so much trouble to keep other children from growing up with TAP?” Her tone went beyond precocity; she didn’t come across as some child actor mouthing an adult’s lines. Every word simply negated the implications her appearance would normally have conveyed.

And her bluntness was unnerving, but it cut through my own diplomatic hesitancy. I said, “That’s right. I don’t understand.”

Jane smiled calmly. I don’t believe she was resigned to her situation—but she was patient. Very patient.

She said, “With the implant, you can *play* words—or *scan* them. Experience them, blindly—or understand them, completely. Uncle Daniel’s not a big fan of *understanding*, though. He thinks there are certain words which should be *played* and not *scanned*.”

“What kind of words?”

She raised one hand, palm towards me. It was an ironic gesture; she must have known I was oblivious to IR.

“If I play *this* word ... I feel a boundless sense of loyalty and pride towards my team ... my city ... my State ... my *nation*!” Her face shone with fervent, agonized, almost hysterical joy; she looked like nothing so much as one of the flag-waving school girls they’d whipped into a patriotic frenzy as ornamentation for the 2000 Olympics. “But if I *scan* it ... “ Her expression faded into one of faint amusement—as if someone had just tried to dupe her with a very old, and very obvious, scam.

“*This* word plays as what many religions call ‘faith’.” Her face was radiant, but tranquil now. “The peace that defies understanding.” She smiled apologetically. “Except, of course, it doesn’t. Scan it, and the mechanics are transparent: one foot down hard on an entrained neurochemical feel-good pedal—with cognitive, aesthetic, and cultural echoes linked to the context in which the training was acquired.”

I glanced at Remedios; there were silent tears moving down her face. *They wouldn’t lock up the mother, or institutionalise the daughter. They’d kill this child, if they had to. That was the only reason she’d helped them program the death of Grace Sharp.*

“Now, this is what the Buddhists call ‘enlightenment’.” Jane closed her eyes and smiled serenely. “Similar raw pharmacology, but the higher-level components are different. There’s a kind of heavily self-affirming cognitive myopia: every mental tool which could expose the true nature of the state is explicitly negated.”

I thought of James, lost in wordless tranquillity. The package he’d swallowed whole, the mind virus fine-tuned by centuries of evolution, declared: *Language is dangerous, language deceives you ... because language could have shown him the way out of the hole he’d dug for himself.*

“And *this* is ... sexual love, desire? Call it what you like, but if you *scan* it—”

Something cut her short. Maybe it was a look from her mother. Or maybe it was the expression on my face.

Jane continued smoothly, “There are others. I won’t list them all—but growing up with the implant makes them obvious. And Uncle Daniel’s friends don’t believe that a subculture with that knowledge would be ... *conducive* to their idea of social cohesion. They feel very strongly about that.” She turned to face him—and her expression now contained more pity than anything else. “And I do understand. Because I’ve found the word for their affliction, too. I’ve found the word for the love of power.”

By the time I got home it was almost midnight. Mick’s room was in darkness, but he was still playing the game; I sat down beside him and removed the headset gently, then reached over and logged him off.

He opened his mouth to apologize, or invent some excuse. I said, “Just shut up and listen.”

“What happened? I was worried.” I hadn’t told him everything—but he knew I’d gone to meet someone connected with Grace Sharp’s death.

I tried to speak calmly. “I’ve screwed up the case. Badly. I’ve made some stupid mistakes, and now I’m going to have to drop it. Okay? That’s all I can tell you. And we’re not going to talk about it again.”

He stared at me, incredulous. “Why? What did you do?”

I shook my head. “I said, we’re not going to talk about it.”

He started blinking away tears. I took him in my arms; he didn’t fight me, but he said angrily, “I don’t *believe* you!”

I said, “Sssh.”

Later, I lay on my bed in the dark, rolling between my thumb and forefinger the smooth cold object, like a small ceramic bead, which Jane Remedios had slipped into my hand.

If she’d managed to copy her implant, this chip would encode her entire TAP vocabulary. And to an adult it would be useless—but a newborn child who started with the knowledge it had taken her eight years to acquire might surpass her in half that time.

They’d be watching me closely—but they couldn’t be watching everyone. I believed I could pass the chip on to someone willing to use it, if I was careful.

So I lay in the dark, and tried to decide.

Between the silence of power and mystification, the unearned suspension of disbelief, *the way things had always been*—and the torrent of understanding which would sweep it all away.

YEYUKA

On my last day in Sydney, as a kind of farewell, I spent the morning on Bondi Beach. I swam for an hour, then lay on the sand and stared at the sky. I dozed off for a while, and when I woke there were half a dozen booths set up amid the sun bathers, dispensing the latest fashion: solar tattoos. On a touch-screen the size of a full-length mirror, you could choose a design and then customise it, or create one from scratch with software assistance. Computer-controlled jets sprayed the undeveloped pigments onto your skin, then an hour of UV exposure rendered all the colours visible.

As the morning wore on, I saw giant yellow butterflies perched between shoulder blades, torsos wrapped in green-and-violet dragons, whole bodies wreathed in chains of red hibiscus. Watching these images materialise around me, I couldn't help thinking of them as banners of victory. Throughout my childhood, there'd been nothing more terrifying than the threat of melanoma—and by the turn of the millennium, nothing more hip than neck-to-knee lycra. Twenty years later, these elaborate decorations were designed to encourage, *to boast of*, irradiation. To proclaim, not that the sun itself had been tamed, but that our bodies had. To declare that cancer had been defeated.

I touched the ring on my left index finger, and felt a reassuring pulse through the metal. Blood flowed constantly around the hollow core of the device, diverted from a vein in my finger. The ring's inner surface was covered with billions of tiny sensors, spring-loaded funnel-shaped structures like microscopic Venus fly-traps, each just a few hundred atoms wide. Every sizable molecule in my bloodstream that collided with one of these traps was seized and shrink-wrapped, long enough and tightly enough to determine its shape and its chemical identity before it was released.

So the ring knew exactly what was in my blood. It also knew what belonged, and what didn't. Under its relentless scrutiny, the biochemical signature of a viral or bacterial infection, or even a microscopic tumour far downstream, could never escape detection for long—and once a diagnosis was made, treatment was almost instantaneous. Planted alongside the sensors were programmable catalysts, versatile molecules that could be reshaped under computer control. The ring could manufacture a wide range of drugs from raw materials circulating in the blood, just by choosing the right sequence of shapes for these catalysts—trapping the necessary ingredients together in nooks and crannies moulded to fit like plaster casts around their combined outlines.

With medication delivered within minutes or seconds, infections were wiped out before they could take hold, tiny clusters of cancer cells destroyed before they could grow or spread. Linked by satellite to a vast array of medical databases, and as much additional computing power as it required, the ring gave me a kind of electronic immune system, fast enough and smart enough to overcome any adversary.

Not everyone on the beach that morning would have had their own personal HealthGuard, but a weekly session on a shared family unit, or even a monthly check-up at their local GP, would have been enough to reduce their risk of cancer dramatically. And though melanoma was the least of my worries—fair-skinned, I was covered in sunscreen as usual; fatal or not, getting burnt was painful—with the ring standing guard against ten thousand other possibilities, I'd come to think of it as a vital part of my body. The day I'd installed it, my life expectancy had risen by fifteen years—and no doubt my bank's risk-assessment software had assumed a similar extension to my working life, since I'd be paying off the loan I'd needed to buy the thing well into my sixties.

I tugged gently at the plain metal band, until I felt a sharp warning from the needle-thin tubes that ran deep into the flesh. This model wasn't designed to be slipped on and off in an instant like the shared units, but it would only take a five minute surgical procedure under local anaesthetic to remove it. In Uganda, a single HealthGuard machine served 40 million people—or rather, the lucky few who could get access to it. Flying in wearing my own personal version seemed almost as crass as arriving with a giant solar tattoo. Where I was headed, cancer had very definitely not been defeated.

Then again, nor had malaria, typhoid, yellow fever, schistosomiasis. I could have the ring immunise me against all of these and more, before removing it ... but the malaria parasite was notoriously variable, so constant surveillance would provide far more reliable protection. I'd be no use to anyone lying in a hospital bed for half my stay. Besides, the average villager or shanty-town dweller probably wouldn't even recognise the thing, let alone resent it. I was being hypersensitive.

I gathered up my things and headed for the cycle rack. Looking back across the sand, I felt the kind of stab of regret that came upon waking from a dream of impossible good fortune and serenity, and for a moment I wanted nothing more than to close my eyes and rejoin it.

Lisa saw me off at the airport.

I said, "It's only three months. It'll fly past." I was reassuring myself, not her.

"It's not too late to change your mind." She smiled calmly; no pressure, it was entirely my decision. In her eyes, I was clearly suffering from some kind of disease—a very late surge of adolescent idealism, or a very early mid-life crisis—but she'd adopted a scrupulously non-judgmental bedside manner. It drove me mad.

"And miss my last chance ever to perform cancer surgery?" That was a slight exaggeration; a few cases would keep slipping through the HealthGuard net for years. Most of my usual work was trauma, though, which was going through changes of its own. Computerised safeguards had made traffic accidents rare, and I suspected that within a decade no one would get the chance to stick their hand in a conveyor belt again. If the steady stream of gunshot and knife wounds ever dried up, I'd have to retrain for nose jobs and reconstructing rugby players. "I should have gone into obstetrics, like you."

Lisa shook her head. "In the next twenty years, they'll crack all the molecular signals, within and between mother and foetus. There'll be no premature births, no Caesareans, no complications. The HealthGuard will smooth my job away, too." She added, deadpan, "Face it, Martin, we're all doomed to obsolescence."

"Maybe. But if we are ... it'll happen sooner in some places than others."

"And when the time comes, you might just head off to some place where you're still needed?"

She was mocking me, but I took the question seriously. "Ask me that when I get back. Three months without mod cons and I might be cured for life."

My flight was called. We kissed goodbye. I suddenly realised that I had no idea why I was doing this. The health of distant strangers? Who was I kidding? Maybe I'd been trying to fool myself into believing that I really was that selfless—hoping all the while that Lisa would talk me out of it, offering some face-saving excuse for me to stay. I should have known she'd call my bluff instead.

I said plainly, "I'm going to miss you. Badly."

"I should hope so." She took my hand, scowling, finally accepting the decision. "You're an idiot, you know. Be careful."

"I will." I kissed her again, then slipped away.

I was met at Entebbe airport by Magdalena Iganga, one of the oncologists on a small team that had been put together by Médecins Sans Frontières to help overburdened Ugandan doctors tackle the growing number of Yeyuka cases. Iganga was Tanzanian, but she'd worked throughout eastern Africa, and as she drove her battered ethanol-powered car the thirty kilometres into Kampala, she recounted some of her brushes with the World Health Organisation in Nairobi.

“I tried to persuade them to set up an epidemiological database for Yeyuka. Good idea, they said. Just put a detailed proposal to the cancer epidemiology expert committee. So I did. And the committee said, we like your proposal, but oh dear, Yeyuka is a contagious disease, so you'll have to submit this to the contagious diseases expert committee instead. Whose latest annual sitting I'd just missed by a week.” Iganga sighed stoically. “Some colleagues and I ended up doing it ourselves, on an old 386 and a borrowed phone line.”

“Three eight what?”

She shook her head. “Palaeocomputing jargon, never mind.”

Though we were dead on the equator and it was almost noon, the temperature must have been 30 at most; Kampala was high above sea level. A humid breeze blew off Lake Victoria, and low clouds rolled by above us, gathering threateningly then dissipating, again and again. I'd been promised that I'd come for the dry season; at worst there'd be occasional thunderstorms.

On our left, between patches of marshland, small clusters of shacks began to appear. As we drew closer to the city, we passed through layers of shanty towns, the older and more organised verging on a kind of bedraggled suburbia, others looking more like out-and-out refugee camps. The tumours caused by the Yeyuka virus tended to spread fast but grow slowly, often partially disabling people for years before killing them, and when they could no longer manage heavy rural labour, they usually headed for the nearest city in the hope of finding work. Southern Uganda had barely recovered from HIV when Yeyuka cases began to appear, around 2013; in fact, some virologists believed that Yeyuka had arisen from a less virulent ancestor after gaining a foothold within the immune-suppressed population. And though Yeyuka wasn't as contagious as cholera or tuberculosis, crowded conditions, poor sanitation and chronic malnourishment set up the shanty towns to bear the brunt of the epidemic.

As we drove north between two hills, the centre of Kampala appeared ahead of us, draped across a hill of its own. Compared to Nairobi, which I'd flown over a few hours before, Kampala looked uncluttered. The streets and low buildings were laid out in a widely-spaced plan, neatly organised but lacking any rigid geometry of grid lines or concentric circles. There was plenty of traffic around us, both cycles and cars, but it flowed smoothly enough, and for all the honking and shouting going on the drivers seemed remarkably good humoured.

Iganga took a detour to the east, skirting the central hill. There were lushly green sports grounds and golf courses on our right, colonial-era public buildings and high-fenced foreign embassies on our left. There were no high-rise slums in sight, but there were makeshift shelters and even vegetable gardens on some stretches of parkland, traces of the shanty towns spreading inwards.

In my jet-lagged state, it was amazing to find that this abstract place that I'd been imagining for months had solid ground, actual buildings, real people. Most of my second-hand glimpses of Uganda had come from news clips set in war zones and disaster areas; from Sydney, it had been almost impossible to conceive of the country as anything more than a frantically edited video sequence full of soldiers, refugees, and fly-blown corpses. In fact, rebel activity was confined to a shrinking zone in

the country's far north, most of the last wave of Zairean refugees had gone home a year ago, and while Yeyuka was a serious problem, people weren't exactly dropping dead in the streets.

Makerere University was in the north of the city; Iganga and I were both staying at the guest house there. A student showed me to my room, which was plain but spotlessly clean; I was almost afraid to sit on the bed and rumple the sheets. After washing and unpacking, I met up with Iganga again and we walked across the campus to Mulago Hospital, which was affiliated with the university medical school. There was a soccer team practising across the road as we went in, a reassuringly mundane sight.

Iganga introduced me to nurses and porters left and right; everyone was busy but friendly, and I struggled to memorise the barrage of names. The wards were all crowded, with patients spilling into the corridors, a few in beds but most on mattresses or blankets. The building itself was dilapidated, and some of the equipment must have been thirty years old, but there was nothing squalid about the conditions; all the linen was clean, and the floor looked and smelt like you could do surgery on it.

In the Yeyuka ward, Iganga showed me the six patients I'd be operating on the next day. The hospital did have a CAT scanner, but it had been broken for the past six months, waiting for money for replacement parts, so flat X-rays with cheap contrast agents like barium were the most I could hope for. For some tumours, the only guide to location and extent was plain old palpation. Iganga guided my hands, and kept me from applying too much pressure; she'd had a great deal more experience at this than I had, and an over-zealous beginner could do a lot of damage. The world of three-dimensional images spinning on my workstation while the software advised on the choice of incision had receded into fantasy. Stubbornly, though, I did the job myself; gently mapping the tumours by touch, picturing them in my head, marking the X-rays or making sketches.

I explained to each patient where I'd be cutting, what I'd remove, and what the likely effects would be. Where necessary, Iganga translated for me—either into Swahili, or what she described as her “broken Luganda.” The news was always only half good, but most people seemed to take it with a kind of weary optimism. Surgery was rarely a cure for Yeyuka, usually just offering a few years' respite, but it was currently the only option. Radiation and chemotherapy were useless, and the hospital's sole HealthGuard machine couldn't generate custom-made molecular cures for even a lucky few; seven years into the epidemic, Yeyuka wasn't yet well enough understood for anyone to have written the necessary software.

By the time I was finished it was dark outside. Iganga asked, “Do you want to look in on Ann's last operation?” Ann Collins was the Irish volunteer I was replacing.

“Definitely.” I'd watched a few operations performed here, on video back in Sydney, but no VR scenarios had been available for proper “hands on” rehearsals, and Collins would only be around to supervise me for a few more days. It was a painful irony: foreign surgeons were always going to be inexperienced, but no one else had so much time on their hands. Ugandan medical students had to pay a small fortune in fees—the World Bank had put an end to the new government's brief flirtation with state-subsidised training—and it looked like there'd be a shortage of qualified specialists for at least another decade.

We donned masks and gowns. The operating theatre was like everything else, clean but outdated. Iganga introduced me to Collins, the anaesthetist Eriya Okwera, and the trainee surgeon Balaki Masika.

The patient, a middle-aged man, was covered in orange Betadine-soaked surgical drapes, arranged

around a long abdominal incision. I stood beside Collins and watched, entranced. Growing within the muscular wall of the small intestine was a grey mass the size of my fist, distending the peritoneum, the organ's translucent "skin", almost to bursting point. It would certainly have been blocking the passage of food; the patient must have been on liquids for months.

The tumour was very loose, almost like a giant discoloured blood clot; the hardest thing would be to avoid dislodging any cancerous cells in the process of removing it, sending them back into circulation to seed another tumour. Before making a single cut in the intestinal wall, Collins used a laser to cauterise all the blood vessels around the growth, and she didn't lay a finger on the tumour itself at any time. Once it was free, she lifted it away with clamps attached to the surrounding tissue, as fastidiously as if she was removing a leaky bag full of some fatal poison. Maybe other tumours were already growing unseen in other parts of the body, but doing the best possible job, here and now, might still add three or four years to this man's life.

Masika began stitching the severed ends of the intestine together. Collins led me aside and showed me the patient's X-rays on a light-box. "This is the site of origin." There was a cavity clearly visible in the right lung, about half the size of the tumour she'd just removed. Ordinary cancers grew in a single location first, and then a few mutant cells in the primary tumour escaped to seed growths in the rest of the body. With Yeyuka, there were no "primary tumours"; the virus itself uprooted the cells it infected, breaking down the normal molecular adhesives that kept them in place, until the infected organ seemed to be melting away. That was the origin of the name: *yeyuka*, to melt. Once set loose into the bloodstream, many of the cells died of natural causes, but a few ended up lodged in small capillaries—physically trapped, despite their lack of stickiness—where they could remain undisturbed long enough to grow into sizable tumours.

After the operation, I was invited out to a welcoming dinner in a restaurant down in the city. The place specialised in Italian food, which was apparently hugely popular, at least in Kampala. Iganga, Collins and Okwera, old colleagues by now, unwound noisily; Okwera, a solid man in his forties, grew mildly but volubly intoxicated and told medical horror stories from his time in the army. Masika, the trainee surgeon, was very softly spoken and reserved. I was something of a zombie from jet lag myself, and didn't contribute much to the conversation, but the warm reception put me at ease.

I still felt like an impostor, here only because I hadn't had the courage to back out, but no one was going to interrogate me about my motives. No one cared. It wouldn't make the slightest difference whether I'd volunteered out of genuine compassion, or just a kind of moral insecurity brought on by fears of obsolescence. Either way, I'd brought a pair of hands and enough general surgical experience to be useful. If you'd ever had to be a saint to heal someone, medicine would have been doomed from the start.

I was nervous as I cut into my first Yeyuka patient, but by the end of the operation, with a growth the size of an orange successfully removed from the right lung, I felt much more confident. Later the same day, I was introduced to some of the hospital's permanent surgical staff—a reminder that even when Collins left, I'd hardly be working in isolation. I fell asleep on the second night exhausted, but reassured. I could do this, it wasn't beyond me. I hadn't set myself an impossible task.

I drank too much at the farewell dinner for Collins, but the HealthGuard magicked the effects away. My first day solo was anticlimactic; everything went smoothly, and Okwera, with no high-tech hangover cure, was unusually subdued, while Masika was as quietly attentive as ever.

Six days a week, the world shrank to my room, the campus, the ward, the operating theatre. I ate in the guest house, and usually fell asleep an hour or two after the evening meal; with the sun diving straight below the horizon, by eight o'clock it felt like midnight. I tried to call Lisa every night, though I often finished in the theatre too late to catch her before she left for work, and I hated leaving messages, or talking to her while she was driving.

Okwera and his wife invited me to lunch the first Sunday, Masika and his girlfriend the next. Both couples were genuinely hospitable, but I felt like I was intruding on their one day together. The third Sunday, I met up with Iganga in a restaurant, then we wandered through the city on an impromptu tour.

There were some beautiful buildings in Kampala, many of them clearly war-scarred but lovingly repaired. I tried to relax and take in the sights, but I kept thinking of the routine—six operations, six days a week—stretching out ahead of me until the end of my stay. When I mentioned this to Iganga, she laughed. “All right. You want something more than assembly-line work? I’ll line up a trip to Mubende for you. They have patients there who are too sick to be moved. Multiple tumours, all nearly terminal.”

“Okay.” Me and my big mouth; I knew I hadn’t been seeing the worst cases, but I hadn’t given much thought to where they all were.

We were standing outside the Sikh temple, beside a plaque describing Idi Amin’s expulsion of Uganda’s Asian community in 1972. Kampala was dotted with memorials to atrocities—and though Amin’s reign had ended more than forty years ago, it had been a long path back to normality. It seemed unjust beyond belief that even now, in an era of relative political stability, so many lives were being ruined by Yeyuka. No more refugees marching across the countryside, no more forced expulsions—but cells cast adrift could bring just as much suffering.

I asked Iganga, “So why did you go into medicine?”

“Family expectations. It was either that or the law. Medicine seemed less arbitrary; nothing in the body can be overturned by an appeal to the High Court. What about you?”

I said, “I wanted to be in on the revolution. The one that was going to banish all disease.”

“Ah, that one.”

“I picked the wrong job, of course. I should have been a molecular biologist.”

“Or a software engineer.”

“Yeah. If I’d seen the HealthGuard coming fifteen years ago, I might have been right at the heart of the changes. And I’d have never looked back. Let alone sideways.”

Iganga nodded sympathetically, quite unfazed by the notion that molecular technology might capture the attention so thoroughly that little things like Yeyuka epidemics would vanish from sight altogether. “I can imagine. Seven years ago, I was all set to make my fortune in one of the private clinics in Dar es Salaam. Rich businessmen with prostate cancer, that kind of thing. I was lucky in a way; before that market vanished completely, the Yeyuka fanatics were nagging me, bullying me, making little deals.” She laughed. “I’ve lost count of the number of times I was promised I’d be co-author of a ground breaking paper in *Nature Oncology* if I just helped out at some field clinic in the middle of nowhere. I was dragged into this, kicking and screaming, just when all my old dreams were going up in smoke.”

“But now Yeyuka feels like your true vocation?”

She rolled her eyes. “Spare me. My ambition now is to retire to a highly paid consulting position in Nairobi or Geneva.”

“I’m not sure I believe you.”

“You should.” She shrugged. “Sure, what I’m doing now is a hundred times more useful than any desk job, but that doesn’t make it any easier. You know as well as I do that the warm inner glow doesn’t last for a thousand patients; if you fought for every one of them as if they were your own family or friends, you’d go insane ... so they become a series of clinical problems, which just happen to be wrapped in human flesh. And it’s a struggle to keep working on the same problems, over and over, even if you’re convinced that it’s the most worthwhile job in the world.”

“So why are you in Kampala right now, instead of Nairobi or Geneva?”

Iganga smiled. “Don’t worry, I’m working on it. I don’t have a date on my ticket out of here, like you do, but when the chance comes, believe me, I’ll grab it just as fast as I can.”

It wasn’t until my sixth week, and my two-hundred-and-fourth operation, that I finally screwed up.

The patient was a teenaged girl with multiple infestations of colon cells in her liver. A substantial portion of the organ’s left lobe would have to be removed, but her prognosis seemed relatively good; the right lobe appeared to be completely clean, and it was not beyond hope that the liver, directly downstream from the colon, had filtered all the infected cells from the blood before they could reach any other part of the body.

Trying to clamp the left branch of the portal vein, I slipped, and the clamp closed tightly on a swollen cyst at the base of the liver, full of grey-white colon cells. It didn’t burst open, but it might have been better if it had; I couldn’t literally see where the contents was squirted, but I could imagine the route very clearly: back as far as the Y-junction of the vein, where the blood flow would carry cancerous cells into the previously unaffected right lobe.

I swore for ten seconds, enraged by my own helplessness. I had none of the emergency tools I was used to: there was no drug I could inject to kill off the spilt cells while they were still more vulnerable than an established tumour, no vaccine on hand to stimulate the immune system into attacking them.

Okwera said, “Tell the parents you found evidence of leakage, so she’ll need to have regular follow-up examinations.”

I glanced at Masika, but he was silent.

“I can’t do that.”

“You don’t want to cause trouble.”

“It was an accident!”

“Don’t tell her, and don’t tell her family.” Okwera regarded me sternly, as if I was contemplating something both dangerous and self-indulgent. “It won’t help anyone if you dive into the shit for this. Not her, not you. Not the hospital. Not the volunteer program.”

The girl’s mother spoke English. I told her there were signs that the cancer might have spread. She wept, and thanked me for my good work.

Masika didn’t say a word about the incident, but by the end of the day I could hardly bear to look at him. When Okwera departed, leaving the two of us alone in the locker room, I said, “In three or four years there’ll be a vaccine. Or even HealthGuard software. It won’t be like this forever.”

He shrugged, embarrassed. “Sure.”

“I’ll raise funds for the research when I get home. Champagne dinners with slides of photogenic patients, if that’s what it takes.” I knew I was making a fool of myself, but I couldn’t shut up. “This isn’t the nineteenth century. We’re not helpless anymore. Anything can be cured, once you understand

it.”

Masika eyed me dubiously, as if he was trying to decide whether or not to tell me to save my platitudes for the champagne dinners. Then he said, “We do understand Yeyuka. We have HealthGuard software written for it, ready and waiting to go. But we can’t run it on the machine here. So we don’t need funds for research. What we need is another machine.”

I was speechless for several seconds, trying to make sense of this extraordinary claim. “The hospital’s machine is broken—?”

Masika shook his head. “The software is unlicensed. If we used it on the hospital’s machine, our agreement with HealthGuard would be void. We’d lose the use of the machine entirely.”

I could hardly believe that the necessary research had been completed without a single publication, but I couldn’t believe Masika would lie about it either. “How long can it take HealthGuard to approve the software? When was it submitted to them?”

Masika was beginning to look like he wished he’d kept his mouth shut, but there was no going back now. He admitted warily, “It hasn’t been submitted to them. It can’t be—that’s the whole problem. We need a bootleg machine, a decommissioned model with the satellite link disabled, so we can run the Yeyuka software without their knowledge.”

“Why? Why can’t they find out about it?”

He hesitated. “I don’t know if I can tell you that.”

“Is it illegal? Stolen?” But if it was stolen, why hadn’t the rightful owners licensed the damned thing, so people could use it?

Masika replied icily, “Stolen *back*. The only part you could call ‘stolen’ was stolen back.” He looked away for a moment, actually struggling for control. Then he said, “Are you sure you want to know the whole story?”

“Yes.”

“Then I’ll have to make a phone call.”

Masika took me to what looked like a boarding house, student accommodation in one of the suburbs close to the campus. He walked briskly, giving me no time to ask questions, or even orient myself in the darkness. I had a feeling he would have liked to have blindfolded me, but it would hardly have made a difference; by the time we arrived I couldn’t have said where we were to the nearest kilometre.

A young woman, maybe nineteen or twenty, opened the door. Masika didn’t introduce us, but I assumed she was the person he’d phoned from the hospital, since she was clearly expecting us. She led us to a ground floor room; someone was playing music upstairs, but there was no one else in sight.

In the room, there was a desk with an old-style keyboard and computer monitor, and an extraordinary device standing on the floor beside it: a rack of electronics the size of a chest of drawers, full of exposed circuit boards, all cooled by a fan half a metre wide.

“What is that?”

The woman grinned. “We modestly call it the Makerere supercomputer. Five hundred and twelve processors, working in parallel. Total cost, fifty thousand shillings.”

That was about fifty dollars. “How—?”

“Recycling. Twenty or thirty years ago, the computer industry ran an elaborate scam: software companies wrote deliberately inefficient programs, to make people buy newer, faster computers all

the time—then they made sure that the faster computers needed brand new software to work at all. People threw out perfectly good machines every three or four years, and though some ended up as landfill, millions were saved. There's been a worldwide market in discarded processors for years, and the slowest now cost about as much as buttons. But all it takes to get some real power out of them is a little ingenuity.”

I stared at the wonderful contraption. “And you wrote the Yeyuka software on this?”

“Absolutely.” She smiled proudly. “First, the software characterises any damaged surface adhesion molecules it finds—there are always a few floating freely in the bloodstream, and their exact shape depends on the strain of Yeyuka, and the particular cells that have been infected. Then drugs are tailor-made to lock on to those damaged adhesion molecules, and kill the infected cells by rupturing their membranes.” As she spoke, she typed on the keyboard, summoning up animations to illustrate each stage of the process. “If we can get this onto a real machine ... we'll be able to cure three people a day.”

Cure. Not just cut them open to delay the inevitable.

“But where did all the raw data come from? The RNA sequencing, the X-ray diffraction studies...?”

The woman's smile vanished. “An insider at HealthGuard found it in the company archives, and sent it to us over the net.”

“I don't understand. When did HealthGuard do Yeyuka studies? Why haven't they published them? Why haven't they written software themselves?”

She glanced uncertainly at Masika. He said, “HealthGuard's parent company collected blood from five thousand people in Southern Uganda in 2013. Supposedly to follow up on the effectiveness of their HIV vaccine. What they actually wanted, though, was a large sample of metastasising cells so they could perfect the biggest selling point of the HealthGuard: cancer protection. Yeyuka offered them the cheapest, simplest way to get the data they needed.”

I'd been half expecting something like this since Masika's comments back in the hospital, but I was still shaken. To collect the data dishonestly was bad enough, but to bury information that was half-way to a cure—just to save paying for what they'd taken—was unspeakable.

I said, “Sue the bastards! Get everyone who had samples taken together for a class action: royalties plus punitive damages. You'll raise hundreds of millions of dollars. Then you can buy as many machines as you want.”

The woman laughed bitterly. “We have no proof. The files were sent anonymously, there's no way to authenticate their origin. And can you imagine how much HealthGuard would spend on their defence? We can't afford to waste the next twenty years in a legal battle, just for the satisfaction of shouting the truth from the rooftops. The only way we can be sure of making use of this software is to get a bootleg machine, and do everything in silence.”

I stared at the screen, at the cure being played out in simulation that should have been happening three times a day in Mulago hospital. She was right, though. However hard it was to stomach, taking on HealthGuard directly would be futile.

Walking back across the campus with Masika, I kept thinking of the girl with the liver infestation, and the possibility of undoing the moment of clumsiness that would otherwise almost certainly kill her. I said, “Maybe I can get hold of a bootleg machine in Shanghai. If I knew where to ask, where to look.” They'd certainly be expensive, but they'd have to be much cheaper than a commissioned

model, running without the usual software and support.

My hand moved almost unconsciously to check the metal pulse on my index finger. I held the ring up in the starlight. "I'd give you this, if it was mine to give. But that's thirty years away." Masika didn't reply, too polite to suggest that if I'd owned the ring outright, I wouldn't even have raised the possibility.

We reached the University Hall; I could find my way back to the guest house now. But I couldn't leave it at that; I couldn't face another six weeks of surgery unless I knew that something was going to come of the night's revelations. I said, "Look, I don't have connections to any black market, I don't have a clue how to go about getting a machine. But if you can find out what I have to do, and it's within my power ... I'll do it."

Masika smiled, and nodded thanks, but I could tell that he didn't believe me. I wondered how many other people had made promises like this, then vanished back into the world-without-disease while the Yeyuka wards kept overflowing.

As he turned to go, I put a hand on his shoulder to stop him. "I mean it. Whatever it takes, I'll do it."

He met my eyes in the dark, trying to judge something deeper than this easy protestation of sincerity. I felt a sudden flicker of shame; I'd completely forgotten that I was an impostor, that I'd never really meant to come here, that two months ago a few words from Lisa would have seen me throw away my ticket, gratefully.

Masika said quietly, "Then I'm sorry that I doubted you. And I'll take you at your word."

Mubende was a district capital, half a day's drive west of Kampala. Iganga delayed our promised trip to the Yeyuka clinic there until my last fortnight, and once I arrived I could understand why. It was everything I'd feared: starved of funds, under-staffed and over-crowded. Patients' relatives were required to provide and wash the bedclothes, and half of them also seemed to be bringing in painkillers and other drugs bought at the local markets—some genuine, some ripoffs full of nothing but glucose or magnesium sulphate.

Most of the patients had four or five separate tumours. I treated two people a day, with operations lasting six to eight hours. In ten days, seven people died in front of me; dozens more died in the wards, waiting for surgery.

Or waiting for something better.

I shared a crowded room at the back of the clinic with Masika and Okwera, but even on the rare occasions when I caught Masika alone, he seemed reluctant to discuss the details of getting hold of a bootleg HealthGuard. He said, "Right now, the less you know the better. When the time comes, I'll fill you in."

The ordeal of the patients was overwhelming, but I felt more for the clinic's sole doctor and two nurses; for them, it never ended. The morning we packed our equipment into the truck and headed back for Kampala, I felt like a deserter from some stupid, pointless war: guilty about the colleagues I was leaving behind, but almost euphoric with relief to be out of it myself. I knew I couldn't have stayed on here—or even in Kampala—month after month, year after year. However much I wished that I could have been that strong, I understood now that I wasn't.

There was a brief, loud stuttering sound, then the truck squealed to a halt. The four of us were all

in the back, guarding the equipment against potholes, with the tarpaulin above us blocking everything but a narrow rear view. I glanced at the others; someone outside shouted in Luganda at Akena Ibingira, the driver, and he started shouting back.

Okwera said, "Bandits."

I felt my heart racing. "You're kidding?"

There was another burst of gunfire. I heard Ibingira jump out of the cab, still muttering angrily.

Everyone was looking at Okwera for advice. He said, "Just cooperate, give them what they want." I tried to read his face; he seemed grim but not desperate—he expected unpleasantness, but not a massacre. Iganga was sitting on the bench beside me; I reached for her hand almost without thinking. We were both trembling. She squeezed my fingers for a moment, then pulled free.

Two tall, smiling men in dirty brown camouflage appeared at the back of the truck, gesturing with automatic weapons for us to climb out. Okwera went first, but Masika, who'd been sitting beside him, hung back. Iganga was nearer to the exit than me, but I tried to get past her; I had some half-baked idea that this would somehow lessen her risk of being taken off and raped. When one of the bandits blocked my way and waved her forward, I thought this fear had been confirmed.

Masika grabbed my arm, and when I tried to break free, he tightened his grip and pulled me back into the truck. I turned on him angrily, but before I could say a word he whispered, "She'll be all right. Just tell me: do you want them to take the ring?"

"What?"

He glanced nervously towards the exit, but the bandits had moved Okwera and Iganga out of sight. "I've paid them to do this. It's the only way. But say the word now and I'll give them the signal, and they won't touch the ring."

I stared at him, waves of numbness sweeping over my skin as I realised exactly what he was saying.

"You could have taken it off under anaesthetic."

He shook his head impatiently. "It's sending data back to HealthGuard all the time: cortisol, adrenaline, endorphins, prostaglandins. They'll have a record of your stress levels, fear, pain ... if we took it off under anaesthetic, they'd *know* you'd given it away freely. This way, it'll look like a random theft. And your insurance company will give you a new one."

His logic was impeccable; I had no reply. I might have started protesting about insurance fraud, but that was all in the future, a separate matter entirely. The choice, here and now, was whether or not I let him have the ring by the only method that wouldn't raise suspicion.

One of the bandits was back, looking impatient. Masika asked plainly, "Do I call it off? I need an answer." I turned to him, on the verge of ranting that he'd wilfully misunderstood me, abused my generous offer to help him, and put all our lives in danger.

It would have been so much bullshit, though. He hadn't misunderstood me. All he'd done was taken me at my word.

I said, "Don't call it off."

The bandits lined us up beside the truck, and had us empty our pockets into a sack. Then they started taking watches and jewellery. Okwera couldn't get his wedding ring off, but stood motionless and scowling while one of the bandits applied more force. I wondered if I'd need a prosthesis, if I'd still be able to do surgery, but as the bandit approached me I felt a strange rush of confidence.

I held out my hand and looked up into the sky. I knew that anything could be healed, once it was

understood.

ONLY CONNECT

It's beginning to look as if E.M. Forster's famous dictum was superfluous. A theory in which the building blocks of the universe are mathematical structures, known as graphs, which do nothing *but* connect, has just passed its first experimental test.

A graph can be drawn as a set of points, called nodes, and a set of lines joining the nodes, called edges. Details such as the length and shape of the edges aren't part of the graph itself, though; the only thing that distinguishes one graph from another are the connections between the nodes. The number of edges that meet at any given node is known as its valence.

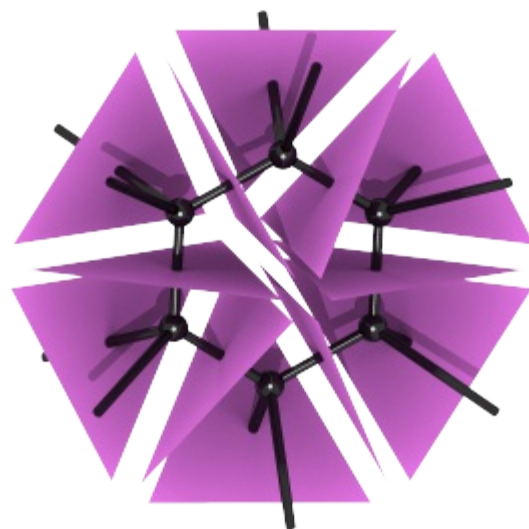
In Quantum Graph Theory, or QGT, a quantum state describing both the geometry of space and all the matter fields present is built up from combinations of graphs. The theory reached its current form in the work of the Javanese mathematician Kusnanto Sarumpaet, who published a series of six papers from 2035 to 2038 showing that both General Relativity and the Standard Model of particle physics could be seen as approximations to QGT.

Sarumpaet's graphs have a fascinating lineage, dating back to Michael Faraday's notion of "lines of force" running between electric charges, and William Thomson's theory of atoms as knotted "vortex tubes". Closer ancestors are Roger Penrose's spin networks, trivalent graphs with each edge labelled by a half integer, corresponding to a possible value of the spin of a quantum particle. Penrose invented these networks in the early 1970s, and showed that the set of all directions in space could be generated from simple, combinatorial principles by imagining an exchange of spin between two parts of a large network.

Generalisations of spin networks later appeared in certain kinds of Quantum Field Theory. Just as a wave function assigns an amplitude to every possible position of a particle, a spin network embedded in a region of space can be used to assign an amplitude to every possible configuration of a field. The quantum states defined in this way consist of lines of flux running along the edges of the network.

In the 1990s, Lee Smolin and Carlo Rovelli discovered an analogous result in quantum gravity, where spin network states have a simple geometric interpretation: the area of any surface depends entirely on the edges of the network that intersect it. These edges can be thought of as quantised "flux lines of area", and in quantum gravity area and other geometric measurements take on a discrete spectrum of possible values. It then makes sense to quantise the topology as well, with the nodes and edges of the network replacing the usual idea of space as a continuum of points.

In the first decades of the new millennium, John Baez, Fotini Markopoulou, José-Antonio Zapata and others did ground-breaking work on the possible dynamical laws for spin networks, assigning quantum amplitudes to the process of one network evolving into another. In the 2030s, Sarumpaet began to synthesise these results into a new model, based on graphs of arbitrary valence with unlabelled edges.



The geometry of three-dimensional space arises from tetravalent graphs, with the four edges emerging from each node giving area to the faces of a “quantum tetrahedron”. Allowing graphs of higher valence runs the risk of producing an explosion of unwanted dimensions, but Sarumpaet found a simple dynamical law which always leads to the average valence stabilising at four. However, trivalent and pentavalent nodes—which have come to be known as “dopant” nodes, in analogy with the impurities added to semiconductors—can persist under the Sarumpaet rules if they’re arranged in special patterns: closed, possibly knotted chains of alternating valence. These loops of dopant nodes, classified by their symmetries and mutual interactions, match up perfectly with the particles of the Standard Model.

Since the area associated with the edges of a quantum graph is of the order of a few square Planck lengths, some 10^{50} times smaller than the surface area of a hydrogen atom, it was once feared that QGT would remain untestable for centuries. However, in 2043 computer simulations identified a new class of “polymer states”: long, open chains of dopant nodes that were predicted to have energies and half-lives within the grasp of current technology to create and detect.

A search for polymer states that commenced at the Orbital Accelerator Facility in 2049 has now yielded its first success. If the result can be repeated, Sarumpaet’s graphs will shift rapidly from being merely the most elegant known description of the universe, to the most likely one.