

# PROLOGUE

*(Rip, tie, cut toy man)*

*June 2045*

Paul Durham opened his eyes, blinking at the room's unexpected brightness, then lazily reached out to place one hand in a patch of sunlight at the edge of the bed. Dust motes drifted across the shaft of light which slanted down from a gap between the curtains, each speck appearing for all the world to be conjured into, and out of, existence – evoking a childhood memory of the last time he'd found this illusion so compelling, so hypnotic: *He stood in the kitchen doorway, afternoon light slicing the room; dust, flour, and steam swirling in the plane of bright air.* For one sleep-addled moment, still trying to wake, to collect himself, to order his life, it seemed to make as much sense to place these two fragments side-by-side – watching sunlit dust motes, forty years apart – as it did to follow the ordinary flow of time from one instant to the next. Then he woke a little more, and the confusion passed.

Paul felt utterly refreshed – and utterly disinclined to give up his present state of comfort. He couldn't think why he'd slept so late, but he didn't much care. He spread his fingers on the sun-warmed sheet, and thought about drifting back to sleep.

He closed his eyes and let his mind grow blank – and then caught himself, suddenly uneasy, without knowing why. *He'd done something foolish, something insane, something he was going to regret, badly ...* but the details remained elusive, and he began to suspect that it was nothing more than the lingering mood of a dream. He tried to recall exactly what he'd dreamed, without much hope; unless he was catapulted awake by a nightmare, his dreams were usually evanescent. And yet—

He leaped out of bed and crouched down on the carpet, fists to his eyes, face against his knees, lips moving soundlessly. The shock of realization was a palpable thing: a red lesion behind his 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: *He held a nail to the wood, yes – but only to camouflage his true intentions. He'd seen his father injure himself this way – but he knew that he needed firsthand experience to understand the mystery of pain. And he was sure that it would be worth it, right up to the moment when he swung the hammer down—*

He rocked back and forth, on the verge of laughter, trying to keep his mind blank, waiting for the panic to subside. And eventually, it did – to be replaced by one simple, perfectly coherent thought: *I don't want to be here.*

What he'd done to himself was insane – and it had to be undone, as swiftly and painlessly as possible. *How could he have ever imagined reaching any other conclusion?*

Then he began to remember the details of his preparations. He'd anticipated feeling this way. He'd planned for it. However bad he felt, it was all part of the expected progression of responses: Panic. Regret. Analysis. Acceptance.

Two out of four; so far, so good.

Paul uncovered his eyes, and looked around the room. Away from a few dazzling patches of direct sunshine, everything glowed softly in the diffuse light: the matte white brick walls, the imitation (imitation) mahogany furniture; even the posters – Bosch, Dali, Ernst, and Giger – looked harmless, domesticated. Wherever he turned his gaze (if nowhere else), the simulation was utterly convincing; the spotlight of his attention made it so. Hypothetical light rays were being traced backward from individual rod and cone cells on his simulated retinas, and projected out into the virtual environment to determine exactly what needed to be computed: a lot of detail near the center of his vision, much less toward the periphery. Objects out of sight didn't "vanish" entirely, if they influenced the ambient light, but Paul knew that the calculations would rarely be pursued beyond the crudest first-order approximations: Bosch's *Garden of Earthly Delights* reduced to an average reflectance value, a single gray rectangle – because once his back was turned, any more detail would have been wasted. Everything in the room was as finely resolved, at any given moment, as it needed to be to fool him – no more, no less.

He had been aware of the technique for decades. It was something else to experience it. He resisted the urge to wheel around suddenly, in a futile attempt to catch the process out – but for a moment it was almost unbearable, just *knowing* what was happening at the edge of his vision. The fact that his view of the room remained flawless only made it worse, an irrefutable paranoid fixation: *No matter how fast you turn your head, you'll never even catch a glimpse of what's going on all around you...*

He closed his eyes again for a few seconds. When he opened them, the feeling was already less oppressive. No doubt it would pass; it seemed too bizarre a state of mind to be sustained for long. Certainly, none of the other Copies had reported anything similar ... but then, none of them had volunteered much useful data at all. They'd just ranted abuse, whined about their plight, and then terminated themselves – all within fifteen (subjective) minutes of gaining consciousness.

*And this one?* How was he different from Copy number four? Three years older. *More stubborn? More determined? More desperate for success?* He'd believed so. If he hadn't felt more committed than ever – if he hadn't been convinced that he was, finally, prepared to see the whole thing through – he would never have gone ahead with the scan.

But now that he was “no longer” the flesh-and-blood Paul Durham – “no longer” the one who'd sit outside and watch the whole experiment from a safe distance – all of that determination seemed to have evaporated.

Suddenly he wondered: *What makes me so sure that I'm not still flesh-and-blood?* He laughed weakly, hardly daring to take the possibility seriously. His most recent memories seemed to be of lying on a trolley in the Landau Clinic, while technicians prepared him for the scan – on the face of it, a bad sign – but he'd been overwrought, and he'd spent so long psyching himself up for “this”, that perhaps he'd forgotten coming home, still hazy from the anesthetic, crashing into bed, dreaming...

He muttered the password, “Abulafia” – and his last faint hope vanished, as a black-on-white square about a meter wide, covered in icons, appeared in midair in front of him.

He gave the interface window an angry thump; it resisted him as if it was solid, and firmly anchored. *As if he was solid, too.* He didn't really need any more convincing, but he gripped the top edge and lifted himself off the floor. He instantly regretted this; the realistic cluster of effects of exertion – down to the plausible twinge in his right elbow – pinned him to this “body”, anchored him to this “place”, in exactly the way he knew he should be doing everything he could to avoid.

He lowered himself to the floor with a grunt. *He was the Copy.* Whatever his inherited memories told him, he was “no longer” human; he would never inhabit his real body “again.” Never inhabit *the real world* again ... unless his cheapskate original scraped up the money for a telepresence robot – in which case he could spend his time blundering around in a daze, trying to make sense of the lightning-fast blur of human activity. *His model-of-a-brain ran seventeen times slower than the real thing.* Yeah, sure, if he hung around, the technology would catch up, eventually – and seventeen times faster for him than for his original. And in the meantime? He'd rot in this prison, jumping through hoops, carrying out Durham's precious research – while the man lived in his apartment, spent his money, slept with Elizabeth...

Paul leaned against the cool surface of the interface, dizzy and confused. *Whose precious research?* He'd wanted this so badly – and he'd done this to himself with his eyes wide open. Nobody had forced him, nobody had deceived him. He'd known exactly what the drawbacks would be – but he'd hoped that he would have the strength of will (this time, at last) to transcend them: to devote himself, monk-like, to the purpose for which he'd been brought into being – content in the knowledge that his other self was as unconstrained as ever.

Looking back, that hope seemed ludicrous. Yes, he'd made the decision freely – for the fifth time – but it was mercilessly clear, now, that he'd never really faced up to the consequences. All the time he'd spent, supposedly “preparing himself” to be a Copy, his greatest source of resolve had been to focus on the outlook for the man who'd remain flesh-and-blood. He'd told himself that he was rehearsing “making do with vicarious freedom” – and no doubt he had been genuinely struggling to do just that ... but he'd also been taking secret comfort in the knowledge that *he* would “remain” on the outside – that his future, then, still included a version with absolutely nothing to fear.

And as long as he'd clung to that happy truth, he'd never really swallowed the fate of the Copy at all.

People reacted badly to waking up as Copies. Paul knew the statistics. Ninety-eight per cent of Copies made were of the very old, and the terminally ill. People for whom it was the last resort – most of whom had spent millions beforehand, exhausting all the traditional medical options; some of whom had even died between the taking of the scan and the time the Copy itself was run. Despite this, fifteen per cent decided on awakening – usually in a matter of hours – that they couldn't face living this way.

And of those who were young and healthy, those who were merely curious, those who knew they had a perfectly viable, living, breathing body outside?

The bail-out rate so far had been one hundred per cent.

Paul stood in the middle of the room, swearing softly for several minutes, acutely aware of the passage of time. He didn't feel ready – but the longer the other Copies had waited, the more traumatic they seemed to have found the decision. He stared at the floating interface; its dreamlike, hallucinatory quality helped, slightly. He rarely remembered his dreams, and he wouldn't remember this one – but there was no tragedy in that.

He suddenly realized that he was still stark naked. Habit – if no conceivable propriety – nagged at him to put on some clothes, but he resisted the urge. One or two perfectly innocent, perfectly ordinary actions like that, and he'd find he was taking himself seriously, thinking of himself as real, making it even harder...

He paced the bedroom, grasped the cool metal of the doorknob a couple of times, but managed to keep himself from turning it. There was no point even starting to explore this world.

He couldn't resist peeking out the window, though. The view of north Sydney was flawless; every building, every cyclist, every tree, was utterly convincing – but that was no great feat; it was a recording, not a simulation. Essentially photographic – give or take some computerized touching up and filling in – and totally predetermined. To cut costs even further, only a tiny part of it was “physically”

accessible to him; he could see the harbor in the distance, but he knew that if he tried to go for a stroll down to the water's edge...

*Enough. Just get it over with.*

Paul turned back to the interface and touched a menu icon labeled UTILITIES; it spawned another window in front of the first. The function he was seeking was buried several menus deep – but he knew exactly where to look for it. He'd watched this, from the outside, too many times to have forgotten.

He finally reached the EMERGENCIES menu – which included a cheerful icon of a cartoon figure suspended from a parachute. *Bailing out* was what everyone called it – but he didn't find that too cloyingly euphemistic; after all, he could hardly commit "suicide" when he wasn't legally human. The fact that a bail-out option was compulsory had nothing to do with anything so troublesome as the "rights" of the Copy; the requirement arose solely from the ratification of certain, purely technical, international software standards.

Paul prodded the icon; it came to life, and recited a warning spiel. He scarcely paid attention. Then it said, "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, appeared at his feet. He opened it, took out the parachute, strapped it on.

Then he closed his eyes and said, "Listen to me. *Just listen!* 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. It doesn't matter how I feel. 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?"

Paul hesitated, trying to put himself in the place of his original, hearing those words – and almost wept with frustration. He still didn't know what he could say that would make a difference. He'd shrugged off the testimony of all the earlier Copies, himself; he'd never been able to accept their claims to know his own mind

better than he did. Just because they'd lost their nerve and chosen to bail out, who were they to proclaim that he'd *never* give rise to a Copy who'd choose otherwise? All he had to do was strengthen his resolve, and try again...

He shook his head. "It's been ten years, and nothing's changed. *What's wrong with you?* Do you honestly still believe that you're brave enough – or crazy enough – to be your own guinea pig? *Do you?*"

He paused again, but only for a moment; he didn't expect a reply. He'd argued long and hard with the first Copy, but after that, he'd never had the stomach for it.

"Well, I've got news for you: *You're not.*"

With his eyes still closed, he gripped the release lever.

*I'm nothing: a dream, a soon-to-be-forgotten dream.*

His fingernails needed cutting; they dug painfully into the skin of his palm.

Had he never, in a dream, feared the extinction of waking? Maybe he had – but a dream was not a life. If the only way he could "reclaim" his body, "reclaim" his world, was to wake and forget—

He pulled the lever.

After a few seconds, he emitted a constricted sob – a sound more of confusion than any kind of emotion – and opened his eyes.

The lever had come away in his hand.

He stared dumbly at this metaphor for ... what? A bug in the termination software? Some kind of hardware glitch?

Feeling – at last – truly dreamlike, he unstrapped the parachute, and unfastened the neatly packaged bundle.

Inside, there was 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 had been poisoned with ambivalence.*

*With hindsight, I realized 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*

He sank to his knees, still holding the note, staring at it with disbelief. *I can't have done this. I can't have been so callous.*

No?

He could never have done it to anyone else. He was sure of that. He wasn't a monster, a torturer, a sadist.

And he would never have gone ahead, himself, without the bail-out option as a last resort. Between his ludicrous fantasies of stoicism, and the sanity-preserving cop-out of relating only to the flesh-and-blood version, he must have had moments of clarity when the bottom line had been: *If it's that bad, I can always put an end to it.*

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 ... and rationalizing this *hijacking* as nothing more than an over-literal act of self-control...



It rang so true that he hung his head in shame.

Then he dropped the note, raised his head, and bellowed with all the strength in his non-existent lungs:

“DURHAM! YOU *PRICK!*”

#

Paul thought about smashing furniture. Instead, he took a long, hot shower. In part, to calm himself; in part, as an act of petty vengeance: twenty virtual minutes of gratuitous hydrodynamic calculations would annoy the cheapskate no end. He scrutinized the droplets and rivulets of water on his skin, searching for some small but visible anomaly at the boundary between his body – computed down to subcellular resolution – and the rest of the simulation, which was modeled much more crudely. If there were any discrepancies, though, they were too subtle to detect.

He dressed, and ate a late breakfast, shrugging off the surrender to normality. *What was he meant to do? Go on a hunger strike? Walk around naked, smeared in excrement?* He was ravenous, having fasted before the scan, and the kitchen was stocked with a – literally – inexhaustible supply of provisions. The muesli tasted exactly like muesli, the toast exactly like toast, but he knew there was a certain amount of cheating going on with both taste and aroma. The detailed effects of chewing, and the actions of saliva, were being faked from a patchwork of empirical rules, not generated from first principles; there *were 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 would 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 would act as input data to the models of his intestinal villus cells. From there, into the bloodstream.

Urine and feces production were optional – some Copies wished to retain every possible aspect of corporeal life – but Paul had chosen to do without. (So much for smearing himself in excrement.) His bodily wastes would be magicked out of existence long before reaching bladder or bowel. Ignored out of existence; passively

even as the inevitable backlash began. Paul was a child of the millennium; he was ready to embrace it all.

But the more time he spent contemplating what Vines had done, the more bizarre the implications seemed to be.

The public debate the experiment had triggered was heated, but depressingly superficial. Decades-old arguments raged again, over just how much computer programs could ever have in common with human beings (psychologically, morally, metaphysically, information-theoretically ...) and even whether or not Copies could be “truly” intelligent, “truly” conscious. As more workers repeated Vines’ result, their Copies soon passed the Turing test: no panel of experts quizzing a group of Copies and humans – by delayed video, to mask the time-rate difference – could tell which were which. But some philosophers and psychologists continued to insist that this demonstrated nothing more than “simulated consciousness”, and that Copies were merely programs capable of faking a detailed inner life which didn’t actually exist at all.

Supporters of the Strong AI Hypothesis insisted that consciousness was a property of certain algorithms – a result of information being processed in certain ways, regardless of what machine, or organ, was used to perform the task. A computer model which manipulated data about itself and its “surroundings” in essentially the same way as an organic brain would have to possess essentially the same mental states. “Simulated consciousness” was as oxymoronic as “simulated addition.”

Opponents replied that when you modeled a hurricane, nobody got wet. When you modeled a fusion power plant, no energy was produced. When you modeled digestion and metabolism, no nutrients were consumed – no *real digestion* took place. So, when you modeled the human brain, why should you expect *real thought* to occur? A computer running a Copy might be able to generate plausible descriptions of human behavior in hypothetical scenarios – and even appear to carry on a conversation, by correctly predicting what a human *would have done* in the same situation – but that hardly made the machine itself conscious.

Paul had rapidly decided that this whole debate was a distraction. For any human, absolute proof of a Copy’s sentience was impossible. For any Copy, the truth was self-evident: *cogito ergo sum*. End of discussion.

But for any human willing to grant Copies the same reasonable presumption of consciousness that they granted their fellow humans – and any Copy willing to reciprocate – the real point was this:

There were questions about the nature of this shared condition which the existence of Copies illuminated more starkly than anything which had come before them. Questions which needed to be explored, before the human race could confidently begin to bequeath its culture, its memories, its purpose and identity, to its successors.

Questions which only a Copy could answer.

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Paul sat in his study, in his favorite armchair (unconvinced that the texture of the surface had been accurately reproduced), taking what comfort he could from the undeniable absurdity of being afraid to experiment on himself, further. He'd already "survived" the "transition" from flesh-and-blood human to computerized physiological model – the most radical stage of the project, by far. In comparison, tinkering with a few of the model's parameters should have seemed trivial.

Durham appeared on the terminal – which was otherwise still dysfunctional. Paul was 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. The pitch of his voice was enough to deflate any aura of power and grandeur.

*Squeak.* "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 think I can manage that." He'd planned all this himself, he didn't need step-by-step instructions. Durham's image vanished; during the experiments, there could be no cues from real time.

Paul counted to ten. The *djinn* returned. Staring at the face on the screen, Paul realized that he had no inclination to think of it as "his own." Perhaps that was a legacy of distancing himself from the earlier Copies. Or perhaps his mental image of himself had never been much like his true appearance – and now, in defense of sanity, was moving even further away.

*Squeak.* “Okay. Experiment one, trial number one. Time resolution five milliseconds. Are you ready?”

“Yes.”

The *djinn* vanished. Paul counted: “One. Two. Three. Four. Five. Six. Seven. Eight. Nine. Ten.”

*Squeak.* “Anything to report?”

“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.”

Durham’s eyes no longer glazed over while he was waiting for the speeded-up reply; either he’d gained a degree of self-discipline, or – more likely – he’d interposed some smart editing software to conceal his boredom.

*Squeak.* “Don’t worry about apprehension. We’re running a control, remember?”

Paul would have preferred not to have been reminded. He’d known that Durham must have cloned him, and would be feeding exactly the same sensorium to both Copies – while only making changes in the model’s time resolution for one of them. It was an essential part of the experiment – but he didn’t want to dwell on it. A third self, shadowing his thoughts, was too much to acknowledge on top of everything else.

*Squeak.* “Trial number two. Time resolution ten milliseconds.”

Paul counted. The easiest thing in the world, he thought, when you’re made of flesh, when you’re made of matter, when the quarks and the electrons just do what comes naturally. Human beings were embodied, ultimately, in fields of fundamental particles – incapable, surely, of being anything other than themselves. Copies were embodied in computer memories as vast sets of *numbers*. Numbers which certainly *could be* interpreted as describing a human body sitting in a room ... but it was hard to see that meaning as intrinsic, as *necessary*, when tens of thousands of arbitrary choices had been made about the way in which the model had been coded. *Is this my blood sugar here ... or my testosterone level? Is this the firing rate of a motor neuron as I raise my right hand ... or a signal coming in from my retina as I watch myself doing it?* Anybody given access to the raw data, but unaware of

the conventions, could spend a lifetime sifting through the numbers without deciphering what any of it meant.

And yet no Copy buried in the data itself – ignorant of the details or not – could have the slightest trouble making sense of it all in an instant.

*Squeak.* “Trial number three. Time resolution twenty milliseconds.”

“One. Two. Three.”

For time to pass for a Copy, the numbers which defined it had to change from moment to moment. Recomputed over and over again, a Copy was a sequence of snapshots, frames of a movie – or frames of computer animation.

But ... when, exactly, did these snapshots give rise to conscious thought? While they were being computed? Or in the brief interludes when they sat in the computer’s memory, unchanging, doing nothing but representing one static instant of the Copy’s life? When both stages were taking place a thousand times per subjective second, it hardly seemed to matter, but very soon—

*Squeak.* “Trial number four. Time resolution fifty milliseconds.”

*What am I? The data? The process that generates it? The relationships between the numbers?*

*All of the above?*

“One hundred milliseconds.”

“One. Two. Three.”

Paul listened to his voice as he counted – as if half expecting to begin to notice the encroachment of silence, to start perceiving the gaps in himself.

“Two hundred milliseconds.”

A fifth of a second. “One. Two.” Was he strobing in and out of existence now, at five subjective hertz? The crudest of celluloid movies had never flickered at this rate. “Three. Four.” He waved his hand in front of his face; the motion looked perfectly smooth, perfectly normal. And of course it did; he wasn’t watching from the outside. “Five. Six. Seven.” A sudden, intense wave of nausea passed through him, but he fought it down, and continued. “Eight. Nine. Ten.”

The *djinn* reappeared and emitted a brief, solicitous squeak. “What’s wrong? Do you want to stop for a while?”

“No, I’m fine.” Paul glanced around the innocent, sun-dappled room, and laughed. *How would Durham handle it, if the control and the subject had just given two different replies?* He tried to recall his plans for such a contingency, but couldn’t remember them – and didn’t much care. It wasn’t his problem anymore.

*Squeak.* “Trial number seven. Time resolution five hundred milliseconds.”

Paul counted – and the truth was, he felt no different. A little uneasy, yes – but factoring out any squeamishness, everything about his experience seemed to remain the same. And that made sense, at least in the long run – because nothing was being omitted, in the long run. His model-of-a-brain was only being fully described at half-second (model time) intervals – but each description still included the results of everything that “would have happened” in between. Every half second, his brain was ending up in exactly the state it would have been in if nothing had been left out.

“One thousand milliseconds.”

But ... what was going on, in between? The equations controlling the model were far too complex to solve in a single step. In the process of calculating the solutions, vast arrays of partial results were being generated and discarded along the way. In a sense, these partial results *implied* – even if they didn’t directly represent – events taking place within the gaps between successive complete descriptions. And when the whole model was arbitrary, who was to say that these implied events, buried a little more deeply in the torrent of data, were any “less real” than those which were directly described?

“Two thousand milliseconds.”

“One. *Two.* Three. *Four.*”

If he seemed to speak (and hear himself speak) every number, it was because the effects of having said “three” (and having heard himself say it) were implicit in the details of calculating how his brain evolved from the time when he’d just said “two” to the time when he’d just said “four.”

“Five thousand milliseconds.”

“One. Two. Three. Four. *Five.*”

Besides, hearing words that he'd never “really” spoken wasn't much stranger than a Copy hearing anything at all. Even the standard millisecond clock rate of this world was far too coarse to resolve the full range of audible tones. Sound wasn't represented in the model 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 was just a number here, a label; nothing could actually *oscillate* at that rate. Real ears analyzed pressure waves into components of various pitch; Paul knew that his brain was being 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.”

*Ten seconds free-falling from frame to frame.*

Fighting down vertigo, still counting steadily, Paul prodded the shallow cut he'd made in his forearm with the kitchen knife. It stung, convincingly. *So where was this experience coming from?* Once the ten seconds were up, his fully-described brain would *remember* all of this ... but that didn't account for what was happening *now*. Pain was more than the memory of pain. He struggled to imagine the tangle of billions of intermediate calculations, somehow “making sense” of themselves, bridging the gap.

And he wondered: *What would happen if someone shut down the computer, just pulled the plug – right now?*

He didn't know what that meant, though. In any terms but his own, he didn't know when “right now” *was*.

“Eight. Nine. *Ten.*”

*Squeak.* “Paul – I'm seeing a slight blood pressure drop. Are you okay? How are you feeling?”

Giddy – but he said, “The same as always.” And if that wasn't quite true, no doubt the control had told the same lie. Assuming...

“Tell me – which was I? Control, or subject?”

*Squeak.* Durham replied, “I can’t answer that – 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.”

Paul grunted dismissively; he had no intention of letting Durham know how unsettling the experiment had been. “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.” The *djinn* wrote with one finger on the screen:

$$(1 + 2) + 3 = 1 + (2 + 3)$$

Paul said, “So why bother with this stage at all? *I know* – I wanted to be rigorous, I wanted to establish solid foundations. But the truth is, it’s a waste of our resources. Why not skip the bleeding obvious, and get on with the kind of experiment where the answer isn’t a foregone conclusion?”

*Squeak.* Durham frowned reprovably. “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? And if it’s all so straightforward, why should you be afraid?”

“I’m not afraid; I just want to get it over with. But ... 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 could both use a break now. I’ll enable your communications – for incoming data only.” He turned away, reached off-screen, and hit a few keys on a second terminal.

Then he turned back to the camera, smiling – and Paul knew exactly what he was going to say.

*Squeak.* “By the way, I just deleted one of you. I couldn’t afford to keep you both running, when all you’re going to do is laze around.”

Paul smiled back at him, although something inside him was 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 had passed outside since the day of the scan, but it didn’t take Paul long to catch up with the state of the world; most of the fine details had been rendered irrelevant by subsequent events, and much of the ebb and flow had simply canceled itself out. Israel and Palestine had come close to war again, over alleged water treaty violations on both sides – but a joint peace rally had brought more than a million people onto the glassy plain that used to be Jerusalem, and the two governments had been forced to back down. Former US President Martin Sandover was still fighting extradition to Palau, to face charges arising from his role in the bloody *coup d’état* of thirty-five; the Supreme Court had finally reversed a long-standing ruling which had granted him immunity from all foreign laws, and for a day or two things had looked promising – but then his legal team had discovered a whole new set of delaying tactics. In Canberra, another leadership challenge had come and gone, with the Prime Minister remaining undeposed. In a week-old report, one journalist described this, straight-faced, as “high drama.” Paul thought: *I guess you had to be there.* Inflation had fallen by half a percentage point; unemployment had risen by the same amount.

Paul scanned the old news reports rapidly, skimming over articles and fast-forwarding scenes which he felt sure he would have studied scrupulously, had they been fresh. He felt a curious sense of resentment, at having “missed” so much – it was all there in front of him, *now*, but that wasn’t the same at all.

And yet, he wondered, shouldn’t he be relieved that he hadn’t wasted his time on so much ephemeral detail? The very fact that he was now less than enthralled only proved how little of it had really mattered, in the long run.

*Then again, what did?* People didn’t inhabit geological time. People inhabited hours and days; they had to care about things on that time scale.

*People.*

Paul plugged into real-time TV, and watched an episode of *The Unclear Family* flash by in less than two minutes, the soundtrack an incomprehensible squeal. A game show. A war movie. The evening news. It was as if he was in deep space,

# Chapter 5

*(Remit not paucity)*

*November 2050*

Peer anchored the soles of both feet and the palm of one hand firmly against the glass, and rested for a while. He tipped his head back to take in, one more time, the silver wall of the skyscraper stretching to infinity above him. Cotton-wool clouds drifted by, higher than any part of the building – even though the building went on forever.

He freed his right foot, re-anchored it higher up the wall, then turned and looked down at the neat grid of the city below, surrounded by suburbs as orderly as plowed fields. The foreshortened countryside beyond formed a green-brown rim to the hemispherical bowl of the earth; a blue-hazed horizon bisected the view precisely. The features of the landscape, like the clouds, were “infinitely large,” and “infinitely distant”; a finite city, however grand, would have shrunk to invisibility, like the base of the skyscraper. The distance was more than a trick of perspective, though; Peer knew he could keep on approaching the ground for as long as he liked, without ever reaching it. Hours, day, centuries.

He couldn't remember beginning the descent, although he understood clearly – cloud-knowledge, cloud-memories – the sense in which there was a beginning, and the sense in which there was none. His memories of the skyscraper, like his view of it, seemed to converge toward a vanishing point; looking back from the present moment all he could recall was the act of descending, punctuated by rest. And although his mind had wandered, he'd never lost consciousness; his past seemed to stretch back seamlessly, forever – yet he could hold it all in his finite gaze, thanks to some law of mental perspective, some calculus of memory limiting the sum of ever diminishing contributions to his state of mind from ever more distant moments in the past. But he had his cloud-memories, too; memories from before the descent. He couldn't join them to the present, but they existed nonetheless, a backdrop informing everything else. He knew exactly who he'd been, and what he'd done, in that time before the time he now inhabited.

Peer had been exhausted when he'd stopped, but after a minute's rest he felt, literally, as energetic and enthusiastic as ever. Back in cloud-time, preparing himself, he'd edited out any need or desire for food, drink, sleep, sex, companionship, or even a change of scenery, and he'd pre-programmed his exoself – the sophisticated, but non-conscious, supervisory software which could reach into the model of his brain and body and fine-tune any part of it as required – to ensure that these conditions remained true. He resumed the descent gladly, a happy Sisyphus. Making his way down the smooth mirrored face of the skyscraper was, still, the purest joy he could imagine; the warmth of the sun reflecting back on him, the sharp cool gusts of wind, the faint creak of steel and concrete. Adrenaline and tranquility. The cycle of exertion and perfect recovery. Perpetual motion. Touching infinity.

The building, the earth, the sky, and his body vanished. Stripped down to vision and hearing, Peer found himself observing his Bunker: a cluster of display screens floating in a black void. Kate was on one screen; two-dimensional, black-and-white, nothing but her lips moving.

She said, "You set your threshold pretty damn high. You'd be hearing about this a decade later if I hadn't called you in."

Peer grunted – disconcerted for a moment by the lack of tactile feedback from the conventional organs of speech – and glanced, by way of eye-movement-intention, at the screen beside her, a graph of the recent history of Bunker time versus real time.

Observing the Bunker – "being in it" would have been an overstatement – was the most computing-efficient state a Copy could adopt, short of losing consciousness. Peer's body was no longer being simulated at all; the essential parts of his model-of-a-brain had been mapped into an abstract neural network, a collection of idealized digital gates with no pretensions to physiological verisimilitude. He didn't enter this state very often, but Bunker time was still a useful standard as a basis for comparisons. At best – on the rare occasions when demand slackened, and he shared a processor cluster with only two or three other users – his Bunker-time slowdown factor dropped to about thirty. At worst? Up until a few minutes ago, the worst had been happening: a section of the graph was perfectly flat. For more than ten hours of real time, he hadn't been computed at all.

His house “in the suburbs” began sixteen stories “above” his city office; in between were board rooms, restaurants, galleries and museums. Having decided upon the arrangement, he now regarded it as immutable – and if the view from each place, once he arrived, blatantly contradicted the relationship, he could live with that degree of paradox.

Thomas stepped out of the elevator into the ground floor entrance hall of his home. The two-story building, set in a modest ten hectares of garden, was his alone – as the real-world original had been from the time of his divorce until his terminal illness, when a medical team had moved in. At first, he’d had cleaning robots gliding redundantly through the corridors, and gardening robots at work in the flower beds – viewing them as part of the architecture, as much as the drain pipes, the air conditioning grilles, and countless other “unnecessary” fixtures. He’d banished the robots after the first week. The drain pipes remained.

His dizziness had passed, but he strode into the library and poured himself a drink from two cut-glass decanters, a bracing mixture of Confidence and Optimism. With a word, he could have summoned up a full mood-control panel – an apparition which always reminded him of a recording studio’s mixing desk – and adjusted the parameters of his state of mind, until he reached a point where he no longer wished to change the settings ... but he’d become disenchanted with that nakedly technological metaphor. Mood-altering “drugs”, here, could function with a precision, and a lack of side-effects, which no real chemical could ever have achieved – pharmacological accuracy was possible, but hardly mandatory – and it felt more natural to gulp down a mouthful of “spirits” for fortification, than it did to make adjustments via a hovering bank of sliding potentiometers.

Even if the end result was exactly the same.

Thomas sank into a chair as the drink started to take effect – as a matter of choice, it worked gradually, a pleasant warmth diffusing out from his stomach before his brain itself was gently manipulated – and began trying to make sense of his encounter with Paul Durham.

*You have to let me show you exactly what you are.*

There was a terminal beside the chair. He hit a button, and one of his personal assistants, Hans Löhr, appeared on the screen.

# Chapter 24

## (Rut City)

Peer was in his workshop, making a table leg on his lathe, when Kate's latest message caught his eye: *You have to see this. Please! Meet me in the City.*

He looked away.

He was working with his favorite timber, sugar pine. He'd constructed his own plantation from a gene library and plant cell maps – modeling individual examples of each cell type down to an atomic level, then encapsulating their essential behavior in rules which he could afford to run billions of times over, for tens of thousands of trees. In theory, he could have built the whole plantation from individual atoms – and that would have been the most elegant way to do it, by far – but slowing himself down to a time frame in which the trees grew fast enough to meet his needs would have meant leaving Kate far behind.

He stopped the lathe and re-read the message, which was written on a poster tacked to the workshop's noticeboard (the only part of his environment he allowed her to access, while he was working). The poster looked quite ordinary, except for an eye-catching tendency for the letters to jump up and down when they crossed his peripheral vision.

He muttered, "I'm happy here. I don't care what they're doing in the City." The workshop abutted a warehouse full of table legs – one hundred and sixty-two thousand, three hundred and twenty-nine, so far. Peer could imagine nothing more satisfying than reaching the two hundred thousand mark – although he knew it was likely that he'd change his mind and abandon the workshop before that happened; new vocations were imposed by his exoself at random intervals, but statistically, the next one was overdue. Immediately before taking up woodwork, he'd passionately devoured all the higher mathematics texts in the central library, ran all the tutorial software, and then personally contributed several important new results to group theory – untroubled by the fact that none of the Elysian mathematicians would ever be aware of his work. Before that, he'd written over three hundred comic operas, with librettos in Italian, French and English –

and staged most of them, with puppet performers and audience. Before that, he'd patiently studied the structure and biochemistry of the human brain for sixty-seven years; toward the end he had fully grasped, to his own satisfaction, the nature of the process of consciousness. Every one of these pursuits had been utterly engrossing, and satisfying, at the time. He'd even been interested in the Elysians, once.

No longer. He preferred to think about table legs.

*He was still interested in Kate, though.* He'd chosen that as one of his few invariants. And he'd been neglecting her lately; they hadn't met in almost a decade.

He looked around the workshop wistfully, his gaze falling on the pile of fresh timber in the corner, but then he strengthened his resolve. The pleasures of the lathe beckoned – but love meant making sacrifices.

Peer took off his dustcoat, stretched out his arms, and fell backward into the sky above the City.

Kate met him while he was still airborne, swooping down from nowhere and grabbing his hand, nearly wrenching his arm from its socket. She yelled above the wind, "So, you're still alive after all. I was beginning to think you'd shut yourself down. Gone looking for the next life without me." Her tone was sarcastic, but there was an edge of genuine relief. Ten years could still be a long time, if you let it.

Peer said gently, but audibly, "You know how busy I am. And when I'm working —"

She laughed derisively. "*Working?* Is that what you call it? Taking pleasure from something that would bore the stupidest factory robot to death?" Her hair was long and jet black, whipping up around her face as if caught by the wind at random – but always concealing just enough to mask her expression.

"You're still—" The wind drowned out his words; Kate had disabled his aphysical intelligibility. He shouted, "You're still a sculptor, aren't you? You ought to understand. The wood, the grain, the texture—"

"*I understand* that you need prosthetic interests to help pass the time – but you could try setting the parameters more carefully."

“*Why should I?*” Being forced to raise his voice made him feel argumentative; he willed his exoself to circumvent the effect, and screamed calmly: “Every few decades, at random, I take on new goals, at random. It’s perfect. How could I improve on a scheme like that? I’m not stuck on any one thing forever; however much you think I’m wasting my time, it’s only for fifty or a hundred years. What difference does that make, in the long run?”

“You could still be more selective.”

“What did you have in mind? Something *socially useful*? Famine relief work? Counseling the dying? Or something *intellectually challenging*? Uncovering the fundamental laws of the universe? I have to admit that the TVC rules have slipped my mind completely; it might take me all of five seconds to look them up again. *Searching for God*? That’s a difficult one: Paul Durham never returns my calls. *Self discovery*—?”

“You don’t have to leave yourself open to every conceivable absurdity.”

“If I limited the range of options, I’d be repeating myself in no time at all. And if you find the phase I’m passing through so unbearable, you can always make it vanish: you can freeze yourself until I change.”

Kate was indignant. “I have other time frames to worry about besides yours!”

“The Elysians aren’t going anywhere.” He didn’t add that he knew she’d frozen herself half a dozen times already. Each time for a few more years than the time before.

She turned toward him, parting her hair to show one baleful eye. “You’re fooling yourself, you know. You’re going to repeat yourself, eventually. However desperately you reprogram yourself, in the end you’re going to come full circle, and find that you’ve done it all before.”

Peer laughed indulgently, and shouted, “We’ve certainly been through *all this* before – and you know that’s not true. It’s always possible to synthesize something new: a novel art form, a new field of study. A new esthetic, a new obsession.” Falling through the cool late afternoon air beside her was exhilarating, but he was already missing the smell of wood dust.

Kate rendered the air around them motionless and silent, although they continued to descend. She released his hand, and said, “I know we’ve been through this before. I remember what you said last time: If the worst comes to the worst, for the first hundred years you can contemplate *the number one*. For the second hundred years you can contemplate *the number two*. And so on, *ad infinitum*. Whenever the numbers grow too big to hold in your mind, you can always expand your mind to fit them. QED. You’ll never run out of *new and exciting interests*.”

Peer said gently, “Where’s your sense of humor? It’s a simple proof that the worst-case scenario is still infinite. I never suggested actually doing that.”

“But you might as well.” Now that her face was no longer concealed, she looked more forlorn than angry – by choice, if not necessarily by artifice. “Why do you have to find everything so ... fulfilling? Why can’t you discriminate? Why can’t you *let yourself* grow bored with things – then move on? Pick them up again later if you feel the urge.”

“Sounds awfully quaint to me. Very *human*.”

“It did work for them. Sometimes.”

“Yes. And I’m sure it works for you, sometimes. You drift back and forth between your art, and watching the great Elysian soap opera. With a decade or two of aimless depression in between. You’re dissatisfied most of the time – and letting that happen is a conscious choice, as deliberate, and arbitrary, as anything I impose on myself. If that’s how you want to live, I’m not going to try to change you. But you can’t expect me to live the same way.”

She didn’t reply. After a moment, the bubble of still air around them blew away, and the roar of the wind drowned the silence again.

Sometimes he wondered if Kate had ever really come to terms with the shock of discovering that stowing away had granted them, not a few hundred years in a billionaires’ sanctuary, but a descent into the abyss of immortality. The Copy who had persuaded David Hawthorne to turn his back on the physical world; the committed follower – even before her death – of the Solipsist Nation philosophy; the woman who had needed no brain rewiring or elaborate external contrivances to accept her software incarnation ... now acted more and more like a flesh-and-blood-wannabe – or rather, Elysian-wannabe – year by year. *And there was no need*