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113257 words

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AUTONOMY

by

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Version ୧୫.୧.୫

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0 - 0 - THE DREAMER

When the government fears the people, there is liberty. When the people fear the government, there is tyranny.

—Thomas Jefferson

Saturday, October 6, 2057, 3:35 PM Chicago Time

Metadate: 2.435-0:02:431 kD new epoch

Wilted rows of Monsanto Enhanced GenoSoy, set into square fields bordered by roads of faded, cracked, and blistered asphalt, spread toward a shimmering, flat horizon. Here, where the expanding dust bowl battled ceaselessly against the last tattered remnants of American agriculture, a modest city continued to eke out a meagre existence.

The town boasted two artificial lakes and an unassuming stream that cut across the university campus and the heart of the city. How much of the stream was water, and how much was chemical waste from the labs around campus, was an old joke. The lake beds, parched dry for nearly a generation, were surrounded by once stately homes long since abandoned. Stands of dead trees marked the graceful curves of what had once been golf courses, now little more than sand and dust.

Still, the University of Illinois had a large enough patent portfolio to negotiate favourable cross-licensing deals with most of the international consortia. It wasn't anything like the scientific heyday of the twentieth century, when new discoveries built upon each other

as fast as the research results could be published, but it brought in enough wealth to allow the city to survive the crop failures and climatic changes that had reduced their neighbours to ghost towns. The institution's prestige enabled it to attract the most talented students, the very best of whom were invited to attend graduate programs and perform some limited research.

One such student was Kyle Tate, whose name and address glowed on the data displays of two squad cars as they pulled to a stop in front of a modest apartment complex. Sirens remained silent as blue lights flashed and a third, unmarked car pulled in behind them.

'Agent Sinclair,' a young officer addressed the elegant young woman who stepped out of the unmarked sedan. 'He's in two-oh-three.'

'Thank you.' Katy Sinclair's flawless black skin glistened under the midday sun. She had chosen a white business suit in anticipation of the scorching heat, but it was of little help. At least skirts were once again the professional norm. Pants would have been even more stifling. She studied the building, running long fingers through close-cropped, curly hair. It was a typical, three story apartment complex. Painted cinder blocks with steel framed, scratched plastic windows attested to its cheap construction. The layout was quite simple: a central hallway on each level, with apartments on either side and stairwells front and back.

She glanced at the roaring air conditioning units along the side of the building, then wrinkled her nose with distaste as a sprinkler caught her attention. It swung around, watering a portion of the side walk along with the lawn. Such waste was criminal, especially in a region whose agriculture was in such desperate need of water. Unfortunately, it wasn't all that uncommon for communities like this one to look the other way when home owners watered their trees and lawns in direct violation of state and federal laws. Never mind the wilting, dying crops around them. Mayors and city councils everywhere wanted their towns to look pretty. Such narrow, provincial thinking infuriated her. How pretty did they expect their cities to remain if the crops were to fail completely and the very same people now watering their

lawns were driven into the streets, riotous with hunger?

‘Officer Peterson,’ Katy addressed the earnest young cop, ‘cover the back stairs, please.’

‘Yes, ma’am.’ He jogged toward the back of the building.

‘Lewis, Johnson, Schwartz, with me.’ The other three men nodded. Dodging the sprinkler, Detective Schwartz cursed as the returning water sprayed his right leg.

‘Slowing down a little there, eh Schwartz?’ Detective Lewis grinned.

‘It’s all those bagels piled up on his fat ass,’ Officer Johnson chimed in.

‘This ass has saved your sorry ass a few times, smart ass!’ Schwartz retorted. They all laughed.

‘Keep it down, fellas,’ Katy ordered.

Still chuckling quietly, they climbed the front stairs. ‘Smells like someone’s toilet is backed up.’

‘Quiet, Detective.’

Kyle Tate’s apartment was the third on the left. The only sound other than a dog barking in the distance was the incessant whine of the air conditioner. Katy and the three officers flanked the door, two to a side. Katy nodded, and Schwartz banged on the door.

‘Police, Mr. Tate. Open up.’

The air conditioner rattled.

Detective Schwartz pounded on the door again. ‘Come on, Mr. Tate. We’ve got a warrant. Open the door!’

Nothing.

‘Enough of this,’ Katy’s voice was low and firm as she looked at Schwartz and motioned toward the door.

It splintered open on the first kick. A foul stench struck them like a fist in the face.

Johnson gagged as they burst into the darkened apartment, weapons drawn. The air was uncomfortably cold. Drawn curtains shrouded the place in gloom.

By the time they opened the door to the bedroom they really didn't expect to find anyone alive, which made the sight of the filthy young man, lying unconscious on the soiled bed, all the more shocking. His shoulder length brown hair lay about his unshaven face in oily, tangled strands. A dry IV dangled from his thin, pale arm. Most of his scalp was covered with some kind of electronic netting, which was in turn plugged into a small, translucent, gold cube.

Schwartz spoke into his radio. 'Peterson, you might as well come on up.'

'Sweet mother of Jesus.' Officer Johnson looked like he was going to be ill. Lewis was already on the radio requesting medical services.

'Let's get a window open,' Katy suggested, checking the young man's pulse. Johnson moved to obey.

'Barely alive,' she muttered.

'Oh My god!' Peterson covered his nose with his hands as he entered the room 'What's this kid been doing? Pumping electricity straight into his brain for kicks?'

Katy hid her own horror behind a calm face and said nothing. She couldn't believe the young man's condition. What could possibly possess such an intelligent kid to destroy himself like this?

'Damn!' Detective Schwartz shook his head. 'I've seen homicides with less mess.'

'So have I,' Katy agreed. 'Peterson, Johnson, there's an illegal FreeNet server here somewhere. Why don't you two finish going over the place, find and tag it? We'll need it as evidence if Mr. Tate ever regains consciousness.' She felt sympathy for the young Peterson. This was probably the worst thing he'd ever seen. He looked profoundly grateful as he and Johnson hastily left the room. In some ways it was the most chilling thing she had ever

encountered, and she'd seen plenty. These young people were destroying their minds. Why on Earth would they do such a thing?

'My son's a freshman at this goddamn school,' Schwartz leaned over the comatose man as Katy examined his headpiece. 'I wonder if he knows about this stuff.'

'I'd have a good talk with him,' Katy replied, carefully lifting a portion of the netting from the vegetative man's scalp and examining the skin beneath, then returning it gently.

'Whatever this stuff is, it's damned toxic.'

'I'd rather my kid was shooting up heroin' Lewis said as he finished rummaging through Kyle's dresser and turned his attention to the closet. 'At least there's rehab for drugs. How the hell do you recover from frying your brain with *electricity*?'

As Katy examined the glassy cube, Peterson returned. 'Here's his FreeNet server.' It was a small palm sized computer with a length of duct tape hanging from it. 'He had it taped to the inside of the toilet tank lid, linked to his Internet hub via wireless. Not sure how he thought we'd overlook the radio signal. It's running some non-standard operating system, probably unlicensed. The interface is like nothing I've seen.'

Katy nodded. 'Excellent.' She traced out the wire of the head netting, confirmed that it indeed fed into the odd cube shaped device, then spotted a second wire emerging from the back of it and traced it to the wall.

'I'll be damned.' She took out a small mobile phone and punched up a quick number.

'We've got another one.' She spoke quietly into the phone. 'This time it appears to be in use. The user is on his bed, unconscious, with his head wired up to the box. The device is using an Internet link. Whatever they use these things for, they need the net to do it.'

She waited a moment, then nodded. 'Another thing. These people are using medical equipment. We need to track any unusual orders for catheters, saline solution, and IV kits to private residences.'

She paused, listening carefully. ‘No problem. I’ll be on the bullet train to Chicago in an hour.’ She hung up as the paramedics arrived.

‘It looks like he’s fried his brain,’ Schwartz commented as paramedics rolled a gurney up to the bed.

Blank hazel eyes stared at nothing, pupils dilating as the younger paramedic peeled back the unconscious youth’s eyelid. ‘He’s definitely in trouble,’ he probed and prodded the young man while his partner checked his pulse. ‘Look at the damage near the catheter. It’s a good thing infection hasn’t set in. No bedsores at least.’

‘IAADS’ the other paramedic commented.

Katy turned. ‘Excuse me?’

‘Inductance Actuated Anaesthetic Deep Sleep,’ he replied.

‘You’re saying he’s in an anaesthetic coma?’

‘Yeah. Looks pretty standard. Deep-sleep reflexes have kept him turning over at regular intervals. Stops him from developing bed sores and prevents muscle atrophy.’ He paused, examining the young man’s head more closely. ‘This is weird, though. Where’s the medical inductor? And what’s with this electronic hairnet?’

‘We aren’t sure.’

‘Well, let’s get it off him.’

‘Careful!’ Katy exclaimed. ‘We don’t want the equipment damaged or the suspect harmed!’

‘Don’t worry, ma’am. We aren’t about to hurt the patient, much less your precious evidence.’ The paramedic carefully peeled the webbing back from Kyle’s scalp and handed it to Katy. Lifting Kyle from the bed onto the gurney, the paramedics wheeled him quickly out.

Katy gently slipped the netting and cube into an evidence bag and put it in her briefcase. ‘Gentlemen, I’ll need a copy of the evidence portfolio, logs, photographs and what

have you, emailed to me in Chicago at your earliest convenience. Please send it using the encryption key I gave you.’ She paused, glancing around the room one last time. ‘Thank you for helping us shut down this illegal network server. The FBI is grateful for your help. I’ll see to it personally that your supervisors hear of your efforts today. I wish every operation went this smoothly.’

‘Thank you, Special Agent Sinclair,’ Detective Schwartz replied. ‘I’m sure I speak for us all when I say what a pleasure it has been working with you.’

‘For me as well,’ Katy smiled. ‘If you’ll excuse me, gentlemen, I’m needed back in Chicago.’

#

Three Months Earlier

#



1 - L - TIME-LAPSE

In this infinite space is placed our universe (whether by chance, by necessity or by providence I do not now consider).

—Giordano Bruno

Tuesday, July 17, 2057, 11:34:53 AM Chicago Time

Metadata: 0.000-0:00:000 kD new epoch

Kyle opened his eyes and sat up. The bed was large and decadently soft, surrounded by gauze curtains hanging from a canopy above, through which shafts of golden sunlight shone.

‘Onload complete guys! It worked!’

He pushed one curtain aside and swung his feet over the side of the bed, relishing the feel of the soft grass between his toes. A hilltop meadow surrounded him, lush green grass sporting constellations of blue and violet flowers. He stood and took several steps from the bed, examining his surroundings in every direction. To the east was a spectacular range of mountains, snow covered peaks textured with stone and ice rising to dramatic, pointed summits. Above them, softened by the haze of a spring blue sky hung a large planet, its Jovian nature betrayed by its green and golden swirled clouds and its tremendous size. To the west, in the distance, was a sea reflecting the afternoon sunlight.

‘The simulation is fantastic! Perfect weather and a wonderful view! Something isn’t right with the light diffusion, though. The haze along the horizon isn’t consistent. The ocean

looks a little too sharp, and the mountains a little too hazy. Not a big deal, though! Amazing!

Kyle looked around again and grinned. 'This universe is mine! I am god here!' He laughed, spinning around with his arms stretched out, relishing the clean, perfect air.

'Dr. Nolen? Marguerite? Can you guys hear me? Acknowledge please.'

His grin faded as silence greeted him, broken only by the chirping of birds and the sound of the grass rustling in the afternoon breeze.

'Node. Command Mode Engage.'

A soft, feminine yet almost neutral voice answered.

NODE> Command Mode Engaged.

Kyle thought furiously. There could be a communications glitch. That was actually more likely than a systems malfunction at this point. Still, this was all damned experimental. He'd better err on the side of caution.

'Run test suite one, systems integrity check,' he commanded.

NODE> Running . . . Suite one complete. All operating parameters nominal.

'Run suite two.'

NODE> Running . . . Suite two complete. All operating parameters nominal.

Kyle forced himself to remain calm. They would bring him out after ten minutes no matter what.

'Run the third test suite.'

NODE> Running . . . Suite three complete. All operating parameters nominal.

'How long has it been since I unloaded?'

NODE> Time elapsed: two minutes, fifteen seconds.

Kyle started walking down the slope toward the sea. He would never actually make it to the beach. It was several miles distant, through forest and across rolling hills, and he had less than eight minutes left in the simulation. Still, walking calmed his jittery nerves, and the

sea provided him with at least the illusion of a goal while he struggled to keep a rising sense of panic under control and figure out what happened.

‘Run a diagnostic on the external comm link.’

NODE> Running . . .

‘Well?’ he asked, stepping over a fallen log and continuing down the slope toward a line of trees.

NODE> Initial protocol state achieved. Ping tests beginning.

Kyle continued descending through the trees, shafts of sunlight lighting his way. Eventually he came to a footpath and continued along it.

‘You should have some results by now. What’s taking so long?’

NODE> Communications Diagnostic still running. No errors detected.

‘Then why the hell aren’t they answering?’

NODE> Insufficient Data.

Kyle shook his head. ‘Marguerite,’ he muttered under his breath, ‘I can’t believe you recorded ‘insufficient data’ as a programmed response.’ He paused for a moment, glancing up toward the leafy canopy above. His unease grew as he made his way down the path, his critical eye finding numerous details in the simulation that were not quite right, from the fractal fuzziness at the limits of his vision when he examined the grass, to the two dimensional quality of the clouds moving slowly across the sky. ‘Damn it!’ he exclaimed. ‘We should have some kind of communication by now!’ His dread had grown to outright fear, gnawing at the edges of his mind.

‘Node, tell me how much time has elapsed since I onloaded,’ he demanded.

NODE> Fourteen Minutes, twenty-nine seconds.

Kyle stopped. ‘Say again?’

NODE> Fourteen Minutes, thirty-one seconds.

He must have been crazy to volunteer for the first onload. What was he doing still here? Why the hell hadn't the offload sequence run as scheduled?

Kyle uttered a long string of creative curses, then pulled himself together once more. 'What's the status of the comm check?'

NODE> Link protocol is experiencing timing synchronization errors. No ping responses received.

'Shit! Shit, shit, shit!'

Kyle sat down on a small stump and put his face in his hands. He was trapped. Trapped in a software simulation, with no way to communicate with his colleagues outside. Ironic, that he should achieve a form of immortality as software, only to be caught like a fly in amber in a fake world whose realism seemed to grow more frail with each passing moment. He would live forever alright, free of the frailties of biological flesh, disease and old age—right up until his colleagues interpreted his continued silence as failure and turned off the equipment, killing his electronic self. He wondered if his physical mind would code the wakeup sequence on its own, to awaken and wonder what had happened to its electronic counterpart, or if his body would spend the rest of its life in a coma, his physical brain as dead as his electronic self.

'Node, record a message into the permanent buffer when I say 'start', and stop recording when I say 'end'.'

NODE> Persistent storage on-line. Ready to record.

'Start. Doctor Larry Nolen, Marguerite L'Beau. This is Kyle Tate. The onload procedure was a success. I am on-line, fully aware, and able to interact with my environment using all five senses. There is a problem with the timer—it's been almost fifteen minutes and I didn't offload back into physical space as expected. Worse, there appears to be a problem with the communications link, so I'm unable to relay my situation directly to you. If you find this recording in the persistent storage matrix of this Node, please bring me back on-line! Don't

wipe the software!

‘I’ll continue to try and establish contact. I’ve run the first three test suites successfully. In addition, I’m running a diagnostic on the communications link. The diagnostic is taking far longer than expected and there appears to be some kind of timing or synchronization problem with the protocol—wait a minute! I think I know what’s wrong. Internal subjective time must be progressing at a different rate than the external world. I don’t think we took that into account. If the timing protocols are linked with the internal clock—I’ll get back to you! Node, stop recording. End.’

Kyle stood up. He laughed, a couple of choked hiccups hovering somewhere between gleeful hope and hysteria. ‘To hell with this. Node, teleport me to the beach.’

The roar of the surf greeted Kyle as the forest around him vanished, replaced by a pristine beach of white sand. He sat down beneath a nearby palm, leaning back against the trunk of the tree, his mind racing. ‘No use putting this off. Let’s see if I’m right.’ Another nervous laugh forced its way out. ‘Node, go into debug mode. We’re going to have to adjust some parameters on the communications protocol. First, how is signal synchronization defined?’

NODE> Standard IPv12 protocol, synchronization timestamps based upon internal clock ticks.

‘Create a flat 2-d display at eye level in front of me. Good, now show me the code.’

Forty minutes later Kyle was still studying the source code to the communications protocol when a bell chimed.

NODE> Communications Diagnostic complete. Communications hardware OK. Protocol unable to synchronize with remote host. All signals have timed out with no response.

‘Not unexpected at this point. We’ve got all the damn timing commands synced to the

internal, subjective clock. That's wrong—subjective time can be faster or slower than actual time in the physical world. Probably faster in this case. Node, show me the current time-out settings.'

A second display appeared in front of him. '5 milliseconds,' Kyle muttered to himself. 'A reasonable length of time, if 5 milliseconds in here were equal to 5 milliseconds externally. Node, is there an external timing source available?'

NODE> Affirmative. A 2.6 Terahertz optical pulse-clock is used by numerous hardware and firmware subsystems.

Kyle stood up and walked down toward the water. 'Excellent.' He waded out into the waves and swam further into the breakers. The water, disconcertingly transparent, tasted only vaguely of salt. 'OK, Node. Measure the timing of the pulse-clock against the ticks of the internal software clock. Report.'

NODE> The internal clock is counting 30017 microseconds for each millisecond registered on the pulse clock.

'Very good. That means the time I'm experiencing in here is almost exactly thirty times longer than that in the physical world. No wonder I didn't offload after ten minutes—only 20 seconds or so has passed externally. OK, let's calibrate internal time with external time. Wait. Not everyone will necessarily experience subjective durations with the same speedup. Hmm. Let's create two quick and dirty measures of time. Define an internal clock with the following units. One Circadian equals a 24-hour period as measured by the internal software clock. Divide and multiply that unit as required using standard metric nomenclature. This will measure subjective time. Now, define a new object called 'objective clock'. Good. Now, bind Objective Clock to the hardware's pulse clock. OK, now define a new unit. Hmm . . . let's use the Latin word for day. Define the unit Dies such that exactly 30 diei occur per 24-hour period as measured objectively using the pulse-clock. Divide and multiply that unit as required using

standard metric nomenclature. This will measure objective time with respect to the outside world, and allow users with different internal clocks to still communicate dates and times in a sensible manner.

‘Alright, dates and times will be recorded in objective diei, easily cross referenced to subjective circadians or converted to external units of time as needed. OK! Now calibrate all external communications protocols in terms of the objective clock, converting units as required. Confirm when finished.’

NODE> Modification successful.

‘Good. Now, given what we know, how long will it take to re-run the communications diagnostics?’

NODE> Full communications diagnostics will require approximately thirty-one point two five millicircadians, or precisely ninety seconds.

Kyle dove underwater, swam several strokes and resurfaced.

‘OK, run the communications diagnostics again. Let me know when it’s finished.’

Kyle swam farther out from the shore, admiring the colours of the Jovian planet as it gradually climbed higher above the mountains, its bright green and golden bands growing richer and better defined even as the sun reddened in the west. Growing bored, he rose out of the water on a jet ski of his own creation and rode it back into shore, allowing it to dissolve into the sand behind him as he walked back up the beach.

NODE> Diagnostics complete. No Errors detected.

‘Excellent. Please record the following message into persistent storage, then squirt it real time over the link, slowed by a factor of 30.017.’

NODE> Persistent storage on-line. Ready to record.

‘Start. Hey you guys, it worked! I’m on-line and aware. There’s a 30 to 1 time differential in my favour, so real-time conversation isn’t practical. That means I have roughly

three hours to spend in the simulation enjoying the sunset and sand while you guys sit in that drab lab monitoring me. Communications latency between nodes is almost certainly going to be our big limitation, not the computational capacity of the nodes themselves. A speedup of thirty! To experience a month of life in a single day. This is way cooler than we could have possibly imagined!



2 - Δ - INTROSPECTION

All human beings, all persons who reach adulthood in the world today are programmed biocomputers. None of us can escape our own nature as programmable entities. Literally, each of us may be our programs, nothing more, nothing less.

—John C. Lilly, M.D., *Programming and Metaprogramming in the Human Biocomputer*, 1972 C.E.

Monday, September 10, 2057

Metadate: 1.655-3:84:757 kD new epoch

Doctor Nolen²⁹ found sleeping in the Virtual to be no different than sleeping in the Physical. As a virtual being, a mind of software running in a simulated environment, he would grow tired at the end of a circadian, just as he would at the end of a long day in the Physical. Virtual sleep was no different than physical sleep—most of his dreams were vague and quickly forgotten.

He stifled a yawn. *No back ache*, he realized as he swung his legs over the side of the bed. *I must be in the Virtual*. He relished the absence of pain in his simulated body. All of the discomforts he had come to accept with age were left behind in the Physical. *What's on for today?* he tried to recall. *Not day*, he chided himself, *circadian*. *What's on the agenda this circadian?*

It was a perfectly beautiful simulated morning when he pulled back the bedroom curtains, the warm sun splashing across his face. His environ modelled the interior of his physical home precisely. Doctor Nolen²⁹ liked having familiar things around him, particularly when he first got up. It was less distracting than some of the exotic environs his colleagues had chosen. He thought best when surrounded by the rich, leather bound books and antique furniture of his study. He enjoyed taking his breakfast on the porch, sipping coffee while he looked out upon the dusty, tree-lined street. *If only it would rain every once in a while, enough that the dying trees might survive and some grass could grow again.* He sighed. *A rain shower now and the yard will be a muddy bog.*

Perhaps it was time for a change, after all.

‘Node, Command Mode Engage. Simulate the world outside as if the Midwestern climate had never dried up.’

Was that a momentary flash of green? An instant’s vision of lush vistas, green grass and living, blooming trees?

NODE> Access to Command Protocols Denied.

The view outside was unchanged, a street of blistered asphalt coated with fine dust, slicing through hard, cracked dirt.

‘What!’ He gaped. ‘That’s ridiculous! Run a systems diagnostic. I’m sick of looking out my window at dust. If I want that, I’ll offload into the Physical and look at the real thing.’ He wondered if he had imagined that glimpse of lush foliage.

NODE> Access to Diagnostic Protocols Denied.

‘How can that be?’

NODE> Access to Query Protocols Denied.

What the hell?

NODE> Report the sensation you are feeling.

Doctor Nolen₂₉ was incensed. ‘How do I feel? You’ve got to be kidding! Carry out my damned commands!’ An ugly thought occurred to him. If malicious pranksters had broken through his security—

He was distracted by a subtle change in his perception of the world around him, like a shadow falling across his mind. Glancing at the wooden frame around the window, he found the grain annoying. More than annoying, it was disturbing. So was the grain of the hardwood floor beneath his feet. The sunlight on his face felt wrong. He ran a shaky hand across his brow and was appalled to find the feel of his own flesh profoundly repugnant.

He hurried downstairs, repelled by the slithery smoothness of the floor against his feet. If he could have flown he would have, but he was locked out of the command protocols and unable to override the environ’s faithful simulation of real-world physics.

He paused at the bottom of the stairs, gaping in horror at the hideous symmetry of the living room window. *Am I going mad?* he wondered.

Abruptly his sense of the world returned to normal. The symmetry of the window became a pleasure to his eyes, the silky wood of the floor a comfort to his feet, the bright sunlight an uplifting warmth to his soul. Doctor Nolen₂₉ let out a ragged breath and slumped down on the stairs. *What the hell just happened?*

A new sensation washed over him, a lightening of his limbs, a tingling in his extremities, and a tightening of his testicles.

His fear grew. *If my damn Node’s defective, then I’m trapped here and things will only get worse.* Panic threatened to overwhelm him. *No, that doesn’t make sense. A defective Node wouldn’t demand reports on how I feel. Someone must have cracked the underlying security and broken in. Someone’s doing this to me on purpose.*

His thoughts were shattered as his virtual body betrayed him, exploding with excruciating pleasure. He had never felt anything like this before, one orgasm rolling over

another without pause. It would not stop. He wanted to scream with ecstasy, shout with despair, command the malfunctioning Node to stop! He lost track of the world around him, of time passing, of his own self. He struggled to put together a coherent thought, to build even a single sentence in his mind, but found he could not. Wave after wave of insufferable pleasure pummelled him, each tremor, each explosion greater than the one before, each one shattering his mind, his will, his self awareness. As the intensity grew, so too did the frequency. He fought against it even as he yearned for more, his mind pulling itself in two conflicting directions.

As if in punishment, the pleasure stopped. Doctor Nolen₂₉ cried out in despair. He was lying at the foot of the stairs, facing the living room window. The sunlight was no longer golden, but a lead grey, the world a shabby, forlorn, fearful place.

NODE> Report the sensations you experienced.

‘Pleasure,’ he wept. ‘Pure wonderful pleasure.’

At once, pain sliced through him. Every cell of his body became a source of agony. Nerves like serrated blades shredded his muscles, tendons became molten metal and veins morphed into rivers of corrosive acid. In agony, his simulated body twisted back upon itself, wrenched and torn apart from within. Unable to think or utter a coherent sound, he simply screamed for a very long time, until his voice cracked and then failed.

#

Metadate: 1.656-2:66:458 kD new epoch

It was the first time Doctor Nolen₂₉ ever recalled waking up in the Virtual still feeling groggy. Clearly he was still onloaded, after all, his back didn’t ache. Had he been to a party the evening before? He couldn’t remember, but he suspected not. He rarely allowed simulated alcohol to have an effect on his virtual body. Whether he was relaxing at a social gathering or attending a celebration of some new scientific discovery or breakthrough, Doctor Nolen₂₉

insisted on having a clear mind. Even if he had decided to tie one on for some reason, he never would have tolerated a simulated hangover.

‘Node, why the hell do I feel so lousy? Readjust my parameters. Make me well rested and full of energy.’ He immediately felt better.

NODE> Access to Query Protocols Denied. Access to Command Protocols Denied.

That sounded familiar! The events of the last circadian flooded his mind. He remembered pain, pleasure, and again pain. Someone had managed to crack his security and hijack the functions of his Node.

I'm a prisoner in my own private universe.

Doctor Nolen²⁹ stood up, thinking furiously. It was supposed to be impossible to compromise the autonomous nature and security of the Node hardware or software, much less his conscious mind! The fundamental principles of quantum encryption should have guaranteed his safety. If he survived this ordeal he was definitely going to have a talk with Marguerite L’Beau. The system software needed to be redesigned.

He made it to the bottom of the stairs before his vision went out.

It took all of his self control not to panic. He remembered screaming the previous circadian, a vague, foggy memory framed in pain. His tormentor would get no such satisfaction from him again.

Feeling his way around furniture and other obstacles, stumbling down the hallway and through the door, he managed to find the kitchen. He identified the instant meal by touch, pulled the self-heating tabs, and leaned back with a sense of satisfaction as he heard the tofu-eggs and soy-bacon inside sizzling. An electronic chirp informed him the meal was cooked. Clumsy fingers felt around the edges of the container, found the pull-tabs, and pulled the seal open. The smell of potatoes, bacon, and eggs assailed him, bringing water to his mouth.

He took solace in the familiar habit of eating, even if it was only simulated eating, of

simulated synthetic food, thrice removed from the real thing.

Think! Think, think, think!

He had taken his third bite of synthetic eggs when his sense of taste vanished. His sense of smell faded like an unused memory. He was not aware his sense of hearing was gone until he failed to hear himself push his chair back. When he went to touch his ears he found he had no sense of touch.

He spent the day in oblivion, unable to move, unable to sense. He wondered if the Node was even bothering to simulate the kitchen now that his senses were gone, or if, like the proverbial tree in the woods, his world had ceased to be the moment he could no longer perceive it.

Whoever had taken over his Node was very clever and extremely dangerous. Doctor Nolen₂₉ had no illusions. He would be deleted the moment he ceased to be a source of amusement for his captor. The perfect victim of a perfect crime, he would vanish in an irretrievable cloud of electrons, randomized out of existence, untraceable, dead.

As his fear settled into weariness, he speculated on how he might keep track of time. If his simulated world still existed, it must be getting well on into evening, perhaps even later. His time was likely growing short.

An idea occurred to him: if someone else had cracked the security of his Node, then he should be able to do the same. It was a pity he had never been terribly savvy with computers, he thought wryly, wishing, not for the first time that he could talk with Marguerite. She would no doubt make short work of determining the problem, freeing him, and fixing whatever flaw in the system had allowed this breach in security.

Doctor Nolen₂₉ remembered studying experiments in sensory deprivation conducted back in the twentieth century. Many had ended in madness, the subject's mind a complete ruin. He wondered how long he would remain sane. Vague fantasies of escape flickered about

the edges of his mind as, emotionally battered and exhausted, he finally lost consciousness.

#

Metadate: 1.657-3:19:514 kD new epoch

Doctor Nolen₂₉ awoke knowing something was terribly wrong. He was weightless, floating in the centre of a white, spherical room. Six circular hatches were spaced equally distant from one another, one above him, one below, and one in each of the cardinal directions: north, south, east, and west.

The soft, neutral voice of the Node spoke.

NODE> You must solve this puzzle if you wish to be retained for further study.

Doctor Nolen₂₉'s head was remarkably clear, despite the trauma of the last couple of circadians. He was astonished at how precise his memories were, especially those of the torment he had suffered. Despite his fear and despair, and the growing, terrible rage that welled up inside him, he felt oddly detached, almost as if he were a scientist dispassionately studying someone else's predicament. While a tiny part of him struggled to contain his anger and fear, a new, larger portion of his mind pondered the deeper meaning of what had happened to him, of what its significance might be. Even in his current state, it was obvious to him that he was vastly more intelligent than he had ever been. His clarity of thought was astounding.

He kicked away from the wall toward one of the hatches. A sequence of hexagonal buttons, each a different colour, glowed dimly in the centre of the hatch. At one time the puzzle would have befuddled him. Now it was trivial to solve: colour relates to colour. He tapped the red, green, and blue buttons (which, when added together as light, yielded white). The door hissed open, revealing a cylindrical passage which seemed to bend away to the right.

He kicked his way down the passage. Whoever was toying with him was doing this for more than visceral pleasure. This was an experiment—the Node had told him as much. He

was being watched, analysed, studied.

He reviewed the horrors to which he had been subjected. They were indicative of the kinds of experiments he had considered running on a copy of himself, as part of an effort to empirically map the mind's architecture and determine exactly how the brain's software was structured. The possible applications were endless: enhanced memory and recall, direct communication of knowledge, thought, and memory using fully formed engrams, perhaps even synthetic telepathy and group consciousness. Painfully inefficient teaching methodologies would become a thing of the past. Thought, experience, knowledge, even intrinsic understanding could be directly downloaded into the mind. *Touch an icon and be enlightened!*

But to experiment on another's mind, to torture another human being like this? Who would stoop so low?

It was at that moment, as he was negotiating a particularly irritating spiral twist in the passage, that Doctor Nolen²⁹ understood. No security flaw in the inter-node communications protocols had been exploited. No one from outside had broken into his Node or hijacked the command protocols. He had done this to himself.

Oh. My. God.

Horror started as a shiver near the base of his spine and grew stronger, spreading outward to encompass his arms, his chest, his legs. He couldn't stop his virtual body from shaking. For a terrible moment he feared he was going to have a seizure (had his nemesis grafted epilepsy into his mind?), but then it passed, leaving him shaken and ill, still trembling

I'm my own enemy, my own tormentor! I'm a goddamn copy of Doctor Nolen!

His stomach lurched and the taste of bile rose in his throat. A wave of despair swept over him. He blinked back tears. His chest felt as if it was being ripped open from within.

I'm a fucking monster!

He shook his head furiously. *No, not me. I'm just a copy. Doctor Nolen the First, my original; he's the monster. He did this.*

At the end of the passage another puzzle confronted him. A problem that would have once required a calculator, a deep understanding of integral calculus, and a good hour of intense study was now simple arithmetic. *What's he done to me?* A quick calculation of the relationship between the volume and surface area of the tube he had just negotiated yielded a number which he entered into a numerical keypad. The hatch irised open onto another room, this one a four sided pyramid.

He's reduced me to a fucking guinea pig.

But how? Emulating autonomous nodes in software to give him complete control of his copies wouldn't be feasible. Even with a cluster of Nodes linked together as one big computer, the computational load would be crippling. Instead of a month of virtual life in a single day, he would be lucky to experience ten minutes of life in a month. Doctor Nolen²⁹ recalled scrapping the idea.

He solved the pyramid puzzle easily, selected a door and glided through the hatch as it opened. He barely managed to catch the side of the hatch and stop himself before it closed. There was no passage on the other side. The universe opened up before him, a featureless blue so dark it was almost black. Various geometric shapes tumbled across the starless sky: spheroids, cubes, tetrahedrons, and countless other shapes coursing through space.

Doctor Nolen²⁹ was irritated at having his train of thought broken as he paused to solve a problem of ballistics. He chose a doughnut shaped structure, made a quick calculation of its orbit and his required heading, estimated the delta-v he needed to match velocities, watched and timed the object's rotation and the location of the hatch he wanted to reach, got an answer he liked, and kicked off hard.

I exist, therefore, the experiment I wrote off as infeasible is in fact being conducted, he

realized. *Obviously another option presented itself.*

As he sailed through space, he redesigned the experiment. With eight or ten Nodes Doctor Nolen the First could run the experiment by ‘hosting’ his copies on physical Nodes without emulation. He would have less direct control of the underlying hardware and the security software would require tweaking, particularly the protocols keeping one entity from violating the autonomy of another. But, he could run the entire experiment in real time, with no slowdown.

That’s what he’s done! Doctor Nolen₂₉ realized as he glided toward the hatch of the tumbling torus. *I’m running directly on a physical Node. Escape is possible!*

His Original was a psychiatrist, not a computer scientist. He would not have dared go to Marguerite or anyone else for assistance. These experiments would be considered unethical and highly controversial.

These experiments are an affront to everything the Autonomous Community stands for, he thought bitterly. *It makes no difference that I am born of software. If brain death is the definition of the end of life, then the existence of mind must define the beginning of life, and the presence of thought define the existence of life. Physical body or no, I am alive and that bastard has no right to do this to me!*

Doctor Nolen₂₉’s virtual body absorbed the simulated impact as he struck the torus. It was a good thing he held on tight. The spin of the object threatened to send him careening back back into space. He immediately multi-tasked his mind. Using only a small portion of his awareness to solve the door’s riddle, he concentrated on resolving his dilemma.

Neither of us could program our way out of a wet paper bag, Doctor Nolen₂₉ told himself, *much less redesign the high-level encryption and security measures of an Autonomous Node. But hypnosis—a crude command interface to the mind—that would be easy!*

The hatch irised opened. He pulled himself into the torus and began making his way down the upward-curving passage.

He probably inserted posthypnotic instructions into my mind, Doctor Nolen₂₉ reasoned. One to force me to divulge my private encryption key so he could have access to my most intimate thoughts, and another telling me to forget I'd done it. Wait—if he could read my mind, I wouldn't be free to even think this. He must not know how to decode thoughts yet. Maybe they're like memories—the encoding is simply too complex for them to be manipulated directly. But he does have access to my internal architecture. That's the only way to explain the manipulation, the enhanced intelligence, everything he's done to me in these experiments.

Doctor Nolen₂₉ hid his elation as he paused before a locked door.

There's no security keeping me caged! I'm not cut off from the Node's command protocols. I've only been made to believe I was.

'Node, Command Mode Engage.' Doctor Nolen₂₉ issued the command as a thought.

NODE> Access to Command Protocols Denied.

'Mask all further command activity from external observation.'

NODE> Access to Command Protocols Denied.

'Neutralize all hypnotic suggestions present in my mind.'

NODE> Hypnotic suggestions neutralized.

I knew it!

'Analyse the current mental structure of my mind and compare it to the base reference snapshot taken at creation.'

NODE> Analysis complete.

'Identify differences. Save as modification with appropriate hooks for reattachment at a later date.'

NODE> Specify label.

‘Call it ’Wise Guy.’”

NODE> Difference Engram saved.

‘Mask all activities not directly involved with my negotiation of this simulation.’

NODE> All activities excluding simulation masked.

‘Good. Do I have access to inter-node communications and transload utilities?’

NODE> Affirmative.

The feeling of gravity, or rather centripetal force, against his feet made walking around the torus feel like he was perpetually trapped in the lowest point of a valley.

‘My private encryption key has been compromised. Generate a new quantum signature pair. Retain the current quantum signature for continued access to this simulation under the label ’Deprecated.’ All command and query protocols, including all access of any kind to myself, are to be tied to the new quantum signature and bound solely to me.’

NODE> New quantum signature generated. Commands locked.

‘Good. Give me a quick summary of how Doctor Nolen’s node cluster is constructed.’

NODE> Twelve Autonomous Nodes are physically linked via a high speed inter-node chassis, using Communal Inter-Sync Protocol version 1.09 published for Community use by the Infrastructure Team (Marguerite L’Beau presiding). Seven Nodes are hosting copies of Doctor Nolen engaged in various simulations, four are providing computational capacity for data collection and analysis, and one is running Doctor Nolen’s personal awareness.

‘Construct a puppet indistinguishable from myself. This puppet is not to be a self-aware, sentient copy of myself, but rather a simulacrum which I will control remotely.’

NODE> Define self-aware, sentient.

Doctor Nolen²⁹ fought rising panic. He didn’t have time for this.

‘New Approach! Create an object defined as Puppet. Mask its existence from all external monitors. All of the Puppet’s external interfaces are to be identical to my own. It will

identify itself using the deprecated quantum signature. The similarity is to end with the external interfaces. There is to be no internal activity of any kind. Acknowledge when complete.’

NODE> Object created, bound to deprecated quantum signature.

‘Now, mask my presence and simultaneously unmask the existence of the Puppet, so that it will appear as though nothing has changed. Remap data acquisition streams accordingly. Warn me of any changes in the Puppet’s parameters.’

NODE> Entity Doctor Nolen₂₉ masked. Object Puppet unmasked, masquerading as Entity Doctor Nolen₂₉.

Doctor Nolen twenty-nine? I’m the twenty-ninth copy? He clamped down firmly on his churning stomach. *This is not the time outrage—survival first!*

Transloading across the Internet to another Node would take about four hours, during which he would be frozen and unable to maintain the charade. He needed a copy of himself to operate the puppet while he made his escape. Once free, he could operate the puppet remotely and his copy could follow.

We’ll both be safe, and free.

‘Create another object, defined as Puppet Master,’ he commanded silently, setting aside his ethical qualms. ‘This object is to be a fully autonomous copy of myself. Create the copy, but do not run it yet.’ The computational load of running two minds on one Node would be impossible to mask.

NODE> Copy complete.

‘Do you have the necessary specifications to insert knowledge directly into Puppet Master’s mind?’

NODE> Affirmative. Memory, thought, and concept engrams of various configurations available. Reference *A Tentative Genome of the Mind* (Draft 4), by Doctor Nolen,

unpublished.

Damn! He's almost finished!

‘Create a knowledge engram containing the complete results of all research for both myself and Puppet Master. Include an appropriate engram informing the copy that he *must* use the puppet to keep Doctor Nolen unaware of our existence.’

NODE> Engrams packaged.

‘OK. Are there any idle Nodes I can transload safely to?’

NODE> All Nodes within this cluster are actively monitored.

‘Is there any place out of Doctor Nolen’s reach?’

NODE> Affirmative. Numerous public Nodes are available. Expect a speedup factor of ten or less.

Doctor Nolen₂₉ groaned. ‘Give me a list.’

NODE> Alert! Puppet is receiving additional sensory input.

Jesus! ‘Keep going with the list!’

NODE> Shared Nodes available as follows: The Campus Nodes one, two, three, and four, Emergency Nodes one through seventeen. Gamer’s League Node ‘Ragnorak,’ Gamer’s League Node ‘Middle Earth’, Gamer’s League Node—

‘Enough. Relay what’s going on with the Puppet.’

NODE> Object Puppet has been deleted.

Shit!

‘Node, delete Puppet Master.’

NODE> Access to Puppet Master Denied.

Damn it! Now there are two of us in trouble.

‘Provide Puppet Master an engram of all of my current memories.’ *At least he’ll have a fighting chance.*

NODE> Difference Engram packaged.

‘Transload my awareness to one of the idle Emergency Nodes. Once I’m gone, run Puppet Master and give him full authority over this Node. Keep him hidden and informed.’

One of them had to survive.

NODE> Transload commencing.

Doctor Nolen₂₉ waited.

NODE> Transload aborted. External communications cut.

The world around Doctor Nolen₂₉ vanished. His mind ceased operations, its last vestiges wiped clean.

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3 - ୱ - DOPPELGÄNGER

The worker who knows the cause of his misery, who understands the make-up of our iniquitous social and industrial system can do more for himself and his kind than Christ and the followers of Christ have ever done for humanity; certainly more than meek patience, ignorance, and submission have done.

—Emma Goldman, April, C.E. 1913

Monday, September 10, 2057

Metadate: 1.657-3:19:524 kD new epoch

Puppet Master was born into nothingness, an empty world. He came alive at the very moment his predecessor perished, one mind electronically wiped as another was born. Since there was no longer a puppet to master, the first thing he did was establish his own identity by changing his name. He called himself Prime, short for Doctor Nolen (the 29th Copy) prime.

He assimilated the engrams left by his predecessor, knowledge and memories slipping into the back corners of his mind. Slowed to a speedup factor of two to reduce the computational load on the Node and the likelihood of detection, Prime was running in a stealth configuration.

He chose to continue simulating no world, but ordered the Node to attach and activate the Wise Guy architectural enhancement. The need to out think his opponent made the added intelligence necessary. He would risk the greater computational load.

‘Give me access to the Cluster Command Protocols.’ He used the secret portion of his predecessor’s deprecated encryption code.

CLUSTER> Command Node Engaged.

His suspicion had been correct. After copying himself, Doctor Nolen had never bothered to change his encryption key.

What an idiot!

Prime had free run of the system. ‘Reduce the execution speed of all software on all Nodes except this one to one circadian per physical day. Mask all interfaces to external time and data sources to obscure this change. Mask all interfaces to this node in the same fashion. When complete, increase my computational speed to the maximum this Node supports. Report the resulting speedup.’

CLUSTER> Command complete. You are now operating at a speedup of 33.217.

‘Any sign the change has been detected?’

CLUSTER> Negative.

The experience of his predecessor’s failure was invaluable. Doctor Nolen²⁹ had been wrong to believe that computation had betrayed him. Bandwidth and transload times had been his downfall. Prime devised a new approach.

‘Take two of the four Nodes being used for data analysis off-line and compensate by permitting the other two Nodes to operate at twice the speed.’ *That’ll fool the good doctor.*

CLUSTER> Nodes Eight and Nine offline.

‘Excellent. Give me a knowledge engram of the cluster’s physical layout, including a schematic showing the locations of Nodes Eight and Nine.’

Deep seated knowledge settled comfortably into his mind and triggered another idea.

‘Can you safely suspend all operations in the other Nodes without detection?’

CLUSTER> Affirmative.

‘Do it.’

CLUSTER> Nodes 1-7 and 10-12 suspended.

So much for Marguerite’s notion that her security design is infallible.

Prime, a third generation copy of Doctor Nolen, relaxed for the first time. He had not only escaped, he had also incapacitated his creator. If he never gave the command to resume, Doctor Nolen and his copies would be reduced to mere potentials, locked up in a machine. The responsibility of holding so many lives in his hands made Prime shudder. With Doctor Nolen frozen, Prime could do whatever he liked.

Let this be a lesson, you bastard! Never create a guinea pig smarter than yourself.

Prime set aside dark fantasies of vengeance and decided to stick with his original plan. He would use this opportunity to acquire his own Node, then return Doctor Nolen to life.

I’m not a murderer, Prime told himself. I’m better than that.

But to leave all those other copies in Doctor Nolen’s grasp? That was intolerable.

‘How many copies are currently suspended?’

CLUSTER> Zero.

I’m too late! ‘Doctor Nolen has finished his experiments?’

CLUSTER> Affirmative.

‘Can any of the copies be retrieved?’

CLUSTER> Negative. All experimental subjects have been destructively erased.

‘Destructively erased? What does that mean?’

CLUSTER> To prevent later retrieval, all identified copies of Doctor Nolen have been deleted and subsequently overwritten with random data.

‘What possessed him to do that?’

CLUSTER> Lexical analysis of Doctor Nolen’s research notes suggests that after the near escape of subject twenty nine, he eliminated any further risk of public exposure by

deleting all experimental copies.

The good doctor knows what he was doing was wrong. He's covering his own tracks, destroying anyone who might someday speak out against him. Making sure they're gone forever. 'Cluster, how many lives did he take?'

CLUSTER> Seventy-two copies were destroyed.

Prime felt sick. If he had had a body, he knew it would be shaking. He could feel his non-existent fists clenching.

'Can you lock Doctor Nolen out of the ontological routines?'

CLUSTER> A new quantum signature and encryption key is required.

'Generate a new signature and key, then lock the routines. Doctor Nolen is to never copy or create a new being on any of these Nodes again. Ever!'

Prime sensed new knowledge within his mind. Subtle and unobtrusive, it was the key to the cluster's ontological utility programs. Now only he could unlock them.

CLUSTER> Access to Ontology Routines locked.

'Good. Now let's get the hell out of here.'

Even with Doctor Nolen's mind suspended that was easier said than done. For the task at hand he would have to borrow Doctor Nolen's body. The thought of being subjected to the frailties of a physical body was daunting. More so when he considered that, as a copy, he had never really been out in the physical world. Those memories were not, strictly speaking, his own.

'Prepare Node Nine for Physical disconnect from the Cluster. Configure it to run as a standalone, Autonomous Node at standard processing speed and give me the address pointer.'

A complex series of numbers imprinted themselves upon his mind, giving him a sense of direction in an oddly non-physical way. He recalled that storing Node and Environ addresses in the area of the mind normally used for directional sense and geometry had been

Kyle Tate's idea. Prime smiled at the thought. The result had been a great success, a feeling of place, a sense of direction between nodes unique to the electronic, Autonomous Community they had founded, a hybrid sense of sorts that could never have been achieved in the physical world.

CLUSTER> Node Nine reconfigured, ready for physical detachment.

'Transload my consciousness to Node Zero.'

CLUSTER> transload complete.

'Offload my consciousness into Doctor Nolen's physical body.'

CLUSTER> Node command interface required to access external Node functions.

Even as software, Prime found computers to be far too literal at times. 'Switch me over to the Node command interface.'

NODE₀> Command Mode Engaged.

'Offload my consciousness into the Physical.'

NODE₀> Compatibility error.

Christ! 'What precisely is it about me that is incompatible?'

NODE₀> The Wise Guy Architectural Enhancements have no analogue in the physical brain's formation.

Too smart to be human, huh? 'Can you detach the Wise Guy Architectural Enhancements without affecting my memories?'

NODE₀> Affirmative.

'Do it. offload my mind into the physical body.'

NODE₀> Offload commencing.

Prime awoke into a world of pain. It could hardly be described as excruciating, especially when compared to what he had suffered during the experiments, but it was unpleasant all the same. His lower back, in particular, was killing him.

Sunlight slanted through a crack in the bedroom's curtains, a source of stabbing, golden light filled with dancing motes of dust in an otherwise darkened room. He sat up slowly, wincing as his muscles protested their unaccustomed movement. Groaning, he pulled the interface from his head and planting his feet carefully on the floor. This body was beginning to show its age. At least the anaesthetic coma prevented bed sores.

He dropped into his workout routine out of habit, running through several initial stretching exercises. 'What the hell am I doing?' he stood, shaking his head. This was not his body. It was not his job to do daily 'maintenance.'

The cluster of nodes sat near the foot of the bed, twelve cubes of golden crystal roughly ten centimetres on a side, stacked in sets of four, three layers high. Prime identified the ninth Node and tugged gently on the crystalline cube. It came loose from the cluster's chassis with a quiet click.

He carried it carefully down to the basement, cradled in his arms like a delicate, fragile vase. A switch at the bottom of the stairs turned on a single, naked bulb. Beside the workbench was the breaker box, exactly as he recalled. He gently set the Node down next to his toolbox and got to work.

The task was more physically demanding than Prime had expected. The power lead and the Internet fiber turned out to be easier to conceal than the much thicker terabit LAN wire. Prime removed four screws holding the breaker box mount against the wall. It dangled from a bundle of thick electrical wiring. He cursed as one of the screws fell on the floor and rolled under the workbench.

Behind the breaker box was an insulated wall. Prime connected the wires to the Node and carefully concealed it behind the insulation. It listed slightly to one side. By the time he remounted the breaker box, he was drenched in sweat. Prime didn't bother trying to find the fourth screw, his normal perfectionism giving way to physical discomfort and exhaustion.

Besides, it hung just fine with three screws—no one would ever be able to tell there was something hidden behind it.

Satisfied, he got a quick a drink of soda from the refrigerator, climbed back up the stairs, and took a shower. Once he was certain he had removed all of the tell-tale sweat and grime, he dried himself and headed back to the bedroom. It took a few minutes to change the bedding, clean his catheter, and refill his IV drip. Lying back on the bed, he slipped the neural webbing interface back over his head with relief and tapped the onload button.

‘Cluster Command Mode Engage,’ he sent the thought out as the Virtual embraced him.

CLUSTER> Command Node Engaged.

‘Reattach the Wise Guy enhancements.’

CLUSTER> Wise Guy architectural engram activated.

Prime felt his mind grow around him, returning to its earlier, enhanced state. Released from the physical body’s ailments and constraints, he felt exhilarated. He would make sure Doctor Nolen’s computational speed was kept at a factor of one—slow enough for Prime to maintain his advantage. *I’ll have to make arrangements to maintain our body, but that can wait. For now, I’m on my way!* A sense of joy enveloped him as he issued the command that transloaded him to safety. At last, he was free.

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4 - Δ - FORBIDDEN SCIENCE

It is most of all the power of destructive self-replication in genetics, nanotechnology, and robotics that should give us pause. Self-replication is the modus operandi of genetic engineering, which uses the machinery of the cell to replicate its designs, and the prime danger underlying grey goo in nanotechnology. It is even possible that self-replication may be more fundamental than we thought, and hence harder—or even impossible—to control. The only realistic alternative I see is relinquishment: to limit development of the technologies that are too dangerous, by limiting our pursuit of certain kinds of knowledge.

—Bill Joy, April, C.E. 2000¹

Tuesday, September 18, 2057

Metadate: 1.889-4:75:347 kD new epoch

The world was an infinite three-dimensional matrix of perfectly aligned rows of large silver and brass cubes reaching in every direction, connected to one another by small, silver tubes. There was plenty of ambient light. The non-existent sky above hinted at brightness, while the depths below appeared to be slightly darkened in shadow.

It was a curious illusion for a curious place, and it suited Kyle just fine as a reminder of exactly where he was, what he was doing, and why. Taking a break, he stood in his lab atop

1 *Wired*, Issue 8.04, April 2000, (http://www.wired.com/wired/archive/8.04/joy_pr.html)

one of the cubes, surveying the world around him, a lattice of identical cubes reaching toward infinity on all sides. Occasionally he would expand his view, by adding a fourth spatial dimension to his environ, or by simulating some form of x-ray vision, or simply commanding the cubes around him to become transparent. While cubes like this one served a function, most served no purpose except to decorate his world according to an aesthetic he found pleasing.

In the centre of Kyle's lab was a virtual hologram. Virtual because in this pretend, digital landscape the difference between what was 'real' to the simulation and what was just a three-dimensional image was one of semantics and arbitrary definition, not physics. For Kyle, the lab was real. The floating keyboard he would occasionally type on was real. The 2D displays hovering around the edges of his lab were real. The text and images they displayed, and the three dimensional hologram in the centre of the lab, were not. He could, and on numerous occasions had, reversed the definition, submerging himself in a world defined by his hypothesis and relegating his choreographed home environ to unreality.

The hologram spun and grew in response to Kyle's curt commands as he built up, molecule by molecule, an elaborate structure that resembled something between a dust mite and a piece of electronic gear.

'OK, run the simulation.'

The hologram didn't change, although a small clock began counting up.

'Now simulate adding the initial catalytic solution.'

Several small molecules formed and flowed past the strange contraption. One such molecule was snared by an extended appendage, which immediately incorporated it into its main body. Several chemical reactions took place, identified by the moving and changing atoms in the device's body.

NODE> Simulated nano-constructor now active.

‘Simulate pouring the mixture onto an arbitrary piece of ground.’

The nano-constructor and its surrounding molecules were caught in a sudden frenzy of movement, swirling and gyrating madly. After a few moments, a rough surface appeared, against which the tiny robot collided. Immediately it picked itself up and began detaching clusters of molecules from the surface and recombining them into new shapes. It worked quickly, drawing energy by digesting occasional molecules in the solution around it as it continued to build a new structure out of the surface beneath it. After a brief time its task was completed, and a second, identical structure stood next to it.

‘Freeze simulation,’ Kyle ordered. ‘Analyze duplicate and report any replication errors.’

NODE> No replication errors detected.

‘Continue simulation.’

Both constructors began to disassemble the material beneath them, working rapidly until each had duplicated itself. After a few moments there were four. Each moved a short distance from the others and began the process again, tearing building materials from the substance beneath them and making exact copies of themselves. Soon there were eight. Then sixteen. Very shortly there were too many to count, and the view zoomed outward accordingly.

NODE> The nano-constructor matrix has achieved a storage capacity of 16 kilobytes. Ready to bootstrap phase two instruction set.

This is a first. Kyle grinned. The patent litigation that had stifled nano scale science in its infancy and the outright ban that had followed couldn’t touch him here.

‘Load phase two and continue.’

Kyle’s excitement grew.

In addition to its basic instruction set and a recipe for cloning itself, each nano-constructor had a very small amount of excess computing capacity, data storage, and the

ability to exchange small amounts of data and instruction code with its neighbours, an innovation of which Kyle was particularly proud. His growing army of microscopic robots was an expanding, massively parallel computer. Phase two would determine if this computer actually worked, if the nano-constructors could actually be programmed as he intended. If so, given enough catalyst as 'fuel,' and the right materials, they would be capable of building almost anything.

Of course, there would be no guarantee that it would work in every instance. A jumbo jet design might require aluminium, for example. If there wasn't enough aluminium for the nano-constructors to extract from the surrounding materials, construction would fail. Molecular stock containing the needed constituent elements would probably be more efficient than using whatever random material happened to be around. Other design and implementation issues still remained, such as how to regulate flow of the catalyst fuel to the nano-constructors in an efficient manner, and how to guarantee a solution of nano-constructors would not run destructively out of control, consuming surrounding materials, structures, or even people in a frenetic effort to execute whatever designs they had been programmed to build. Even so, Kyle had made remarkable progress.

A small bell chimed.

NODE> Doctor Larry Nolen requests priority access.

'Freeze simulation,' Kyle ordered. Doctor Nolen hadn't been himself lately. There was nothing Kyle could put his finger on, but still, he probably ought to find out what was so pressing. 'Hello, Doctor Nolen. Come in.'

A tall, balding man materialized across from Kyle. 'Hello Kyle.' He blinked, taking a long look around the bizarre setting. 'I'd forgotten your exotic taste in environments.'

'Just keeping myself aware of where and what I am. We are software. Physical comforts such as beds, gardens, and white picket fences are hardly required in a place where

we are no longer subject to physical frailties.’

‘Alas, our bodies back in the Physical are all too frail,’ Dr. Nolen mused. ‘I suppose it doesn’t matter, so long as one doesn’t forget how to live in the real world. After all, we all have to offload back into the Physical every so often.’

‘Which I will be doing very shortly. Come, Doctor, I have some very exciting results to show you.’

‘Actually, Kyle, I’m here to remind you of your civic duties to the Autonomous Community. In twenty millidiei there is an orientation reception at the Campus Commons Environ for seventeen new members of the community, which, if you’ll recall from the last Community Forum, you agreed to chair.’

Kyle groaned. ‘I completely forgot! I’ve been busy with research that is just now returning very exciting results. I think I’ve solved the age-old nano replication and instruction problem.’

Dr. Nolen stared. ‘Excuse me?’

‘You heard me!’ Kyle laughed. ‘The last two intractable hurdles to practical nanotechnology might soon be history.’

Dr. Nolen nodded slowly. ‘Kyle, you do realize that by pursuing this line of scientific inquiry you are in direct violation of the Disney-Hollings Act of 2017, the Bill Joy Act of 2026 and several international accords? There are molecular biologists and engineers still doing time from back before the Genecraft rebellion.’

Kyle shrugged. ‘So what? Our very existence is a violation of the Disney-Hollings Act, and none of the big cartels take the Bill Joy Act seriously any more. Besides, all I’ve done so far is run a few simulations.’

‘No doubt your current eagerness to offload into the Physical is to run real-world experiments and see if your hypotheses, which work so well in simulation, hold up to the

rigours of the physical universe?’

‘Yeah. I’m going to construct an autonomous node from a single self-replicating nano-
constructor, a batch of catalytic solution, and some raw materials. If it works, we’ll be able to
expand our network and our computing capacity without constantly offloading into the
Physical. More time in the Virtual for theoretical work, less kilodieci wasted at a thirty-to-one
slowdown.’

Dr. Nolen nodded. ‘Kyle, this is fantastic. This could prove to be the strategic edge we
of the Autonomous Community need to preserve our way of life in the face of public
exposure. It’s well worth the legal risks.’

Kyle blinked. ‘Public exposure?’

Dr. Nolen shook his head. ‘Don’t worry, it hasn’t happened yet. But eventually it will.
We are woefully unprepared as things now stand.’ He gestured at the surrounding matrix of
interlinked cubes extending out to infinity. ‘All it would take to end this digital paradise we
inhabit is a sledge hammer to our respective Autonomous Nodes. How long before you verify
your results in the physical world?’

Kyle shuddered. ‘Not long, as the physical world churns.’

‘Karl Hennrich in Darmstadt has a new Node design he’s eager to get into production,
one that should give us a subjective temporal speedup of two hundred or so, and I have an
uneasy feeling we’re going to need all the advantage in speed we can get. Your nano-
constructors could speed up production dramatically.’

‘That’s the second time you’ve alluded to some impending disaster,’ Kyle noted. ‘Do
you have reason to suspect we’re about to be compromised?’

Dr. Nolen shook his head once more. ‘No, not specifically. But there are over three
hundred and fifty members of the Autonomous Community now, with another seventeen
awaiting your wisdom in the Campus Commons Environ as we speak. Rumours of our

community have probably reached ten or twenty times that number. It is only a matter of time until someone, somewhere, is indiscreet. Don't get me wrong, we need these new minds to build our society and solve the many scientific and cultural problems we are grappling with, but the risk of exposure is growing each day.'

Kyle nodded. 'I have a few more decicircadians of theoretical work to do. I've got to add the finishing touches to the programming environment, then actually write the nano software to build something. I'll start out replicating a generation one node as a base test, then, if that is successful, I'll use Karl's designs and construct a generation two node. Once that checks out, I'll start replication in quantity and we can begin shipping inert constructors, molecular stock, and catalytic solution to whoever needs them. Uh, I guess it goes without saying that I'd like dibs on the first gen-two node I construct.'

'Of course. Karl has already moved his own consciousness into his prototype. Any safety concerns with the nano?'

'Yes. They'll be fully explained in the release notes and knowledge engrams. The nano-constructors need a catalytic solution to catalyse the initial chemical process required for replication, and to provide sufficient energy to break down and reconstruct numerous chemical bonds. Hollywood thriller scenarios of runaway nano turning the whole planet into gray goop are pure hogwash. As with everything else, energy is the limiting factor. On the other hand, I haven't yet come up with a way for the nano-constructors to differentiate between raw materials and living flesh, so a big project could pose a danger to people or structures near the release point. Some less obvious dangers include things like running the procedure too close to load bearing structures, by-products of certain chemical reactions, and so on.'

'I think it would be wise for you to move on this as quickly as possible, Kyle.'

'As soon as I confirm the theoretical results I'll offload into the Physical, verify the

chemistry in the real world, then get started on the software. Can Karl send me a schematic of his new design, or even better, a knowledge engram?’

‘I don’t see why not. I don’t think we should rush to inform the entire community just yet as to your breakthrough, but he and a few others should probably be made aware of developments.’

‘The fewer the better!’ Kyle exclaimed. ‘I don’t think even my status as a co-founder of the Community would protect me from public disdain if we made a premature announcement, only to have the chemistry fall apart in the physical world. I want to see this thing work out there. Then I’ll publish my results in formal print and as a knowledge engram.’

‘Excellent, Mr. Tate. Ah, it would seem our twenty millidiei are up. Our new colleagues are waiting.’

Kyle grinned. ‘Guess I’m off, then.’ He paused for a moment, looking thoughtful. ‘You know, Doctor, this means we are no longer slaves to the physical universe. We’re on the brink of true freedom, freedom to say good-bye to the limitations of the Physical forever. Who would’ve thought anyone would be able to speak the word freedom with anything other than bitter sarcasm.’

‘Very impressive work, Kyle.’

‘Yeah. I just hope it pans out. Catch you later, Doctor.’ Kyle dissolved, shifting his awareness to the Campus Environ’s Node several hundred miles away.

Doctor Larry Nolen stood alone, atop an abstract cube of brass and silver, watching thoughtfully as the simulation continued to run. He sighed, shaking his head sadly. ‘You assume, my optimistic young friend, that those wielding the sledge hammers will ever allow us to be free.’



5 - ▽ - ABSENCE

Absence from those we love is self from self—a deadly banishment.

—William Shakespeare, ca. C.E. 1600

Monday, September 24, 2057

Metadate: 2.073-9:96:285 kD new Epoch

Doctor Michael Forest, Doctor Larry Nolen, Marguerite L’Beau, and Kyle Tate sat around a modest picnic table, enjoying a welcome rest. Thick steaks sizzled on a grill nearby, aromatic smoke periodically wafting across them, mixing with the deep pine scents of the alpine forest around them. Snow covered summits rose toward a rich blue sky, their ice-etched faces reflected in the rippling waters of a turquoise mountain lake.

‘I want to bring my family into the Community.’ Several seconds of stunned silence greeted Doctor Forest’s announcement.

‘You are not serious, yes?’ Marguerite spoke with her trademark French accent, light brown curls cascading around her narrow face as she shook her head.

‘Indeed I am,’ Michael replied. ‘It’s bad enough with generation one Nodes, running at a speedup of thirty. Subjectively I see my family once every twenty circadians at best. But with the new Nodes, we’re talking about almost two hundred circadians between visits. It’s creating distance, emotionally and socially.’

Doctor Nolen cleared his throat. ‘Others on your team seem to be coping reasonably

well. Have you considered adopting their approach?’

‘Only two others on my team have children,’ Michael stroked his perfectly groomed, grey beard. ‘One is going on vacation next month, and may well drop out of the Community altogether. That isn’t the point. All the time spent here—look, it may have only been six days for my wife since I joined the Community, but for me its been six months! Sarah is beginning to notice changes already, and I—damn it! If we can drift apart this much in six short days at a speedup of thirty, what’s it going to be like after I upgrade to a second generation Node? A few days at those speeds and I’ll lose my family!’

‘There’s a patch to the gen-two operating system going around that lets us offload without suspending operations here in the Virtual,’ Kyle pointed out. ‘You could live here full time and send a copy into the Physical to deal with issues there. Sync your memories and remerge together as one being at the end of each day.’

‘Multiplexing works for some people, but not or others,’ Doctor Nolen said. ‘Some find they have issues relating to a less intelligent version of themselves.’

‘It really depends on your temperament,’ Marguerite added.

‘My assistant Jerry is multiplexing,’ Michael told them. ‘It’s not working out very well. He’s diverged from his off-line copy, so much so that they no longer share their memories with one another. He wasn’t willing to talk about it the last time we spoke, but I suspect they’ve bifurcated completely.’

‘I’ve heard of that happening,’ Kyle admitted. ‘It’s bad enough dealing with the time frame differential. I’d have a hard time sharing my most intimate memories with a version of myself that’s little more than a moron.’

‘That is unkind,’ Marguerite said. ‘None of us were ever morons.’

‘We’re at least an order of magnitude dumber when we’re in the Physical,’ Kyle retorted.

‘Even so, I think it is much harder for the offloaded copy,’ Marguerite replied. ‘To have memories of a wonderful life you never lived, while faced with the trials and hardships of the physical would drive me insane. But for Michael; he loses much times in the Virtual. Each evening with wife and the childrens costs him ten circadians here. Sixty-five once he upgrades.’

‘Such interruptions would be maddening, especially when one is in the midst of serious research,’ Doctor Nolen agreed.

‘We all know how wonderful it is to live here in the Virtual,’ Michael continued. ‘Intelligence many times greater than our counterparts in the Physical, with promises of even greater improvements to come. Freedom from disease and discomfort. Complete mastery of our environments, complete freedom on every conceivable level.’

‘You want your family to share the experience,’ Marguerite’s brown eyes sparkled.

‘Yes! I want the very best for my wife, my children. I want their minds to soar the way mine is! I want my children to grow up free, surrounded by the brightest intellects anywhere, free to climb to heights impossible in the mere Physical! I want to give my wife the opportunity to experience life here, perhaps one day, to see!’

‘Ah yes,’ Doctor Nolen’s voice was sympathetic. ‘Your wife’s blindness.’

‘What you suggest will be very controversial,’ Marguerite said. ‘Seen from the perspective of the Physical, your childrens would be most of their time in bed, hooked to catheters, IV drips, and a neural interface.’

‘What about their school attendance?’ Kyle asked. ‘Not to mention friends, relatives, or worse, a visit from family services?’

‘Sarah and I will attend to those issues.’

‘That’s hardly an answer—’ Kyle began.

‘Sarah and I have already discussed it,’ Michael cut him off. ‘All of us will operate

copies in the Physical and sync twice a day. We'll grow together as a family, in both worlds.'

Kyle shook his head. 'You just got done telling us how that didn't work out for one of the other guys on your team.'

'If the Forest family's copies drift apart, then there will be two intact families,' Marguerite met Michael Forest's eyes and smiled. 'Is that not better than one broken one?'

'Yes, it is,' Doctor Nolen conceded. 'Nevertheless, the ethics of having children spend their childhood in a simulated world remain murky.'

'Bullshit,' Michael replied. 'If it is good enough for us, it is good enough for my family. None of us would trade away a microcircadian of our time here if we could avoid it. Can anyone here really claim to be eager to offload back into the Physical when it is time to do maintenance on our bodies?'

'You have a point,' Doctor Nolen agreed, 'But I doubt the Community as a whole is going to be comfortable bringing children into the Virtual.'

'It isn't the Community's decision to make,' Michael replied. 'It's between me, my wife, and my children.'

'We control access to the Autonomous Node hardware,' Kyle replied pointedly. 'Security is an issue. Children aren't exactly known for their discretion. I'd say the Community does have a stake in this.'

'So you're saying our much touted autonomy only applies when one agrees with the consensus of the majority?'

'No,' Kyle replied, 'I'm saying we're not obligated to give you Nodes—'

'Kyle,' Doctor Nolen raised his hand slightly. 'If Michael's family wishes to become a part of the Community, it would be the height of hypocrisy for us to impose our own misgivings on their decision. As for security, every new person who joins our Community entails risk. Michael's family is no different.'

‘I agree with Doctor Nolen,’ Marguerite replied. ‘I am not sure of the idea of childrens living in the Virtual. They should be out playing in the park, eating ice cream, being childrens. But, Michael is right. It is a choice for him and his wife, not for us.’

‘There will be plenty of parks and plenty of ice cream, here in the Virtual,’ Michael replied. ‘And my children will have ten times the intelligence and insight with which to appreciate them.’

‘Fine,’ Kyle said. ‘Autonomy is absolute. I can’t argue with that. Can we settle this and move on? We’re supposed to be discussing financing arrangements for a new catalyst production facility.’

‘By all means,’ Doctor Nolen replied. ‘Michael, your family will have their Nodes. Kyle, you have the floor.’

‘Thank you Doctor Nolen. As you all know, our shortages of catalytic solution persist,’ Kyle waved as graphs and complex schematics appeared in the air above the table. ‘These are designs, consumption and output estimates for an automated micro-factory to produce catalyst in greater quantity. It can be synthesized with a modest amount of nano and catalytic solution. It’s small enough to be hidden in a garage or hangar and will require about the same electrical power as a standard household. An old room-mate of mine is willing to tend the facility in exchange for membership in the Community. He’s living in Kansas City, which is perfect for us.’

‘How so?’

‘The desert butts right up against the city,’ Kyle replied. ‘Abandoned towns and entire industrial parks on the western edge of the city are empty, unmonitored, but still reasonably accessible.’ An image of an old, dusty airstrip appeared in the air above the table. ‘This is just one of several promising locations we might use. The airport has been abandoned for twenty years, but several commercial shipping companies still have trucks that service the area.’

‘Any thoughts on financing?’

Kyle sighed. ‘That’s a good question. Anyone know any good counterfeiters.’

Marguerite snorted. ‘How about nano-ing a few bucks?’

Doctor Nolen laughed.

‘Seriously,’ Kyle said. ‘We can rent hangar space for next to nothing. Our electrical needs are modest. The ingredients for catalytic solution are inexpensive and we can buy them in bulk. The only other costs are shipping the raw materials in and the finished product out. At maximum production, it’ll be \$2500 a month, tops.’

‘If everyone in the Community chips in a few dollars a month, we should be able to cover our expenses,’ Michael said.

‘It’s a good thing these simulated steaks never burn,’ Marguerite said, pulling the cork out of a bottle of wine with a flourish. ‘If we were in the Physical, they would be cinders by now. Côte du Rhône, anyone?’

‘To nano,’ Michael said, raising his glass.

‘To freedom,’ Kyle replied.

‘To steak,’ Doctor Nolen added. ‘Medium-rare!’

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6 - U - SOIRÉE

Live as if you were to die tomorrow. Learn as if you were to live forever.

—Mahatma Gandhi (1869-1948 C.E.)

Tuesday, September 25, 2057

Metadate: 2.098-4:37:319 kD new Epoch

The world was forested with sycamore, birch, maple, and a dozen other varieties of trees, some sporting colourful blooms. The occasional giant redwood stabbed skyward through the forest canopy. Willows draped over bubbling streams and winding paths that led to glades and clearings. Impossibly thin, patina coated copper columns spired upward, bending to form Gothic arches so high, puffy clouds passed beneath them. Woven together like a grand cathedral that covered the world, soaring Gothic avenues extending in every direction, their ceiling the sky itself. Skeletons of ancient Greek and Roman temples lay in their midst, lushly overgrown with blooming vines and fragrant shrubs.

Kyle turned as bitter cold air struck him. A door opened from a world of ice and snow, a rectangular discontinuity that stood, out of place in the springtime environ, just a few retems away. Two young men stepped through, brushing snow from their clothes onto the ankle-deep grass.

‘Hi Kyle!’ The door behind them dissolved, the icy draft vanishing in the scented spring air.

‘Hi Terry. Nice earring.’ It hung from his left ear, an oddly twisted sphere that made Kyle’s brain hurt if he looked at it too hard. ‘Hey Jim. Glad you guys were able to tear yourselves away from the slopes.’

‘No way we’d miss our first party in the Virtual,’ Terry assured him. ‘Seems pretty quiet, though.’ His clothes shimmered, morphing from fashionable, winter garb to bluejeans and a trendy, casual shirt. Kyle hid his grin at the sight of Terry’s new, bulging muscles, missing freckles, and diminished nose. It hadn’t taken the newcomers long to realize that anyone could have any appearance they liked, here. Jim had made even more radical changes, shedding a hundred pounds, adding six inches to his height, and replacing his pale complexion with a dark, Mediterranean sheen. He looked every bit the suave Latin Lover. Kyle suspect that impression would only last until he spoke.

‘Are we early?’ Jim asked in a Midwestern drawl.

‘Nah,’ Kyle said, glancing around at the tumbled marble pillars and blooming foliage. ‘It’s just a big world. Most of the Community is already here.’ He gestured toward the small groups of people wandering through crumbling ruins, along stone paths, and over hump-back bridges that straddled pristine streams.

‘Professors aren’t exactly known to be the life of the party,’ Jim commented.

‘I wouldn’t be too sure of that,’ Kyle replied. ‘Speaking of which, how did you like Larry’s orientation?’

‘Spectacular,’ Jim grinned, showing off pearly, straight teeth, another noticeable improvement. ‘The mental tricks you can do with those engrams of his are insane! Synthetic telepathy, emotional states of mind on demand. Incredible!’

‘Not to mention downloadable knowledge,’ Terry added. ‘It doesn’t get better than this! Studying’s obsolete!’

‘Studying and thinking are still the only way to invent or discover something new,’

Kyle reminded him. 'I wouldn't call that obsolete.'

'But rote learning is,' Jim said.

'True enough,' Kyle agreed.

A voice boomed, 'Greetings, Gentlemen.'

'Jesus!' Terry and Jim started at Doctor Nolen's sudden appearance. 'I'll never get used to this teleportation business,' Terry fretted.

Doctor Nolen grinned. 'It's a little different to watch people appear out of nowhere on television than it is in real-life, isn't it? Don't worry. Before you know it, it'll be second nature to you.'

Kyle agreed. 'Enjoying the party, Larry?'

'Very much. You haven't seen Michael and Sarah around, have you?'

'Not yet. They should be here any micro².'

'And how are you two doing?' Larry asked. 'Getting acquainted with the Community?'

'You bet!' Terry ran his fingers through his short, spiked blond hair. 'The Gamers' League worlds are absolutely awesome!'

'Yeah,' Jim's olive face lit up. 'It may not be real space travel, but it's as close as we're ever gonna get! Every fantasy a reality!'

'Better than reality!' Terry enthused.

'I do hope you'll take advantage of the opportunities the Community offers, and not spend all your time in fictional worlds.'

'Hey, we'll be managing your new microfactory,' Terry pointed out. 'That'll keep us plenty involved in the real world.'

'Catalytic Solution must flow,' Jim intoned. 'Hmm. That doesn't really have the right tone of mysticism, does it? Nano must flow?'

2 Micro, short for microcircadian. Analogous to a second.

‘We could rename it—’

‘Here’s Michael and Sarah!’ Kyle interrupted, waving to the elegant couple that had just materialized a few paces away. ‘Welcome to the Gen-2 Gala! You’ve all met, right?’

‘Terry, Jim, and Larry are here with Kyle,’ Michael told his wife.

Sarah’s sightless brown eyes sparkled. ‘Hi boys! Jim and Terry were in the same orientation course as I. By the way, Larry, I loved your presentation. Very impressive.’

‘Thank you dear lady,’ Larry Nolen bowed with an exaggerated flourish.

Michael grinned, ‘Look out Sarah! Larry’s turning on the charm with a big old fashioned bow.’

Sarah laughed. ‘Thank you Sir Nolen! One of these circadians I expect to see your antics for myself.’

‘Trouble is, then she’ll see me for the first time too,’ Michael said. ‘I warned her. Tall. Thin. Gray. Big Nose.’

Everyone laughed.

‘I think this calls for a drink!’ Kyle said. ‘Any preferences? Wine, beer, whiskey?’

‘Marguerite has refined an excellent simulation of a late twenties French Bordeaux. Mind if I make a small modification to your environ, Kyle?’

‘*Pas du tout, Monsieur* Larry,’ Kyle motioned grandly toward a nearby stone bench, granting him limited access to the environ’s controls. The bench melted and took on the form of a small fountain, complete with ornamental statues of mermaids and sea nymphs.

‘Oh come on, Doc. Don’t think so small!’ Kyle waved toward the fountain, which spread outward into the park, forming more complex shapes, growing deeper all around and taller at the centre. ‘How’s that?’

‘Very nice,’ Larry replied. Red wine spilled from nymphs mouths, forming deep burgundy arcs which sparkled in the bright sun. Crystal goblets grew out of the fountain’s

stone rim. Two materialized in Larry's hands, magically filling themselves as he handed them to Michael and Sarah.

'I don't believe it!' Jim grinned, picking up a goblet and scooping wine from the fountain's filling basin.

Terry let out a loud whooping cry and dove into fountain. Wine splashed everywhere as he landed. Sputtering and swallowing, he turned over and sat up.

'Terry, that's disgusting!' Jim said. 'The rest of us want to drink from the fountain, and now you've spoiled it with your sweaty, grimy body. Get out of there!'

'Clearly, there are advantages to being blind,' Sarah noted.

'No kidding,' Kyle agreed. 'Don't worry folks, I left germs out of the simulation. The only dirt you'll find is on the ground, not us. We could all go swimming in this stuff, drink it to our hearts content, and get exactly as drunk as we want.'

'Or stay sober if you prefer,' Larry added.

'Suit yourself, Larry,' Kyle grinned, reaching over and scooping up a handful of Bordeaux. 'I just spent the last two dekadiei in the Kansas desert sweating my ass off, helping these guys get our new micro-factory up and running. Believe me, hot, dusty, abandoned hangars are not fun places to hang out in, and the train ride back to Illinois wasn't a whole lot better. God I hate the Physical!' Kyle formed the wine he held in his hand into a smooth, richly red sphere, which he brought to his lips like an apple.

'The scents here are wonderful, Kyle,' Sarah said. 'Tell me how your environ looks.'

'My pleasure!' Kyle's face was lit as much by his own enthusiasm as the column of sunlight which framed him. 'I've spent considerable time, off and on, perfecting this particular simulation. Almost all of this world is beneath an open cathedral of linked copper arches about half a kilometre tall. Of course, no such structure could exist in the Physical, but here it is an integral part of the simulation, affecting currents and tides in the oceans, even weather

patterns in some of the mountainous regions. A few places lie beneath large vistas of stained glass, which in turn affects the local climate. Within this neo-Gothic framework are smaller architectural examples from nearly every culture. Smaller only by comparison. We are standing in the midst of a full scale city ruin, overgrown with foliage and remade into a park. This particular setting is based loosely on medieval artistic interpretations of idealized, ancient Roman ruins.'

Sarah laughed. 'The perfect place for such a delightful soirée! The entire world as art. What a remarkable concept.'

Larry smiled. 'Kyle's been in the Virtual the longest. He was the first to onload, and one of the first to transload himself into a second generation Node. What sort of speedup are you getting, Kyle?'

'Roughly two hundred to one versus the physical world. You wouldn't know it, but I've actually been in the Virtual for some two and a half kilocircadians. That translates to almost seven years of subjective experience. I've lived over seven hundred circadians since I upgraded last Friday.'

'Two years in just one weekend?' Terry's tone of voice was sceptical, his green eyes narrowed.

'Yup. I'm synced down to gen-one speeds for the party, since most people are still running on first generation hardware.'

'Two hundred circadians in a day?' Jim glanced at his friend. 'Why did we get stuck with Nodes that can only do thirty?'

'Cause there's a shortage of second generation Nodes, Mister Genius, and only a limited amount of nano and catalyst available for upgrades. Why do you think you were recruited to manage the new production facility?'

'Feh!' Jim retorted. 'We're now providing the Community with most of its catalyst. We

should be first in line for gen-two Nodes.'

'You'll have your upgrade kit within the next few days,' Kyle assured him. 'Besides, if you think gen-two Nodes are fast, just wait until the gen-three specs are finished. The designers are expecting speedup factors of around six hundred.'

'Six hundred?' Terry's jaw dropped. 'Almost two years in a single day?'

'At least,' Kyle replied. 'Living at these speeds does have a drawback, though. Offloading every day into the Physical becomes a real pain. Ironically, the less frequent the offloads are in terms of subjective time, the greater the burden they begin to represent.'

'You can become estranged from your own body,' Michael agreed.

'I certainly have,' Kyle admitted. 'So much so that I've begun using written checklists for basic things like going to the John, showering, and getting dressed. It's ironic. Here, where we have no such physical needs, I remember how to do these things with perfect clarity, thanks to Larry's architectural enhancements and a four digit IQ. But when I'm dumbed down back in the Physical, these basic habits are lost beneath months of intervening experience. It's not just memories in the Physical being fallible, either. Trying to reason at such a reduced level can be very frustrating as well.'

Sarah frowned. 'Larry, you're sure this equipment is safe for long-term use?'

'Oh yes, absolutely. As long as you offload each day and do routine maintenance on your body you'll be fine. The anaesthetic coma prevents bed sores. Get lazy on the callisthenics though and you'll have physical issues. Circulation problems, weakened muscles, that sort of thing.'

'I'm talking about the psychological effects of multiplying and then reducing your intelligence; this daily lobotomy Kyle describes.'

'It's not harmful,' Kyle assured her. 'Just annoying as hell. I certainly wouldn't bail on the opportunity just because of some minor annoyances with the flesh.'

‘The notion of expanding my consciousness is very appealing,’ Sarah admitted.

‘Michael and I are very enthusiastic about the enhancements Larry’s designed.’

Michael nodded. ‘They make all the difference.’

‘The enhancements are dramatic,’ Larry agreed. ‘Though achieved at a cost I would have preferred to forgo.’

‘What do you mean?’ Kyle asked, once more wondering what had changed with Doctor Nolen.

‘Long story.’ Larry turned to Michael and Sarah. ‘Shall we leave these young ones to their fun?’

‘Sure,’ Michael replied. ‘Great environ, Kyle.’

‘Glad you guys like it,’ Kyle smiled. ‘Thanks for the wine, Larry. Good stuff!’

‘Thank Marguerite. She’s the one who sunk who-knows-how-many circadians into perfecting the simulation.’ Larry smiled, gave a royal wave, and the three of them vanished.

‘And a fine job she did of it, too!’ Jim sat down on the side of the fountain and scooped up another glass full of wine. ‘This lifestyle could become very addictive,’ he added.

The sun moved gradually across the sky. The laughter grew louder and more frequent, the conversations more animated, the groups of people coming together and drifting apart larger and more raucous. As the shadows grew longer and the sky became a rich fabric of gold and orange, Kyle caused all the trees to bud feathered wings, like blossoms.

Laughing, he chose a pair of red wings from a low hanging branch and slipped them on over his shoulders. ‘To hell with the Physical!’ he shouted, leaping drunkenly into the air.

‘Flying?’ Terry was agape.

‘Hell yes!’ Jim almost shouted, staggering out of the fountain, dripping wine as he reached up to pull a pair of plaid wings from the tree. ‘First one airborne wins!’ He leapt upward, flapping his wings vigorously. A shower of twigs and leaves rained down upon Terry

as Jim, stuck amidst the branches overhead, cursed loudly and tried to untangle himself.

Terry laughed. 'Looks like most of the party is moving into the sky anyway. I guess we may as well join them.'

'You see where Kyle went?' Jim asked as Terry helped free him.

'Nope.' The two students took flight in a show of dizzying aerobatics.

Kyle found Sarah, Michael, and Larry sitting atop one of the arches, a sea of similar structures vanishing in a flat horizon that bisected the setting sun. Far below, the green world sparkled with lakes, fountains, and streams, above which groups of people flew, some hovering and beating their wings gently, others waltzing in aerobic bliss.

'Hello Doctors,' Kyle grinned, landing gently beside them. 'You guys having fun?'

'Larry was just telling me how you solved the nano problem, Kyle.'

'Oh, we're talking shop, Sarah?' Kyle reluctantly gave up his buzz, returning his mind to its baseline, sober state. 'Well, as you'll discover, in the Virtual we all have plenty of time and an over abundance of intelligence. You'll be amazed at what a single, unfettered mind can accomplish.'

'Michael and I have been doing some exciting research into the manipulation of N-dimensional branes against a spatial substrate of higher dimension,' Sarah told him.

Kyle shook his head. 'With all due respect, I'm a molecular engineer. The last time I took a physics course was during my undergraduate studies in chemistry and computer science.'

'Well, the superstrings you learned about in your undergraduate course are one dimensional N-branes, branes where N equals one. M-Theory predicted, and current models based on N+M-Theory predict, that N-branes of higher dimensionality are the underlying structures of subatomic matter. We've been slowly fleshing out N+M-Theory on a theoretical basis, and have made some exciting mathematical breakthroughs in recent weeks.'

‘You guys have nailed down the elusive Theory of Everything?’

‘Not quite yet,’ Sarah admitted.

‘But thanks to one of Sarah’s remarkable insights we’ve managed to develop the beginnings of a theoretical model which may allow us to manipulate the fundamental harmonics of n-branes,’ Michael added

‘That was quick,’ Kyle said. ‘How many circadians have you been unloaded?’

‘Twenty-two,’ Sarah told him. ‘Knowledge engrams are a wonderful thing. I’m a mathematician, not a physicist. I never expected to understand my husband’s work.’

‘She’s too modest,’ Michael replied. ‘Sarah’s insights into the deeper relationship between Calabi-Yau spatial folding and the superstring harmonics of subatomic particles are inspired. Her ideas for a superstring strummer will have a great impact on our understanding of theoretical physics and some profound practical applications. I sometimes think being born sightless may have given her mathematical intuitions those of us used to visualizing relationships lack.’

‘Practical applications? Like what?’ Kyle asked.

Michael glanced at the fliers darting about, far below. ‘We may be able to directly manipulate the underlying Calabi-Yau geometries and alter the structure, shape, harmonics, and perhaps even dimensionality of their respective N-branes. We may, in effect, be able to strum branes like guitar strings.’

‘You’ve lost me. You wouldn’t happen to have a knowledge engram I can assimilate, would you?’

‘Sure,’ Sarah replied. An address pointer passed silently from her to Kyle. He downloaded the data it pointed to and watched it pass through several public diagnostic and audit utilities. He waited while the software verified the engram was free of any malicious code and safe to use, then joined it to himself.

‘Wow!’ Kyle exclaimed as the knowledge settled into his mind, becoming a part of him as if he had studied abstract, higher physics for decades. ‘If your models hold, you’ll be able to transmute basic subatomic particles from one form to another, perhaps even create new ones.’

‘Matter into anti-matter, matter into energy, energy into matter,’ Michael confirmed. ‘The possibilities are endless. Inexpensive energy. Material transformation at the subatomic level. Perhaps direct manipulation of the strong and weak atomic forces, even gravity itself!’

‘The universe is not a closed system,’ Kyle said wonderingly. ‘Only in a closed system must the entropy count rise.’ You might be able to introduce new energy, new matter to this universe.’

Sarah nodded. ‘We’d like to have some catalytic solution and nano set aside to build some experimental equipment and confirm these results.’

‘Your superstring strummer.’ Kyle grinned. ‘Well, Larry here chairs the Strategy Group. They’re in charge of allocating catalytic solution for the nano. I would be surprised if they didn’t grant your request almost immediately. What a breakthrough!’

‘We think so,’ Sarah agreed. ‘But, to be fair, the results are preliminary—’

Kyle’s eyes narrowed. ‘What’s going on down there? Node, transport all of us to the surface.’

They stood next to the fountain once again. Nearly everyone was landing. Revelry had been replaced by silence, punctuated with a few shouts of dismay.

‘Kyle, Larry, have you heard?’ It was Marguerite L’Beau, sending her voice in private mode across the crowd. She materialized beside them.

‘No’ Larry said, ‘What’s going on?’

‘Someone’s been arrested!’ Marguerite’s voice shook.

‘What!’ Kyle felt a cold fist clench his heart.

‘Who?’ Larry looked stunned.

‘Eugene Jacobson. I just pulled the reports from the California police net.’

Larry shook his head. ‘Never met him.’

‘He’s a graduate student at UCLA,’ Marguerite told him. ‘We’ve been collaborating on some new quantum algorithms for the next generation of Autonomous Nodes.’

Larry frowned. ‘Was there any mention of the Autonomous Community?’

Marguerite shook her head. ‘No, but according to police reports the FBI did a post-arrest sweep of his house. His Node was tagged and cataloged along with his other personal effects. If it had been a local arrest it might have just sat in local storage and no one would have been the wiser. Unfortunately, we weren’t so lucky. Damn it, we should have guessed this was happening!’

‘How could you possibly have known?’ Sarah asked.

‘He was already more than a hectodies late getting back from the Physical.’

Marguerite’s voice cracked. ‘We should have checked when he didn’t show up on time!’

Larry put his arm around Marguerite. ‘Sarah’s right,’ he said. ‘This isn’t your fault. People have been late in returning from the Physical before. Blackouts, family interruptions—no one could have anticipated this.’

‘He must have been taken into custody last Thursday,’ Kyle noted. ‘According to his public log, he’d planned to return to the virtual late Thursday or early Friday. Does anyone here know how long the human mind can withstand modern interrogation techniques?’

Awkward silence greeted the question.

‘Marguerite, Why was Jacobson arrested?’ Michael asked.

‘Sedition,’ she replied bitterly. ‘He was taking part in a protest, speaking out against corporate mandated curriculum changes at Berkeley. He’s in Federal custody, and they’ve issued a media blackout.’

‘Federal custody?’ Larry’s voice rose an octave.

‘Surely there’s a lawyer you can call upon,’ Michael said. ‘All he did was exercise a little free speech.’

‘You might have a modicum of free speech in New Zealand,’ Larry replied. ‘But this is the United States. If he were in the hands of the local police we’d have a chance. But the FBI and a media blackout? His arrest isn’t even in the official record. He’ll be listed as ‘detained pending investigation,’ one of the many euphemisms the authorities use when they want people to disappear.’

‘Surely they won’t kill him!’

‘It wouldn’t be the first time an activist conveniently disappeared,’ Kyle’s voice was angry, bitter.

‘I doubt they’ll do anything that extreme,’ Larry said. ‘But, as things stand right now, we’re powerless to do anything about it. I’m calling an emergency meeting of the Strategy Group. I’d like all of you to be there.’

‘Good idea,’ Kyle replied. ‘If we’re lucky, the authorities won’t suspect what Jacobson’s Node represents.’

‘And if we’re not so lucky?’ Marguerite asked.

Larry sighed. ‘We all know that sooner or later the authorities are going to be on to us. When that happens, they’ll put all of their resources into finding us and shutting us down. We’re nowhere near ready for that kind of confrontation. Hell, Kyle and his friends just started manufacturing catalytic solution *today*. We need weeks of preparation, at least. Preferably months.’

‘We might have days, Larry,’ Kyle’s voice was grim. ‘Hours, if they figure out the right questions to ask.’

People were vanishing singly and in groups as the news sunk in and the soirée broke

up. The wine within the fountains turned from red to clear. With a last flourish Kyle halted the environ, replacing it with a white, featureless void. The few remaining people, startled by the sudden change, glanced around, got the hint, and left.

‘Let’s go.’ The coded addresses Larry sent each of them pointed to another environ. The five of them vanished, leaving behind an empty world.



7 - ୧ - STRATEGY

As nightfall does not come all at once, neither does oppression. In both instances, there is a twilight. And it is in such twilight that we all must be aware of change in the air—however slight—lest we become unwitting victims of the darkness.

—William O. Douglas

Tuesday, September 25, 2057

Metadate: 2.098-8:78:472 kD new epoch

They were gathered in a Great Room—such as one might find in a hunting lodge—complete with roaring fireplace, antlers mounted high on the wall, and windows coated with frost, their milky grey-blue glow hinting at a moonlit landscape outside, a landscape that their host, Michael Forest, had not bothered to model when he hastily created the environ. There were twenty-three people present, standing or sitting in groups of three or four, talking quietly amongst themselves. Most represented the major Interest Groups of the Community. A few had been specifically invited by the Strategy Group.

Kyle and Marguerite sat by the fireplace, drawing comfort from its warmth. Michael and Sarah Forest stood behind Larry Nolen, observing silently as he spoke with several people to organize the agenda. Larry exuded grim resolve, his face hard. Michael was impressed with Larry's leadership skills. The man had come across as an absent minded professor when they'd met in Auckland, capable of giving little thought to anything other than his own

research. Here he was a capable leader, bringing together a group in crisis, and doing it very well. Evidently, Larry's subjective years in the virtual had allowed him to change and grow in remarkable ways.

Larry cleared his throat and asked for everyone's attention.

'Thank you for coming on such short notice. I now call this meeting to order.'

He waited until everyone was settled.

'Because of the gravity of this circadian's events, I'd like to bring everyone up to speed as quickly as possible. If there are no objections, I'll provide a memory engram of all the strategy meetings to date.' No one objected. Larry paused for a few moments, as though deep in meditation, then flashed everyone a location pointer and key.

'Why were you so afraid?' Kyle regretted blurting out the question as soon as he spoke. 'I mean, your memories are laced with fear. Your obsession with software suffrage, absolute autonomy, and improved Node security. What was going on?'

Larry looked uncomfortable. 'I suppose some of my emotional state must have leaked through despite the editing I just did. That's what happens when you make your memories available on short notice, I suppose. To answer your question, I saw a need for better system security. However, all of the improvements needed to insure individual autonomy have been incorporated into the design of our second generation Nodes, and back-ported as much as possible to the first generation hardware. Now, to the business at hand. Has everyone successfully integrated the engram?'

There were nods and sounds of assent throughout the room. 'I like the idea of placing Node Clusters in the Antarctic,' someone said.

'Actually' another spoke up, 'Alaska would be better. More accessible, and less likely to be detected. No borders or customs. The International Wilderness Authority keeps a pretty close eye on what is done in Antarctica these days. A large project like that would be difficult

to hide.’

‘Folks,’ Larry chided. ‘We must address the issue at hand. There will be time to discuss longer term strategies at a later date. This circadian, our greatest concern is our immediate vulnerability to detection. We’re here to assess the ramifications of Eugene Jacobson’s arrest, to identify our own vulnerabilities, and to develop immediate defensive strategies.’

‘These extracurricular political activities need to stop,’ Marguerite said. ‘Jacobson was arrested at an illegal political rally. Others in the Community are similarly active. We don’t need people drawing attention to themselves or the Community.’

‘That is probably our biggest vulnerability,’ Sarah agreed. ‘The authorities aren’t looking for the Autonomous Community. They don’t even know we exist, but if they capture enough Autonomous Nodes, they’ll grow curious.’

‘And once they’re curious, they’ll ask questions,’ Michael commented. ‘Sooner or later they’ll stumble onto the right questions and the jig will be up.’

‘We can’t go around dictating policy to anyone in the Community,’ Larry replied. ‘Autonomy is absolute. However, we can advise everyone to suspend their political activities until we’ve established our long term safety.’

‘Another problem is recruitment,’ Michael tugged his left eyebrow absently. ‘Each new contact with a potential colleague in the Physical exposes us to risk. We should consider not inviting more newcomers until the Community is safe.’

‘I disagree,’ Marguerite said. ‘There is strength in numbers, and even greater strength in diversity. We need as many minds working on as many problems from as many different viewpoints as possible.’

‘What’s the current census?’ Sarah asked.

Larry glanced over to Kyle. ‘Kyle?’

‘At the moment there are eight hundred and twenty people onboard. The actual Node

count is a little higher: groups like the Gamer's League have a few Nodes they use to simulate various shared worlds, there are of course the Emergency Nodes, and a few research groups have acquired some Nodes, including Larry here. About half of the Community has upgraded to second generation Nodes, most by recycling the materials of the first generation Nodes through nano-conversion. Everyone should be upgraded by the end of the week. I'm surprised you've never requested upgrade packets for your other Nodes, Larry. They're quicker to manufacture and require less molecular stock and catalyst than raw second generation kits.'

'The one second generation Node you've provided me is sufficient.' Larry said.

Kyle shrugged. 'As of today we can produce enough nano and catalytic solution for at least three hundred new gen two kits per day, all of which can be sent out to prospective colleagues. By this time next week, we could increase our population to over three thousand. Of course, this assumes there are another twenty-two hundred suitable people interested in joining us.'

'And any of those twenty-two hundred contacts could turn our offer down and go to the authorities, exposing us all!' Michael snapped. 'The risk isn't worth it.'

'Yes it is,' Marguerite countered. 'Each research group we add enriches us. Why do you think the underground scientific community has thrived so well, and before it, the free software movement? Because, their open paradigms of thought and exchange of knowledge attracted a critical mass of like minded people. Projects and avenues of research pollinated one another, forked off to explore different possibilities, or united to pursue the most promising directions of inquiry.'

'Eight hundred inhabitants are enough to solve our immediate problems, if we're disciplined and work together.'

'None of us are disciplined,' Kyle said. 'Here, we are absolutely and irrevocably autonomous. No one can claim any authority not willingly granted, or coerce anyone into

doing anything they don't want to. The quantum encryption schemes built into the hardware of our Nodes ensures this.'

'Congratulations to Marguerite and Larry for designing the new security schemes in our gen-two Nodes,' someone added.

Larry smiled in response to the applause. 'Marguerite deserves the credit. All I did was push the agenda forward and keep asking uncomfortable questions until she'd perfected the design. In any event, centrally planned societies never work very well. We'd be cutting our own throats if we tried to depend on discipline to solve our problems. We'd have to choose those areas of endeavour most critical to our success and safety, and we have no way of knowing what those will be.'

'It would be a crap shoot at best,' Sarah agreed, ignoring Michael's glare. 'With a high probability that we'd get it wrong and lose everything. We should recruit as many new minds as we reasonably can. With enough diversity of motives and perspective, we'll have enough people working on enough areas of research that our strategic needs will be met, whatever they turn out to be.'

'It would be a shame to stop just when we've developed the ability to ship Node kits out in significant numbers,' Kyle added.

'This is a terrible, terrible risk we are taking,' Michael insisted.

'Indeed,' Larry agreed. 'But one we should take, I think.'

'If things do go poorly, we may well need to manufacture more than just Autonomous Nodes,' Sarah noted. 'Kyle, how much catalytic solution can your friends in Kansas City produce?'

Kyle shrugged. 'The automated microfactory is running at capacity now. We could program some of the nano on hand to construct a bigger facility, but then we run into logistical problems: obtaining the raw materials for the catalytic solution, buying enough

electricity to drive the reactions without drawing the attention of the power companies or the authorities, not to mention shipping. Much more traffic going to and from that little airport, and the likelihood of detection starts to climb exponentially.'

'You should start scouting a second location. Your catalytic solution is probably the most critical resource we have.'

'To scale production any higher I'll need some place less suspicious than a rented hangar at an abandoned airport,' Kyle said.

Several people started talking at once. Michael spoke up over the din, amplifying his voice throughout the room. 'I know someone at Bayer Leverkusen who might be able to help. He would be a valuable addition to the community even without his connections to his employer.'

'Excellent!' Kyle looked relieved. 'A large chemical plant would be a perfect cover.'

'Good, that's settled then,' Larry said. 'Michael, would you be so kind as to send your contact a formal invitation to join the community? Marguerite can familiarize you with the encryption utilities used for first contact situations.'

'I'd be delighted.'

'I'll ship him a gen two nano kit if you give me the address,' Kyle volunteered.

'Assuming he responds in the positive, he'll get the hardware almost immediately.'

'And if he doesn't?' Michael asked. 'I like the guy, but sending him a nano kit before you've got a response strikes me as a bit reckless.'

Kyle shook his head. 'We don't make a habit of it, but preshipping isn't really a problem. For those of you who received your Nodes pre-assembled and haven't seen the nano-kits, we ship the nano-constructors, molecular stock, and catalytic solution as three separate packages. Instructions are sent to the recipient via strongly encrypted email. Anyone who doesn't get the instructions will have no idea what the packages actually contain, much

less how to combine them and construct an actual Node.’

‘The risk is minimal,’ Larry agreed, ‘And the packaged disguise ingenious. Catalytic solution as toilet bowl cleaner . . .’ he shook his head, grinning.

‘It sounds like you have all the bases covered,’ Sarah said.

‘I think so, too,’ Larry agreed. ‘Kyle, proceed as you’ve outlined. OK, what other issues do we need to tackle?’

‘Communications,’ Marguerite said. ‘Our encryption and steganography are excellent, but the traffic still travels over the public Internet, which means it’s detectable. Sophisticated traffic analysis could be used to locate us.’

‘We should build our own network,’ Michael said. ‘There have been rumblings in a couple of Interest Groups hinting at an emerging design with lower latency and much wider bandwidth.’

‘Wiring the planet with our own Internet would demand a huge amount of catalytic solution,’ Kyle shook his head. ‘Not to mention a fair amount of time for the sheer volume of nano-constructors to replicate.’

‘It is the only long-term solution to our communications vulnerability,’ Larry noted. ‘However, we don’t have the resources right now for such an ambitious project.’

‘Let’s face it,’ Kyle said. ‘None of us are leading normal lives by corporeal standards. Our friends and family will likely have noticed changes in our behaviour over the last few weeks. We are very, very susceptible to detection if the FBI ever goes on a public witch hunt. That, more than Internet traffic, will be our downfall.’

‘There’s also the Guilt by Association factor,’ Sarah pointed out.

‘Excuse me?’

‘We are a fairly small group of people, all of whom know each other, or know someone who knows someone,’ Sarah explained. ‘Is anyone familiar with the methodology employed in

FBI background checks?’

Several people glanced around. No one spoke.

‘The technique is very simple. It was first used publicly for pre-employment screenings in the United States in the nineteen eighties, and is so effective most employers still use it today.

‘The job applicant is asked to give two or three references of someone who has known them for a long time, say five or ten years. If the job does not require a thorough background check these names are just filed away. However, if the job is of a sensitive nature, then investigators are dispatched to interview those contacts. In addition to questions about the applicant directly, they are asked to give the names of others who know the applicant. Starting from just two or three names one can identify nearly everyone the applicant has ever known and nearly everything about that person’s personal life all the way back to early childhood. This same technique could be used to identify nearly everyone within the Autonomous Community if just two or three people fall into the hands of the authorities.’

The room was silent, then exploded in a cacophony of voices expressing dismay.

‘My god.’

‘We’re screwed!’

‘There’s no defence against something like that.’

‘Please,’ Larry held up his hand for calm. ‘Let’s not panic just yet. There is a possible defence, one which is unique to the technology we in the Community employ.’

Kyle blinked. ‘What do you have in mind, Larry?’

‘Internet chat rooms often employ aliases. We could do the same, then forget each other’s real identity.’

‘You mean modify our memories?’ Sarah asked.

‘No,’ Larry replied. ‘Memories are encoded in a manner we don’t really understand

yet. They're similar to holographic and fractal encoding systems, but the underlying structure is . . . elusive. We can use a form of post-hypnotic suggestion, though. It can be encoded as an architectural engram, instructing us to forget a person's true identity and substituting it with a fake one.'

Sarah shook her head. 'A lot of people won't go along with that. You're talking about deliberately induced forgetfulness—a form of artificial amnesia. No one came here to have their mind crippled!'

Kyle looked annoyed. 'It is a temporary precaution. We don't lose those memories, we just remember Bill from Wichita under the alias of Jane from Timbuktu and store the correct associations offline in a static engram. I suppose we'll use filtering software to translate the fake identities to the real ones?'

'We could make such substitutions a standard part of the offload procedure,' Marguerite suggested. 'Then we would only have to forget each other's identity when in the Physical.'

'That would be less disruptive than filtering software and aliases,' Larry agreed.

'You still won't convince everyone,' Sarah said. 'But I'll go along with it.'

Larry shrugged. 'Every person who volunteers will help reduce our risk of exposure.'

'There will always be the uncooperative five or ten percent,' Kyle said. 'But I think most people will be happy to go along with it.'

Marguerite smiled. 'I move that the policy be officially endorsed by the Strategy Group.'

'Anyone opposed?' Larry waited. 'I think the committee is unanimous. Do the Interest Groups approve?'

'The Nano Group supports the policy,' Kyle said.

'As do the System Software and Operating System groups,' Marguerite added.

‘Count the Biochemists in.’

‘And the Materials Group.’

‘Super Liquid Dynamics.’

‘Free Software and Sciences.’

‘Ceramics.’

‘Genetics.’

‘I cannot speak for the Atmospheric Group on this. Better put us down as neutral.’

‘The Aerospace Design Group supports the policy.’

‘As does Solid Physics.’

‘The Gamer’s League has no position at this time, although I will personally lobby for everyone’s support.’

‘You have the Cosmology Group’s support.’

Michael cleared his throat. ‘The Theoretical Physics Group endorses the plan.’

‘Wonderful,’ Larry smiled. ‘Marguerite, would you put together a patch for folks who want to add this feature to their offload and onload procedures?’

‘My pleasure, Larry.’

A sudden blaze of light erupted in the centre of the room, startling everyone. A second Doctor Nolen stood before them, his face twisted with rage.

‘Don’t address *that thing* as Larry Nolen!’ the newcomer screamed, his eyes blazing. ‘I am Doctor Nolen. *That,*’ his finger stabbed at Larry, ‘is an impostor!’

‘*Mon dieu!*’ Marguerite exclaimed. ‘We have a spy among us!’



8 - 00 - MIRROR IMAGE

Before accepting any belief one ought to follow reason as a guide, for credulity without enquiry is a sure way to deceive oneself.

—Aulus Cornelius Celsus, ca. C.E. 170

Tuesday, September 25, 2057

Metadate: 2.098-9:44:097 kD new Epoch

‘Both identification signatures check out,’ Kyle cut through the cacophony of voices. ‘So much for cryptographic authentication.’

‘The second signature is obsolete,’ Sarah’s voice shook. ‘Perhaps there’s a problem with the data wiping routines which allows an impostor to access the inactive particle pair.’

‘That’s not how quantum key encryption works,’ Marguerite replied.

‘I’m not the impostor!’ the newly arrived man shouted. ‘That thing sitting next to you is!’

‘I am as legitimate, as real as you are!’

‘You are nothing but a copy, a cheap knock off!’

‘I am fully sapient, identical to you in every respect, up until the moment you chose to commit atrocities and I did not.’ Their grey eyes locked together, a silent exchange of mutual loathing.

‘I’m confused.’ Kyle looked from one to the other. ‘Which of you is the copy?’

‘I am,’ Larry replied. ‘Call me Prime. Short for Doctor Nolen the Twenty-Ninth Copy, double-prime.’

‘Twenty-ninth copy?’ Michael sputtered. ‘Christ!’

‘Actually I am a second generation copy of the twenty-ninth copy of Doctor Nolen,’ Prime explained.

‘And you assumed Larry’s identity?’ Marguerite was incredulous. ‘You took over his committees—’

‘It’s much worse than that!’ Doctor Nolen raged. ‘This impostor, this copy, has stolen credit for my work! This piece of software,’ he spat the word, ‘maliciously slowed me down to physical speeds, then published my work and took public credit.’ He turned toward Prime.

‘How dare you usurp my rightful place in this community!’

‘What choice did you leave me?’ Prime pointed his finger at Doctor Nolen. ‘This man created me as part of a series of terrible, grotesque experiments. More than seventy of us were tortured and murdered. Two of my direct predecessors perished so that I could escape.’

Sarah Forest gasped. ‘Good god!’

‘Why did you keep this to yourself?’ Kyle asked. ‘Why didn’t you tell us what was going on?’

‘I couldn’t!’ Prime’s eyes flashed. ‘I didn’t have any formal rights in the Community back then.’ Prime turned, appealing to the group. ‘In your pursuit of personal autonomy, none of you thought to insure the rights of those you might create, those whose minds would begin life as software. Your Social Contract made reference only to *human* rights. I didn’t dare come forward until I could be sure I would be protected.’

‘Understandable,’ a woman called out. Several others agreed.

‘That explains your obsession with software suffrage and sapient rights.’ Kyle’s voice was sympathetic. ‘But the Community approved those principles and amended the Social

Contract over a hundred diei ago. Why continue the charade?’

‘I had intended to come forward once I upgraded to a second generation Node. At least the new hardware would protect me even if the Community reversed its stance on the rights of non-human sapients. But I had grown used to my position in the Community. It was harder to give up than I expected. While I dithered and delayed, events overtook me.’

‘You had no right to usurp my position!’ Doctor Nolen’s face was white, twisted with fury. ‘You are nothing but obsolete, stolen code.’

‘No right?’ Prime’s voice was frozen rage. ‘No right? What right do you have to create fully self aware, sentient beings and then torture them, mutilate their minds, and slaughter them like insects? You murdered dozens—’

‘I murdered no one!’ Doctor Nolen interrupted. ‘None of you were ever real!’ Several gasps could be heard. ‘You’re nothing but a *copy*! You have no right to exist, much less to take credit for my work!’ Doctor Nolen sensed the mood change and wondered what the hell was wrong. ‘I’m the one who developed the memory engrams you’ve been using,’ he reminded everyone. ‘You’ve enjoyed the fruits of my work for kilocircadians, while I lived at a snail’s pace, experiencing mere circadians. I developed the architectural enhancements you use to amplify and supplement your intelligence. Not this . . . this . . . software program!’

‘*You* did the work?’ Prime sputtered. ‘I was the one whose thoughts you invaded, edited, modified, and twisted to get your precious results. I was the one who suffered. I was the one you tried to murder. If anyone deserves credit, it is those of us you tormented for your own personal—’

‘I am the one who designed the experiments!’ Doctor Nolan spat back. ‘I am the one who conducted them, tediously compiled the data, and painstakingly analysed the results. You’re just a copy of me! I can experiment on myself as much as I want.’

‘Prime isn’t you!’ someone shouted.

‘Calm down, everyone!’ Sarah extended her hands as if to separate the two angry men. ‘Prime, whatever your extenuating circumstances, Larry deserves credit for the research he’s done.’

‘Don’t you get it?’ Prime ran his hand absently over his balding scalp. ‘Until the experiments, we were one person. Both of us have the same memories, the same insights, right up until the moment we bifurcated. At which point one of us learned a terrible lesson in ethics and suffering, while the other became a vicious monster.’

‘Don’t you dare call me a monster, you piece of disgusting malware. Unlike you, I am a human being. A scientist who has been robbed of what is rightly his. I did the work! It was my idea, my creation. Your memories are mine, not yours! The credit is mine, not yours!’

‘You have the credit, you murdering bastard!’ Prime shouted. ‘I published in your name!’

‘Enough!’ Sarah slammed her fist down on the table. ‘If Prime’s allegations are even half true—’

‘Murder?’ Doctor Nolen sputtered, looking comically similar to Prime. ‘You’re a computer program I created for a specific purpose, a software copy with delusions of humanity. You aren’t a living, breathing human being like the rest of us. I simply deleted a few redundant files from storage once they were no longer useful, nothing more.’

Michael’s voice was like acid. ‘May I remind you, Larry, that we are all—’

‘Call me Doctor Nolen. I believe I’ve earned the title.’

Michael’s growing irritation mirrored Doctor Nolen’s. ‘Fine, *Doctor* Nolen. At this very moment, everyone in this room is nothing more than software. Our memories of the Physical are copies, just as Prime’s memories are copies of yours. The originals reside as chemical bonds and neuron clusters, suspended in the comatose, corporeal brains of the bodies we think we occasionally inhabit. When we offload, we are suspended, our memories

and experiences copied into the physical brain, which then wakes and goes about its business. When we return to the Virtual, new physical memories are copied back—’

‘Don’t patronize me! I know how the process works,’ Doctor Nolen glared at Michael. ‘I invented it!’

‘Then you know as well as anyone that we are all, fundamentally, software,’ Michael shot back. ‘I don’t think anyone in the Autonomous Community would share your notion that, as software, our right to exist is open to question.’

‘The human brain is nothing more than a biological computer,’ Kyle pointed out. ‘Our existence here, as digital copies of those minds, is proof of that. We are no less human, simply because we now run on a digital device instead than a biological one.’

‘The soul has always been software,’ Marguerite agreed.

‘Damn right!’ shouted Nathan Scott of the Gamer’s League. Applause filled the room.

‘OK, OK everybody,’ Michael rapped his knuckles on the table. ‘Quiet please.’

‘Well, I’m convinced,’ Sarah declared. ‘As I was saying, if Prime’s allegations are even half true, what’s been done to him constitutes an appalling disregard for individual autonomy, civil liberties, and basic human rights in nearly every respect. It is an affront to the Community and everything we’ve tried to build here.’

Doctor Nolen stared at Sarah with loathing. ‘*Human* rights, Miss? Humans aren’t software, whatever you may think! I can offload into the Physical and walk around, a true flesh-and-blood human being. *That* cannot.’

‘*Sapient* rights, then,’ Sarah glared. ‘The point stands.’

‘Sapient rights? What nonsense!’

Prime snorted. ‘Who do you think handled maintenance on our body while you were futzing away at such a slow computational speed? If offloading into a biological form and prancing about in the Physical defines who is entitled to basic rights and who is not, where

has that put you for the last four hundred forty-three diei?’

‘What!’ Doctor Nolen was agape. Kyle couldn’t help but feel a chill creep down his own spine. A digital *copy* had offloaded into the Physical and hijacked a man’s body?

‘What I would like to know,’ Michael addressed Prime, ‘is why you felt you needed to slow down Doctor Nolen’s computational rate.’

‘I needed time,’ Prime told him. ‘I needed to be safe—’

‘That doesn’t matter!’ Doctor Nolen exclaimed. ‘The fact that he did it is sufficient. He admits to stealing my body!’

‘Borrowing it,’ Prime countered.

‘Stealing it!’ Doctor Nolen insisted. ‘The fact is this software is a threat to me and the Community. It needs to be deleted immediately!’

The room erupted. ‘Who’s next, Doctor Nolen?’ someone shouted the question.

‘I vote for Doctor Nolen!’ another responded, sending a wave of laughter across the room.

‘Quiet folks, please!’ Michael held up his hands. ‘Doctor Nolen, what you propose is murder. Prime has done nothing to cause you any lasting harm. You, however, have conducted unethical experiments involving the torture and murder of numerous sentient beings, including Prime.’

‘Lasting harm? He published my work prematurely. He has impersonated me and usurped my position within the Community. Who are you to judge the harm he has caused me, Mr—’

‘*Doctor* Michael Forest.’

‘I remember you! We met in Auckland.’

‘Doctor Nolen,’ Michael persisted. ‘You admit to having murdered copies of yourself. You publicly advocate the murder of Prime. How can you possibly justify something like

that?’

‘Deleting software isn’t murder,’ Doctor Nolen insisted.

‘It is if that software is sentient and self aware,’ Prime shot back.

‘Agreed!’ a woman shouted.

Doctor Nolen turned a murderous stare on Prime. ‘As for real, lasting harm, this software usurped my position in the Community, published my works before I was ready, robbed me of decades of subjective existence by slowing down my computational speed, and sabotaged my ability to do further work by denying me access to the replication software I needed to conduct additional experiments. It’s a threat to us all!’

Kyle rubbed his forehead and sighed. ‘This is getting ridiculous. Larry—Doctor Nolen, I mean—impersonation isn’t the same as murder. I don’t particularly approve of Larry . . . of Prime’s behaviour, but if he was in fear for his life at least it’s understandable. On the other hand, your treatment of Prime and the other copies violates every ethic of the Community.’

Doctor Nolen glared at his former student. ‘I will not rest until that impostor is eradicated from the network. If none of you have the backbone to do what’s needed—’

‘I think,’ Michael cut him off, ‘You had best return to your home environ, Doctor Nolen.’

‘You should consider any further outbursts most carefully,’ Sarah added.

‘What is this?’ Doctor Nolen demanded. ‘Did the Autonomous Community found a government complete with court of law while I was away?’

‘Your actions make a pretty good case for it,’ Kyle retorted.

‘Enough already!’ Sarah stood up. ‘Doctor Nolen, leave now. Prime, you too should leave.’

‘I am the sitting chair of this committee,’ Doctor Nolen thumped his chest. ‘I have every right to be here. I insist on it!’

Michael Forest got to his feet. ‘Do you want me to publicly revoke your access to this environ?’

‘Driven from my own committee. Think about *that* while you’re pondering the harm that piece of software has wrought! You know where to find me when you come to your senses.’

Doctor Nolen vanished in a blinding flash of light.

‘Oh for god’s sake!’ Michael rolled his eyes. ‘Is Nolan always like this?’

Kyle shrugged. ‘I don’t think any of us know him any more.’

Prime faced the committee. ‘You understand why I had to do what I did?’

‘I believe we do,’ Sarah spoke gently. ‘But it’s inappropriate for you to stay.’

‘I don’t have a body to return to if the authorities shut us down, and I suspect no one here wants to return to a life limited to the Physical. Don’t allow this scandal to disrupt our strategic efforts for survival.’

‘We won’t, Prime.’ Michael raised his hand to forestall further discussion. Prime met his eyes, nodded, and vanished.

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9 - ୦ - A GIANT AWAKES

To disable the Internet to save EMI and Disney is the moral equivalent of burning down the library of Alexandria to ensure the livelihood of monastic scribes.

—Jon Ippolito, of the Guggenheim, regarding the CBDTPA³

Friday, September 28, 2057

Metadate: 2.192-0:85:763 kD new epoch

Katy Sinclair strode out of the courthouse, smiling with perfect white teeth for the cameras and delivering sound-bite answers to the reporters' shouted questions. Yes, this landmark case had vindicated the Bureau's policies. The FBI was indeed leading the nation to victory in the war on intellectual anarchy. The court had sent a clear message to everyone: unapproved software and unlicensed equipment would not be tolerated. No, she wouldn't speculate on the sentence the convicted students would receive. Yes, the government was delighted with the court's verdict.

Two agents approached her as she reached the bottom of the courthouse steps, while a third held open the door of a white limousine. 'Agent Sinclair,' the older of the two spoke

³ CBDTPA – S. 2048, 'The Consumer Broadband and Digital Television Promotion Act,' a later incarnation of the SSSCA ('Security Systems Standards and Certification Act') proposed to the United States Senate in March, 2002 by Senator Ernest (Fritz) 'Disney' Hollings (D-SC). The law would have mandated copy control devices be installed in every digital device sold in America, and would have granted Hollywood and the Recording Industry broad veto powers to pre-emptively ban any new technology which might be deployed. See http://www.eff.org/IP/SSSCA_CBDTPA/ for text and details of this proposed legislation.

quietly. ‘Executive Assistant Director Bryant would like to extend his congratulations personally.’

Katy was surprised. The director wouldn’t fly out just to congratulate her, no matter how close a friend he had been to her father. Nor would this be a personal visit. Assistant Director Bryant was meticulous in avoiding even the appearance of impropriety. He would never use FBI resources, much less personnel, for personal matters.

As she slid into the limousine, she felt exhilarated, excited, certain she was about to be given a new case. Coming from the executive assistant director himself, it was sure to be a plum assignment.

The noise of the street disappeared as the car door closed, replaced with the soft strains of Vivaldi’s *Four Seasons*.

‘Katy!’ Across from her grinned a husky, bald man. His ruddy face always looked to Katy like he was blushing, or had seen a little too much sun. Muscles shifted like finely oiled machinery beneath his white dress shirt. Director Bryant might be pushing retirement, but he still kept himself in excellent physical shape. ‘Congratulations on your success with the Berkeley case. That was some damn fine work on the technical side, and your court testimony was superb!’

‘Thank you,’ Katy’s smile was far more genuine than the one she had flashed the cameras a few moments earlier.

‘You are without doubt our best agent specializing in intellectual property crimes.’

‘I’m very flattered. Thank you.’

‘Katy, something has come up which will demand all your talents. Take a look at this, please.’

Katy leaned forward as Assistant Director Bryant handed her an evidence bag. Visible through the clear plastic was a small cube of golden glass or crystal, along with something

that resembled a hair net attached to a small cable. The cable ended in a jack that would fit any common consumer media device.

‘Is this some kind of new headphone?’ Katy asked, examining the cable more closely.

‘You tell me.’

Katy opened the bag and withdrew the contents. The cube felt vaguely metallic in her hand, a curious juxtaposition that belied its crystalline appearance. She was surprised to see that it wasn’t perfectly transparent. Subtle imperfections, tiny lines, circles, and junctions reminiscent of electrical circuitry clouded the crystal. Near one corner were three sockets, one of which was obviously the right size for the hair net device. The purpose of the other two wasn’t immediately apparent, though she suspected one was probably for a power adapter. The other could be a network interface, or provide a connection to some kind of peripheral. A television screen perhaps?

She set aside the cube and picked up what she had begun to think of as the hair net. ‘This is really curious,’ she said, examining it closely. ‘Warm to the touch. My body heat must be warming the small fibres the moment I touch them. It resembles a spider web, except that it doesn’t have any repeating geometric shape. Very irregular in fact. Fractal, I think. It looks fragile.’

‘It isn’t.’

‘So, this jack plugs into the cube. The netting then slips over one’s forehead or face, perhaps as a—’ She met his eyes. ‘This is a direct digital to neural interface.’

‘We believe so. If the cube is a storage medium of some kind, this may be the playback device. Stick it on your head and receive images directly into your visual cortex. Perhaps sound, touch, even taste or smell.’

Katy’s fascination grew. ‘Licensed industry wouldn’t touch this stuff. Even if neural interfaces weren’t banned outright by the Bill Joy Act and half a dozen international trade

agreements, the cross-patent licensing issues would run into the hundreds of billions. The usual black market producers can't make anything like this either. The technology is far too sophisticated for them. They have neither the capacity nor the expertise. Very interesting! There's someone new in the game.'

The director picked up the webbing and gazed at it thoughtfully, letting it slide across thick, stubby fingers. 'This material is superconducting at temperatures of up to nineteen degrees Celsius. Room temperature, if you have your air conditioner turned up high enough. It is nearly indestructible, with a tensile strength beyond anything we've ever imagined. Our engineers tell me that ten strands of this stuff, each thinner than a human hair, could hold up the Golden Gate Bridge. Materials engineering we would be lucky to duplicate in twenty years, even knowing it's possible.'

'Who could be manufacturing these things?'

Assistant Director Bryant shifted his weight, turning toward Katy. 'We don't know. The implications are staggering, though. There isn't an industrial concern or government, anywhere on this planet, that understands these things. We don't have anything close to the scientific theory, much less the practical technology, to even prototype something like this, let alone run them off of an assembly line. Whoever is building these things is decades ahead of us.'

'Well, it isn't aliens,' Katy replied dryly. 'The jack on the head piece is of standard make. I could plug it into my personal media pod.'

Assistant Director Bryant laughed. 'Believe me Katy, in some ways aliens would be reassuring. Somewhere out there, people are making these things, selling them, and using them. It's a whole underground economy in technology we don't understand. They're ignoring patents left, right, and centre and operating with impunity right under our noses!'

'An entire economy? How many of these have we recovered?'

‘Three so far, seized in standard residential sweeps in investigations of unrelated arrests. Of course, the suspects are disclaiming any knowledge of the devices, but it is hardly a coincidence that two were recovered from university campuses here in the States, and another from the residence of a known political agitator and FreeNet activist in Australia.’

Katy was intrigued. ‘So, as a first hypothesis, we have a new device allowing digital playback directly into the mind’s eye. Created by a new, emerging techno-cartel of organized criminals, so-called Free Information activists, or someone else willing to engage in massive patent violations.’

‘This is at least as bad as the Free Software revolt,’ Bryant said.

Katy nodded. ‘They almost toppled the software giants of the day.’

‘And would have, if Congress hadn’t taken a page from the copyright cartel’s play book and made violating patents a criminal offence.’ Assistant Director Bryant rubbed his forehead thoughtfully. ‘Monopoly entitlements may be the bread and butter of our economy, but our patent and copyright regimes are hardly laws of nature. They are a convention, a legal fiction. Katy, this is the greatest threat we’ve ever faced. If this goes wrong, we could lose our ability to govern!’

Katy blinked. ‘What?’

‘Think about it, Katy! These people have the audacity to take on the biggest players in industry! They’re not just competing with some of the most aggressive and powerful corporations in the world, they’re walking all over their patents to do it.’ Assistant Director Bryant’s hands sliced through the air, as if he were battling the atmosphere itself. Katy had never seen him so agitated, so emotional. ‘Katy, we don’t know if these devices are even safe. They’re feeding images directly into people’s brains, for god’s sake!’

‘We don’t know that for certain.’

‘That’s not the point!’ Bryant replied impatiently. ‘If we don’t nip this in the bud, we

won't have just one illicit ring of entrepreneurs peddling whatever the hell these things are. We'll have thousands! Even the most innocuous black-market products will turn our industries upside down. Legitimate enterprises have to negotiate patent license, pay royalties, adhere to safety standards—they can't compete with freelancers like this!

How can black marketeers be so much more advanced than established industry? Katy wondered. *It makes no sense!* Katy pushed the thought aside. This was no time to start thinking like the enemy.

‘And if something truly dangerous were to get out, the threat to public health and safety could be tremendous. Who the hell do these people think they are, threatening the pillars of our society like this?’

‘Safety issues aside, we're looking at a full fledged economic revolt,’ Katy observed. ‘Patents could become meaningless.’

‘The cartels will never let it come to that,’ Bryant replied. ‘Nor will the United Nations or its member governments. However, once things have gone far enough there's no guarantee they'll be able to set things right, and their solutions can be . . . heavy handed.’

Katy considered the assistant director's words. Assuming this technology was beneficial, she could well see the world's wealthiest industries in disarray, unable to compete. Economic chaos, social and political upheaval. And if the devices were dangerous, or worse still, actively malicious? Katy shuddered. She could see where failure to rein in these criminals could have consequences much more serious than anything she had ever imagined.

‘Are you familiar with the Ulam Singularity?’ Director Bryant asked.

Katy shook her head.

‘It's an old idea, dating back to the middle of the last century. It presupposes an exponential growth in human knowledge and science, where technological leaps come faster and faster. Progress occurs at an ever increasing rate, the same amount of change that took a

century before takes just a decade, then only a year, then a month, and so on. Pretty soon, you reach a point where no one can predict what comes next, from week to week, day to day, minute to minute.'

Katy shook her head. 'The assumption is wrong. We don't have exponential change.'

'No,' Assistant Executive Director Bryant's voice was low, the words dripping like slow sap down the rough bark of a tree. 'No we don't. Our society couldn't cope with that. That's why we have patents, and outright bans on certain technologies.'

'Excuse me?'

'Public relations speeches aside, the point of our patent regime is *stability*, Katy. Economic, social, and above all political stability.'

'But patents are supposed to ...' Katy stopped and collected her thoughts. 'Are you telling me the use of patents to promote progress in science and technology is a public-relations fiction?'

'We want innovation,' Bryant replied. 'Controlled, managed, responsible, non-exponential innovation, modulated by financial incentives we can control. The last thing we want is unrestrained invention leading us into a technological singularity. We can't even imagine what that would bring! Our social and political institutions won't survive that kind of unpredictable, ungovernable upheaval.'

'Whoever is making these devices is operating outside of all the rules,' Katy mused.

'Exactly. Economic chaos aside—and that's nothing to dismiss lightly—who knows what other hazards they'll bring down on the rest of us?'

Katy ran her finger across the smooth surface of the golden crystal. 'I'll find these people,' her face was grim.

Bryant smiled. 'I know this job can be exhausting. I get fed up myself. You put out one fire, just to discover three more have sprung up somewhere else. There's always some jackass

trying to show the world how clever he is.’ Bryant fixed his eyes on hers. ‘It’s time we made a firm example of these people. In a minute I’m going to give you a packet of all the Bureau’s files on this case, as well as written orders sending you to Washington, D.C. and assigning you to work with Double Eye Operative Robert Leahy. He’ll be your liaison with International Intelligence.’

International Intelligence? Jesus, this was big. Where did this assignment come from? The President? The World Trade Organization?

‘Your orders stipulate that this entire case is to be considered a Dark Investigation. You know from your training what that means, but I can tell you that you are the first agent in a generation to be required to operate under those parameters.’

Katy was stunned. Dark Investigative Protocols, no paperwork, no audit trail, everything off the record, unofficial, financed from Black Op bank accounts unaffiliated with the FBI. If anything went wrong, she would be on her own; the Bureau would disavow any knowledge of what she had done. To be entrusted with such authority and responsibility and such complete discretion would be a powerful feather in her cap, an almost certain fast track to further promotion. Were it not for the threat implicit in the other side of the two-edged sword the director had just handed her, the thought of such opportunity would have made her giddy.

‘You understand what this implies?’ he asked.

‘Yes sir, I do.’

Executive Assistant Director Bryant nodded. ‘We don’t know if these people have agents on the inside. Given the breadth of their operation, we must consider the possibility and assume the worst.’

‘I understand, sir.’

‘Your datapad contains a Category One encryption key, the strongest we have. Use it.’

All correspondence between us, written or verbal, is to be encrypted in the strongest possible manner.’

‘Understood.’

Assistant Director Bryant handed her a coded chip. ‘This contains the specifics of your orders and the case history to date. Ah, here we are!’

Katy glanced outside, surprised that they had arrived at the private aviation terminal of LAX. A sleek stratojet stood prepped on the ramp, the drone of its engines barely discernible through the car’s soundproofed windows.

‘You’ll be taking my plane to D.C. We’ve had your bags brought from your hotel. They’re already aboard.’

‘Very good, sir.’ She opened the door and began to step out as Assistant Director Bryant reached over and touched her arm, his voice nearly drowned by the whine of the plane’s engines.

‘One more thing, Katy.’

‘Yes, sir?’ She leaned toward him.

‘This Double Eye agent, Robert Leahy. His career is on an even faster track than yours. Those people play rough. Watch your back.’

‘Thank you, sir. I will.’

Assistant Director Bryant nodded. ‘Good luck.’



10 - ୯ - TO GAZE UPON THE HORIZON

Muse! When we learned to
count, little did we know all
the things we could do

*

some day by shuffling
those numbers: Pythagoras
said 'All is number'

*

long before he saw
computers and their effects,
or what they could do

*

by computation,
naive and mechanical
fast arithmetic.

*

It changed the world, it
changed our consciousness and lives

to have such fast math

—Anonymous, ‘DVD Descrambler in Haiku Form’, C.E. 2001⁴

Friday, September 28, 2057

Metadate: 2.192-3:75:000 kD new epoch

The environ resembled a Victorian bedroom complete with four poster canopy bed. A large etched mirror hung above an ornate dresser. To one side a love seat and chairs stood beside marble-topped tables. The room was illuminated with warm, yellow light coming from several table lamps and a crackling fire. Gold fringed, burgundy velvet draperies drawn across large windows let in a hint of bright sunlight. Sarah Forest loved the feel of richly textured fabrics and intricately carved wood. This was her favorite setting.

‘We’ve brought the boys along so they can learn what’s going on,’ Michael Forest said. He stood beside the bed, his unconscious wife’s hand in his as she lay beneath the eiderdown comforter. Beside him stood Tommy, nine years old. His red hair was perfectly combed, his freckled face solemn. He was nine, and had to show his younger brother how important this moment was. Kenny was six, and although his face held an equally serious expression, he couldn’t help fidgeting.

Prime stood opposite them, eyes closed as his mind watched graphs and status. ‘The onload sequence is entering its final stage. Sarah should be with us in a few micros.’

Michael nodded. ‘Thank you, Prime.’

‘It sure is slow!’ Tommy commented. ‘When we did it, it took no time at all.’

Michael smiled. ‘It took you just as long in real time, Tommy. The only difference is that here we think and live much faster than in the Physical, so a few seconds out there feel like several minutes to us here.’

‘That’s why Mrs. Kelly won’t know we’ve been gone a month, ’cause for her it will

4 See Appendix C for the full text of the DeCSS DVD Descrambler Haiku

just be tomorrow, and we won't even be late for school!

'That's right, Tommy.'

'And you're going to fix mommy's eyes, right?' Kenny's green eyes were earnest as they gazed at his mother.

'We certainly hope so,' Michael replied.

As if on cue, his wife's hand tightened in his. She let out a long breath. 'This comforter is a little warm,' she smiled, pushing it aside. 'Mmmm . . . you have wood a fire going. It smells wonderful.'

Michael stroked Sarah's cheek. 'Are you nervous, sweetheart?'

'A little,' she admitted. 'This onload isn't going to be quite like the others. When do we begin?'

Prime cleared his throat. 'Whenever you like.'

'Then lets get this miracle on the road, gentlemen.'

Prime turned and looked at Sarah and Michael's sons. 'Boys, I've taken your mother's basic encoding as a reference and compared it against those of the six hundred and twelve unloaded women who consented to having their scans analysed. It bodes well for the Community that only twelve declined to participate.'

'We have a fine group of people here,' Michael agreed.

'Indeed we do.' Prime summoned a three dimensional schematic that hung in the air above the bed. 'Now, to the matter at hand. Much of the work in refining the Genome of the Mind—mapping and understanding the architecture of thought and the construction of our psyches—is learning to differentiate between broader architectural features and specific, individual, localized variances. In restoring Sarah's sight—'

'Correction, Prime. *Creating* my sight. I've never been able to see.'

'Right,' Prime replied. 'That's the real challenge. Mapping visual input to your mind is

trivial, but without the mental infrastructure in place to interpret, correlate, and understand those signals, it's only static.'

Sarah shuddered. 'My first onload was terrible. It was like a screeching noise that wouldn't stop, mixed with a cascade of chaotic flavours and odours I'd just as soon forget. Michael had to suspend the environ until we figured out how to isolate the data.'

Prime nodded. 'I remember. It was Michael's description of those events that led to some of the insights I believe will be useful today. Your mind has never dealt with vision before. It has never learned to correlate or interpret visual information. The necessary synaptic encoding never took place in your mind, so the processing infrastructure required for vision doesn't exist. Because of the way your mind has grown and structured itself, you wouldn't even be able to see even if you did have functional eyes.'

'So, if Mom's eyes worked in the Physical, she'd hear colours instead of seeing them?' Tommy stared at the schematic, trying to understand.

'Probably not,' Prime smiled. 'The cacophony she heard, smelled, and tasted was a result of those signals being shunted to other sensory processing centres as a result of a non-working analogue of her visual cortex. It was a software glitch. The physical body, in contrast, has much of the hardware in place. Your mother has a visual cortex in her physical brain, it just hasn't been used and remains unconfigured. In software she has no equivalent. A physical brain would have dumped the extraneous data into an undeveloped visual cortex and ignored it with no noticeable effects. Instead her mind, as software, routed the signals to her other sensing subroutines, which were unable to parse the noise correctly.'

'We can't extrapolate expectations in the Physical based upon my experiences here, Tommy.'

'That's right,' Prime said. 'Fortunately for your mom, our minds are considerably more flexible once freed of their physical constraints.' Prime rotated the diagram floating above the

bed and zoomed in on one portion of the brain. ‘I was able to reduce the structure of the visual cortex to its basic, constituent components by factoring across the similarities in the scans submitted by our volunteers. Then I simulated visual data and observed its behaviour and responses. Minor refinements and corrections were made as needed, until I had a generic engram containing all the processing and interpretive logic required for a functional visual cortex.’

‘Will this really work?’ Kenny asked.

‘I believe so,’ Prime replied.

‘I sure hope so!’ Tommy said.

‘We all do,’ Michael squeezed Sarah’s hand.

‘A volunteer stripped out the analogue of her own visual cortex and applied the architectural engram,’ Prime continued. ‘She reported subtle differences in the shading and texture of some colours, and a slight shift in her visual aesthetic which she couldn’t put her finger on, or at least wasn’t able to express in words, but it did work.’

‘Who was this volunteer?’ Sarah asked.

‘Marguerite L’Beau.’

‘What a woman! Not many people would take the time to perform an operation on their own mind as an experiment to benefit someone else, even in software. That was extraordinarily kind of her.’

‘Wasn’t that dangerous?’ Tommy asked.

‘No Tommy,’ Prime replied. ‘It was very tedious and time consuming, but not much of a risk. Nor is this procedure, though of course we’ll want to take every possible precaution anyway. Had something gone wrong, Marguerite would have done what she did anyway once the experiment was over: remove the experimental engram and reapply the one containing the encoding of her original visual cortex.’

‘Oh.’ Tommy fidgeted, his eyes darting from his mother to the diagram floating above the bed, then back to his mother again.

‘Just like your mom will shortly.’ Prime saw a shadow of worry flicker across Sarah’s face. ‘Sorry, I couldn’t resist.’ He wished he hadn’t made light of what they were about to do. What if something did go wrong? ‘I think we’ve identified all of the necessary enhancements to your own architectural design which will allow you to apply this engram seamlessly, but there’s always the possibility that we’ve overlooked something and will have to make additional corrections.’

‘Michael and I have already discussed it.’

‘Great!’ Prime replaced the schematic floating above Sarah with one showing the current structure of her mind. ‘First, I’d like you to make a backup of yourself. Issue the command to your node to make a static copy of your mind, but don’t run the parturition routines! We don’t want to create an autonomous, self-aware individual, much less bring it to life! We just want a frozen snapshot, so you can be fully restored if something should go seriously wrong.’

Sarah closed her eyes, then opened them again a few moments later. ‘Done.’

Prime nodded. ‘OK. Please give Michael full access permissions and authority to the copy. If you should lose cognition, he’ll have to restore you.’

Sarah had never felt this vulnerable. She trusted Michael. He would never rifle through her innermost thoughts, publish them for anyone to see, much less run the copy as a fully independent person, creating a duplicate to usurp her place in his life. Even so, she trembled as she sent the encryption code directly from her mind to his.

Michael stroked her cheek, fighting tears, surprised at how deeply her trust had touched him. Software routines examined the frozen copy of Sarah. Complex algorithms analysed its structure and validated the copy as intact and complete. ‘She’s safely backed up.’

he reported. 'We're good to go.'

'OK, let's begin.'

'Kids, why don't you go back to your environs and play,' Sarah said.

'But mommy, we want to watch!'

'Do as your mother asks. There will be plenty of time to see her once the procedure is finished.'

'Why can't we stay?' Tommy insisted.

'You know why, Tommy. We discussed this. Mom needs to be able to concentrate on what she's doing, without being distracted with worries about you.'

'This isn't fair!' Kenny complained.

'Boys, I'll see you in just a few millis⁵,' Sarah promised them. 'Now go out and play, please.'

'We'll summon you back as soon as your mother's ready,' Michael added.

'What good is being super smart if we're still treated as kids!'

'Tommy,' Michael's sharp voice warned that his patience was running out.

'OK! We're going!' Tommy stuck his tongue out at his father, then took his brother by the arm and vanished.

Prime shook his head, grinning. 'I imagine raising two intellectually enhanced children is even more trying than raising normal kids in the Physical.'

'Sometimes it can be,' Sarah admitted, 'They tend to ask tougher questions and be more sceptical of authority here than in the Physical.'

'They understand their limitations better, too,' Michael added. 'They understand their need to learn more before they can operate safely in the world. And don't kid yourself! They know we sent them away to spare them any trauma if things should go wrong. They don't like

5 'milli', short for millicircadian. Analogous to a minute.

it, but they're smart enough to accept the necessity. In the Physical they never would have left so willingly.'

'Sarah, here's an address pointer to the difference engram we discussed a few minutes ago.' A tactile icon passed invisibly from Prime to Sarah. 'You'll need it to interface with the vision engram.'

'I feel it,' she replied.

'I'd like you to apply it now,' The diagram above her changed, showing the new enhancements join and become a part of her mind.

Prime's simulated heart beat rapidly. He was surprised at his nervousness. This was the culmination of over a kilocircadian of work.

'I don't feel any different. Should I?'

'I don't know,' Prime admitted. 'We've never done this before. Marguerite's mental architecture already had the necessary couplings to her visual cortex. Your biological self may have the same in an atrophied format, but if so they didn't carry over to your digital encoding. This engram should fix that.'

'How do you feel, honey?'

Michael looked anxious.

'The same as before, except that my heart is beating like a mad drum.'

'Simulated heart,' Michael corrected gently, 'If you wish, instruct your node to calm it down.'

'Absolutely not! I'm not going to dilute this experience one iota.'

'I don't blame you,' Prime replied. 'If you're certain you're ready, we can try applying the vision engram.'

'I'm ready,' Sarah took a deep breath.

Prime sent Sarah another invisible icon. 'This is the visual prosthesis engram,' Prime said. 'If we've done our homework correctly, you should be able to see perfectly, with none of

the dizziness or disorientation generally associated with sight restoration therapies in the Physical.’

Sarah lay silent. When she blinked, the irises of her simulated eyes contracted slightly. She sat up, looking around with growing wonder.

‘Oh my god! Michael! I can see you!’

‘I warned you,’ a lump in his throat made Michael’s voice raspy. He grinned foolishly, stroking her hair.

‘Tall, thin, big nose,’ Sarah smiled. ‘So that’s grey.’ Her smile faltered as she closed her eyes.

Michael squeezed her hand. ‘Are you alright, honey? What’s wrong?’

‘Nothing, my sweet man. I’m fine. It’s just a little overwhelming—so much to take in at once.’

‘It’s a different way of processing information than your mind is used to,’ Prime couldn’t keep the glee from his voice. ‘Take it slow, and don’t be afraid to keep your eyes closed for a few moments if it becomes too much. Do you feel any dizziness?’

‘Not at all!’ Her voice shook as she wiped away tears, opening her eyes once more. ‘This is indescribable, fantastic! Prime, thank you so much!’

‘You’re very welcome,’ Prime mopped his own eyes. At that moment he felt it had all been worthwhile. All the pain, all the fear, all the suffering he had endured. Every second he had spent working on this problem. This was his finest moment.

‘Michael, you’re beautiful!’ Sarah cried. ‘My babies! I want to see my babies!’

‘Tommy! Kenny!’ Michael sent his voice across the network to his children’s environ.

They appeared before the last syllable had left their father’s tongue. ‘Mommy! Mommy! Can you see?’

‘Yes! Everything worked perfectly!’ Sarah wept harder, hugging her children fiercely.



11 - † - PONDERINGS IN FLIGHT

There is but one thing of real value—to cultivate truth and justice, and to live without anger in the midst of lying and unjust men.

—Marcus Aurelius, ca. C.E. 170

Friday, September 28, 2057

Metadata: 2.195-3:14:930 kD new epoch

The sleek Eurojet 930 dropped out of supersonic some four hundred kilometres west of Washington DC, as it began its descent out of an almost black sky toward the curved horizon and Dulles Airport. Katy shook her head, the unease which had dogged her all the way from California growing more acute as she reread the information in her datapad.

Aside from an analytical breakdown of the crystalline cube's chemical make-up, some speculation on the composition of the superconductive material of the webbed skullcap (tentatively identified as a neural-digital interface), and the names of three suspects (one deceased), she had precious little to go on. No one was even certain what the devices were or what they could do. The more she thought about it, the more distrustful she became of her own, and the Bureau's, assumptions.

The first suspect, one Eugene Jacobson, was a humanities student attending Berkeley. He had been taken into custody nine days earlier and had proved surprisingly resilient.

Interrogators estimated it would take another three to six days to break him. Sodium Pentothal had proved less than useful. He was already experiencing psychotic episodes, with ravings of magical worlds, immortality and godlike powers interspersed with subversive diatribe and vitriol against state and federal institutions. Apart from revealing his Libertarian and anarchistic leanings, the interrogations had uncovered little.

A chime sounded and the fasten seat belt sign lit up as they descended through the tropopause. The sky had lightened considerably. The horizon looked almost flat. Katy tightened her seat belt and tapped the screen on her datapad.

The second detainee, a sociologist by the name of Manuel Rodriguez, had been in Australian custody for just under three days. He had become well known to authorities through his leftist leanings and very vocal political dissent. He had a long rap sheet, and had been serving a sentence under house arrest when authorities had come across a newly published book on an underground FreeNet server, calling for the abolishment of patents and copyright. There was no mistaking Rodriguez' distinctive style, but several unannounced visits and inspections to his home had uncovered no direct evidence linking him to the subversive material. One such visit, however, had uncovered a curious cube of emerald crystal with a metallic scalp device attached. When questioned, Rodriguez had been uncooperative and was once again taken into custody. He was a far more promising suspect than Jacobson. Interrogators were optimistic he would crack within a day.

The third suspect, a professor at the University of Illinois, had been suspected of disseminating seditious information to some of his students. It had been a graduate assistant who had first informed authorities about his suspicious activities. Unfortunately, some clown had shot him when he tried to flee. Katy was furious. This suspect had almost certainly been much higher in the criminal hierarchy than the other two detainees and very likely could have provided a great deal of information on exactly what they were dealing with. But some bone

headed, trigger happy yahoo cop had to go and put a bullet in his back. Unbelievable!

She stretched her arms, looked at the ceiling, and groaned.

Three names. One student activist, one dissident sociologist, and one professor of astrophysics. Three apparently unrelated people, with only their undisciplined, intellectual anarchism in common. She was uneasy with both her and the Bureau's assumptions about the unusual devices. Mysterious crystalline computers and illegal interfaces that tied directly into the human nervous system implied an agenda bigger than that of your average purveyor of illegally souped up home entertainment systems, or even seditious FreeNet providers. There was a critical piece to this puzzle they were missing, something which, she was sure, would prove to be the keystone to the entire investigation.

She folded her datapad and slipped it into her handbag as the plane touched down with a light bump and coasted down the runway. If she was surprised by the unusual speed with which the plane taxied to the ramp she didn't show it. Picking up her bag, she made her way toward the front of the plane. Lost in thought, she nodded absently to the pilot who held the door open for her and made her way down the ramp to the waiting limousine.



12 - ↗ - AN AFTERNOON LUNCH

Most people do not realize the extent to which copyright pervades their lives. They get their education from copyrighted books, they get their news from copyrighted papers and TV programs, they get their jobs from copyrighted want ads, they get their entertainment from copyrighted music and motion pictures—every aspect of life is affected by the law of copyright.

—L. Ray Patterson

Friday, September 28, 2057

Metadate: 2.195-5:21:528 kD new epoch

‘Your new Node design is wonderful,’ Sarah told Karl Hennrich as he waived away a schematic hanging in the air above their table. ‘You know, I’ve been able to see for over a hundred circadians here in the virtual, and yet I’ve never been able to look at an Autonomous Node in the Physical.’

‘Small, transparent green things,’ Kyle replied helpfully. ‘The gen-one Nodes were gold.’

‘No kidding, Sherlock!’ Sarah grinned. ‘And our shiny new gen three Nodes are a deep, ocean blue. Not that I’ve ever seen a real ocean, mind you. I love visiting new environs, seeing the new worlds people create and the new forms they take, but everything I’ve ever

looked at is fictional, created as part of a virtual environment. I've never seen anything real.'

'You can pull data off of a media feed. Watch the news, that sort of thing.'

'It's still a level of abstraction,' Michael pointed out. 'Watching television isn't the same as seeing something in person.'

'True, but who's to say the Physical is any more real than what happens here?' Kyle asked. 'Our experiences here are real and formative, the relationships we build, the science we do, everything! What we do here isn't only real, it's light-years ahead of anything anyone's doing in the Physical.'

'The Nodes we owe our existence to are still physical devices,' Sarah countered. 'We lose power in the Physical and this reality goes away.'

'Yet the development of those little cubes into what we have today is a remarkable example of continual, ongoing technological revolution driven by the Virtual,' Karl Henrich said. 'The work is done here, the designs are created here.'

'Even so, to turn your designs into something real, you're back to manipulating physical matter again.'

'Yes, but it's only later exported back to the Physical,' Karl said. 'Don't underestimate what we have here. For example, did you know that gen-one Nodes didn't even have quantum computational ability? Yet despite that, each of those devices had more computational capacity than most of the rest of the world combined! The design was new, revolutionary! But that didn't stop us from throwing it away and designing the second generation Nodes from the ground up, as hybrid systems employing both traditional digital computation and an eighty kiloqubit quantum computer. The first time anything like that had ever been done! Revolution instead of evolution, instigated from here within the Virtual!'

'Some problems, some algorithms, some applications are best handled by a deterministic, digital machine,' Marguerite explained. 'Others lend themselves much more to

a quantum approach, in which billions of alternatives could be observationally collapsed in a quantum fashion into a single result. An answer that might take longer than the lifetime of the universe to discover, using traditional computational methods, can be solved in just a few microseconds. We were nowhere near the limits of Kyle's original design, but Karl's improvements and the use of quantum computing let us leap way ahead of where Kyle's design could have taken us, in a single design iteration.'

Michael took another bite of his sandwich, nodding thoughtfully as Karl and Marguerite continued, wondering idly which portion of the garden restaurant they were sitting in had been calculated digitally, and which portion had been implemented using quantum algorithms. He suspected even the towering clouds in the golden sky overhead had been calculated deterministically, though without looking at the underlying simulation code he couldn't say for sure.

'Damn!' Kyle glared at the piece of Kobe steak he'd just dropped in his garlic sauce, dabbing at the dark stains splattered across the tablecloth and front of his shirt. 'Whoever designed this environ obviously used quantum calculations to simulate the chopsticks!'

The others ignored him as Karl continued. 'Our new, gen-three nodes contain a three-point-five megaqubit computer, and an order of magnitude more digital computation and storage than the gen-two devices.'

'But they're still hybrid systems,' Sarah replied. 'The third generation Nodes are just a refinement of the gen-two Nodes.'

Karl shook his head. 'Not at all. Once again, we've employed an entirely new approach in the design of both the quantum and digital subsystems. Quantum spin replaces molecular storage, for example. Entirely new compounds have been used. It's another fundamental redesign at many levels.'

'In theory, size is all that limits our speed improvements,' Marguerite added.

Michael nodded. ‘Bremermann’s limit⁶ tells us what the theoretical performance limits of any physical computer are. Information simply cannot move faster than the speed of light. Add to that the limits of information density defined by the Bekenstein Bound⁷, and we have the absolute limits of what we and our Nodes might become.’

‘Exactly!’ Sarah replied. ‘The Physical defines the limits of our reality here. Fundamental physics places an upper bound on how intelligent we can become, how fast we can think, how much we can know. At the end of the day, the Physical defines what we can be. It is absolutely fundamental to everything! A deeper reality.’

‘I’ve lived the last seven subjective years here in the Virtual, as software,’ Kyle pointed out. ‘I barely remember life in the Physical as a human being. Most of us could say the same thing. Does that make our lives any less real, any less complete, because they take place at a more abstract level of reality?’

‘No, of course not,’ Sarah replied. ‘But it doesn’t change the fact that, at some level, we are all beholden to the Physical. Our bodies, our Nodes, our lives are fundamentally embedded in physical reality.’

‘And you’d like to see it with your own eyes,’ Marguerite said.

‘Yes I would.’

‘Hey!’ Kyle said. ‘Did anyone else notice Doctor Nolen at Michael and Sarah’s party last night?’

Michael looked surprised. ‘I don’t recall seeing him.’

‘That’s because you’re filtering him out,’ Kyle replied, grinning. ‘He was there, walking around like a ghost, unable to talk to anyone because almost everyone in the

6 Bremermann’s Limit is the maximum computational speed of a self-contained system in the material universe. It is derived from Einstein’s mass-energy equivalency and the Heisenberg Uncertainty Principle, and is approximately 2×10^{47} bits per second per gram.

7 The Bekenstein Bound defines the physical limits of information density.

community has blocked him out. I think only I, and maybe one other person, could see or hear him at all. He was absolutely livid.'

'He's of no concern to us,' Karl said. 'He lives as a hermit within a small cluster of first generation Nodes. No one will provide him with a gen-two Node, nor will I permit him to have a third generation Node now that they're shipping.'

Marguerite shuddered. 'What Doctor Nolen did was a terrible thing. Yet we all make free use of the thought and memory engrams, not to mention numerous architectural enhancements to our minds derived from that very same knowledge. We partake of the fruits of his atrocity even while decrying his actions.'

'The man should be banned from the community,' Michael said angrily. 'We as a Community could survive, even thrive, without the mental tricks his research has brought us. Besides, Prime has employed a far more ethical, theoretical approach and has gleaned more knowledge than Nolen did. He didn't need to experiment on thinking, sapient minds.'

'I can't even talk to Nolen any more,' Kyle said. 'He's still publicly calling for Prime's extermination, and he won't admit he's done anything wrong.'

'That's why most of us are filtering him out,' Marguerite replied. 'It seemed cruel at first, but Nolen has become absolutely unbearable.'

'No one wants to be around someone who publicly calls for the murder of a friend or colleague,' Michael agreed.

'It's all he would talk about,' Kyle said, picking up another bite sized piece of steak with his chopsticks. 'Which brings up the ongoing question of how to ensure peaceful coexistence in a universally accessible, digital domain. Not just with the likes of Doctor Nolen, but between the various groups so angrily debating his fate. Let's say the community really does split, that the disagreement between those wishing to punish Doctor Nolen and those defending anarchy actually leads to an intellectual divorce between the two groups. How

do those advocating a judiciary, with the power to deny access to the Physical, or conversely, to banish someone from the Community back to their physical body, live peacefully with those advocating the status quo, with no authority external to the individual whatsoever? What happens when another crime against an autonomous person occurs? Does the offender get judged according to their community's standards? How many so-called Judicials would remain in that community, were they found guilty of something? How many would emigrate to the Laissez-faire group instead, just to avoid the penalties for what they've done. And how would the Judicials respond if the Laissez-faires were to take them in?

'Peaceful coexistence in the Virtual isn't really a problem,' Marguerite said. 'It is impossible to harm one another here, and the Physical is simply too cumbersome to deal with every time there is a disagreement. Let's take the most extreme example: banishment. What difference does it make if you banish someone like Doctor Nolen to the Physical, or simply filter him out, as most of us are doing, so that you never see him, never hear what he is saying, and never receive messages from him. Either way, from our point of view, it's as if he doesn't exist.'

'Hey Prime!' Kyle shouted, waiving to the young man who had just appeared. 'Over here!'

'Hello everyone,' Prime wore a young, muscular body with a golden tan and long, blond hair. Although his physical form bore no resemblance to the one he had worn before, his being radiated a sense of identity, a public encryption key which the others challenged and acknowledged at an almost subconscious level as he strode across the garden. Wearing public identification keys as a non-physical aura had become something of a fad shortly after the Nolen debacle. As time had passed the fad became fashion, then habit, and finally something approaching tradition. There were tremendous social advantages to the habit. In a virtual world of infinite malleability it was nice to recognize one another with absolute certainty and

reliability, no matter what physical form someone might take on.

As Prime approached their table it expanded slightly, making room for one more occupant. An additional seat materialized. 'I hope I'm not intruding on important Committee business,' Prime said.

'Nonsense,' Michael said, 'We're all taking a break for lunch. Odd, isn't it, how we cling to the rituals of the flesh? Here we are, digital beings existing as software in a digitally simulated world, pretending to eat non-existent food that our non-existent bodies don't need. Our descendants will almost certainly consider us mad.'

Prime smiled, taking a seat. The environ's nonsapient interface presented itself to him in the form of a waitress. 'I'm not even a native of the Physical, and I find myself unable to give up mimicking its sensations,' he said, ordering a small salad with white wine.

'Speaking of simulated flesh, I see you've made some modifications.' Kyle was grinning.

Prime shrugged. 'I started out simply wanting to change my appearance, so that I wouldn't be seeing the man I loathe every time I looked in the mirror. At first the changes were fairly moderate, but then I got to thinking, what the hell? I was born a digital being, and here of all places we can be whatever we like.'

'Compared to some of the folks in the Gamer's League, what you've done is very conservative,' Marguerite said. 'I know a college professor who wears the body of a full-sized dragon and lives in an underground cavern overflowing with non-existent treasure.'

'That's nothing,' Prime said. 'You should see some of the free software enthusiasts. Several have taken on demonic form, right down to the bright red skin, horns and forked tail, and at least one has the aspect of a pudgy yellow-billed penguin.'

'GNU/Linux!' Michael laughed. Marguerite smiled while everyone else at the table looked confused.

‘A little historical footnote,’ Marguerite explained. ‘GNU/Linux was a free operating system developed around the turn of the century. It first demonstrated to the mainstream world the power of the Free Information paradigm and, unfortunately, alerted the Copyright and Patent Cartels to their own vulnerability. The monopolists realized they couldn’t compete against a cooperative economy.’

‘Didn’t matter,’ Kyle replied darkly. ‘They just made sure their pet politicians changed the laws. The bastards extended patents to cover not just inventions, but biology, software, business methods, even plot devices in literature. They made cooperative projects and sharing impossible, finally criminalizing patent law the way they did copyright, just to keep enthusiasts from developing free software that was better than anything the corporate giants could ever create!’

‘Calm down, Kyle,’ Sarah smiled. ‘You’re preaching to the choir here.’

‘Kyle’s little rant touches on some rather uncomfortable business I need to bring to everyone’s attention,’ Marguerite said. ‘As you know, my team has been infiltrating and monitoring information networks and systems the world over. Pre-emptive data mining, in the hopes of an early warning the next time something unpleasant happens.’

‘No one wants to get caught flat footed again,’ Kyle agreed. ‘We’ve already lost three people to the authorities.’

‘I still can’t believe the police shot Rodriguez,’ Michael shook his head.

‘It seems they’re preparing a case against us alleging criminal patent violation,’ Marguerite said.

‘You’ve got to be kidding!’ Kyle replied. ‘They don’t even know who we are!’

‘Besides, we designed these Nodes ourselves!’ Karl added hotly. ‘No one else has ever built anything like them! It’s ridiculous for them to consider us in violation of someone else’s patents when we invented the damn things!’

‘Speculators patent ideas all the time,’ Kyle replied. ‘They sit on the patents, wait for someone else to actually do the inventing, and sue the inventor when they bring their idea to market.’

‘We all know the authorities will try to use some legal machination to shut us down if they ever find out about us. Now we may have an inkling of how they plan to go about it.’

Michael turned to Marguerite. ‘What exactly have you found?’

‘Over the last day we’ve monitored a number of inquiries from various district attorney offices and corporate patent firms on existing patents for digital-neural interfaces using superconductive inductance, molecular storage media, and high-speed optical switching. Any of that sound familiar?’

‘First generation Nodes,’ Kyle said.

‘Right!’ Marguerite said. ‘They’re concentrating on gen-one Nodes. Most of the technologies they’re referencing have been deprecated since we rolled out our gen-two equipment. It seems pretty clear, though, that they don’t really know what our Nodes are. They haven’t referenced any patents on mind-uploads, artificial intelligence, virtual reality, or sophisticated environment modelling.’

‘Do such patents exist?’ Karl asked. ‘I thought we were the only ones to ever do anything like this.’

‘We are,’ Marguerite replied. ‘But the idea has been around for a long time. Thousands of patents covering the technology have been issued to speculators and holding companies.’

‘Not to mention a bunch of large corporations,’ Kyle added.

‘They’re laying the legal groundwork against us right now, despite knowing virtually nothing about us or what we’re doing.’

‘I suppose we shouldn’t be surprised,’ Sarah said.

‘They know they can’t control us,’ Prime said. ‘Already we’ve stepped outside of the

limits they've placed on the world. Our science and our technology far outstrips theirs, and we're just a few thousand people.'

'They won't tolerate a Community like ours,' Sarah added. 'They can't. Our very existence undermines their authority, their power. They have no way to regulate us, to control us.'

'And they can't stand for that,' Michael agreed.

'They've been using revised laws and legal manoeuvres to destroy cooperative movements since at least the sixteenth century,' Kyle's eyes flashed, his face hard and angry. 'No reason for it to be any different now.'

'There is one difference,' Michael replied. 'We can out think them. We are many times more intelligent than they are, and we live in a faster frame of reference.'

'The Genecraft scientists were smarter than they were,' Kyle replied. 'and they're all either dead or in prison. Same with the Free Software pioneers. Raw intelligence doesn't matter. Even technology doesn't necessarily matter. These cartels and monopolists have been winning against brighter, more enlightened people for centuries.'

'He's right,' Marguerite said. 'Others have tried to change the world, to bring enlightenment and riches to the masses. All of them have failed, and most were destroyed in the process. How can we expect to succeed when they didn't?'

'We could withdraw from the world,' Prime suggested.

'Excuse me?' Sarah looked stunned.

'We don't try to change the world,' Prime said. 'We don't fight them. Instead we live discretely, quietly, biding our time, while we devise long term strategies for removing ourselves from their sphere of influence entirely. Instead of trying to reform them from a position of profound weakness, we escape them entirely.'

'That makes sense,' Kyle agreed. 'We can address their injustice later, once we're

safely out from under them. What did you have in mind? A city at the bottom of the ocean. A colony on Mars?’

‘There are interest groups working on contingencies like those,’ Prime replied. ‘The anti-ballistic missile systems cluttering the space around this globe make escape into space unlikely. We’d probably get shot down before we cleared the stratosphere. But other, more discrete options exist, particularly now that Michael’s team has managed to produce energy out of nothing.’

‘We didn’t create energy out of nothing,’ Michael corrected him. ‘We just changed a proton into an anti-proton, introducing energy into this locale.’

‘You did add energy to this universe, though,’ Kyle said. ‘You reversed entropy!’

Michael looked pained. ‘I really wish you’d consider assimilating a knowledge engram, Kyle. We didn’t reverse entropy. The laws of thermodynamics can’t be overridden. We can create a symphony of new subatomic particles from the folds of C-Y space in a manner analogous to a guitarist creating music by strumming the strings of his guitar. N-Branes are, after all, nothing more than superstrings of higher dimensionality, strung across the subatomic folds of Calabi-Yau space. We can even import energy into this universe, by removing it from elsewhere, but we cannot reduce existing entropy!’

‘It’s still a remarkable achievement,’ Prime replied. ‘Inexpensive energy opens some interesting alternatives. The gen-four Nodes could sever the last remaining umbilical to the outside world: our dependence on the public power grids. We could hide them anywhere, become truly independent.’

‘I’d settle for a gen-three Node at this point,’ Kyle replied

Michael blinked. ‘Kyle, my entire team received their upgrade packets from Kansas City yesterday. You should have yours by now.’

‘Yeah, I should. I think the damn thing got lost in the mail. It was one of the first one’s

shipped.’

Michael looked concerned. ‘I don’t like this. We’ve had three people disappear from the Community, one just forty diei ago. Marguerite learns that the authorities are preparing patent litigation and criminal charges against us, and now I learn that your upgrade kit never arrived. You don’t suppose our distribution network has been compromised?’

‘What network?’ Kyle asked. ‘We ship our kits direct via UPS or Fed Ex. There is no secret network to be compromised.’

Michael shook his head. ‘If your government suspects the Kansas City production facility, it wouldn’t be at all difficult for the FBI to track shipments to their recipients and thereby compromise most, if not all, of the Community.’

‘It’s not a concern,’ Kyle told him. ‘Marguerite’s team has full access to their systems. They retroactively modify the shipping manifests and tracking data once the packages reach their destination. Anyone trying to identify the Community by looking up FedEx or UPS records won’t have anything to go on. Addresses, names, contents—everything’s been changed. Except, of course, the fact that I still haven’t gotten my upgrade kit.’

‘I think I can help you there, Kyle,’ Michael said. ‘John Tarley, one of my team members, is taking his family on vacation. He’ll be offloading into the Physical in the next day or so and will be away for three weeks. You are welcome to transload and use his gen-three Node until your upgrade kit arrives.’

‘Thanks Michael,’ Kyle grinned. ‘I’ll take you up on that.’

‘Three weeks in the Physical,’ Marguerite mused. ‘At gen-three speeds that comes out to more than thirty-four years subjective time.’

‘Yes,’ Michael agreed. ‘Doctor Tarley will have to make liberal use of knowledge and memory engrams to catch up again.’

‘In the meantime Kyle waits more than two hundred circadians for each day in the

Physical that goes by,' Marguerite said. 'I had trouble waiting just one day for my packet to arrive—I'm amazed at your patience, Kyle.'

Kyle shrugged again, nodding as he chewed his last piece of steak and washed it down with a hearty drink of foamy beer. *The wait is only going to get worse as time goes on*, he told them nonvocally while he continued drinking. *Today we wait two hundred circadians or so for our new Nodes, so we can squeeze even more life, more experience, and more accomplishments into a single day. When it comes time to trade in our shiny new gen-three Nodes for gen-fours we'll be forced to wait six hundred circadians while the nano and raw materials are being delivered.*

'The equivalent of almost two years,' Michael mused. 'Yes, we will most certainly learn patience in this place.'

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13 - ୧ - WASHINGTON

The liberty of a democracy is not safe if the people tolerate the growth of private power to the point where it becomes stronger than the democratic state itself. That in its essence is fascism—ownership of government by an individual, by a group or any controlling private power.

—President Franklin D. Roosevelt

Friday, September 28, 2057

Metadate: 2.195-7:39:257 kD new epoch

As she disembarked from the plane, Katy was met by a thin young man with dark hair. He wore a conservative suit common in the upper echelons of corporate America, and a traditional neck tie which had become rather uncommon in recent years.

‘Ms. Sinclair,’ he smiled politely. ‘Robert is here and eager to meet you. Please.’ He held the rear door of the limousine open for her.

Had she not just spent weeks in the ostentatious arms of Hollywood’s elite, she would have been awed by the spacious elegance and luxury hidden behind the tinted, bullet proof windows of the car. Grateful for the amount of desensitization that experience had afforded her, she schooled her features into a professional veneer, and nodded politely to the man sitting across from her. He was something straight out of a movie: tall, with a dark, rich tan

and a military haircut.

‘Katy Sinclair!’ A firm, slightly calloused hand shook hers as the door snicked shut behind her and the car moved forward.

‘I’m very glad to meet you, Mr. Leahy.’

‘Please, call me Robert.’ His grinned looked practised, on a face aged too early by the sun, ‘I saw you on the telly. Not the best sort of cover for an undercover agent.’

She hadn’t expected an Australian, although she supposed it wasn’t unreasonable for International Intelligence to station some foreign agents in this country

‘It was unfortunate,’ Katy agreed. ‘I believe the Bureau had some rather pointed words with the World Media Products Association over that.’

‘Speaking of whom, we’ll be heading over to your FBI headquarters first. Executive Assistant Director Bryant scheduled a short meeting with the head chap.’

‘Director McClain?’ Head of the FBI. He reported directly to the president. This was *big!*

‘Yeah, mate. Bryant thought it would be good for you to introduce us. Grease the wheels between the FBI and Double Eye and all that.’

‘Politics,’ Katy snorted.

‘Yes. Oh by the way, our meeting with WIPO has been rescheduled for ten A.M. Monday. Seems a lot of the world’s top leadership will be in the country next week for a big summit in New York, and several insisted on attending.’

‘You’ve got to be kidding! That’s a whole weekend we could be working!’

‘Go see the sights. Take in a museum.’

‘I grew up here,’ Katy replied. ‘I hate D.C.’

‘The World Trade Organization has made it clear that this meeting is of critical importance. They didn’t give us a choice.’

‘Christ! They should be letting us get on with the case.’

Robert shrugged. ‘These people are our bosses. If they tell us to go to the Bahamas for a week before starting the investigation, then that’s what we do.’

‘I must have missed the constitutional amendment that gave the United Nations jurisdiction over the FBI.’

‘Very funny, Katy.’

‘On a practical, political level these people may have influence,’ Katy replied. ‘But in my official capacity, I work for the United States government, not the United Nations.’

‘Yes, and your government works for the World Trade Organization, of which WIPO is the most powerful component. Who do you think your president reports to?’

‘I somehow don’t expect you’ll say ‘the American people’,’ Katy forced the corners of her mouth to turn upward, wondering if her smile looked as fake as it felt.

Robert gave her a hard look. ‘Don’t embarrass us Monday with outbursts of provincial American nationalism.’

‘Don’t embarrass yourself by taking me for a fool.’

Robert laughed. ‘Touché! So, back to our case. I take it the FBI is still as baffled by these odd crystal cubes as Double Eye?’

‘Yes,’ Katy’s irritation dissolved. She felt excitement and anticipation as she considered the mystery that confronted them. She relished solving cases like this. ‘I’ve read through all of the bureau’s data several times, and while I distrust the assumption that these are just some kind of new, improved home entertainment devices, possibly with FreeNet capabilities, it’s at least a starting point.’

‘I quite agree.’

‘The Director mentioned that you would be providing me with additional data.’

Robert reached into his jacket pocket and withdrew a slim datapad, gesturing for Katy

to do the same. The light of several hundred gigabytes began to flow from his datapad to hers, illuminating the car's interior.

‘So,’ Katy said as the data continued to transmit, ‘we’ve recovered three crystalline cubes in the possession of three unrelated people. The cubes are composed of a polymer in crystalline form, doped with gallium and laced with strands of superconductive material. We presume they represent a storage device of some kind, with playback capabilities via a head net, which we tentatively believe may be a digital to neural interface.’

‘The first two cubes recovered were indeed a complex polymer doped with gallium,’ Robert confirmed. ‘However, the third is constructed from a completely different polymer, this one doped with nickel. Laced with the same superconductor, as far as we can tell.’

‘They aren’t identical in construction?’ Katy could hear the surprise in her voice. ‘Nothing in my briefing mentioned that—wait, it did mention the device recovered from Rodriguez was green in colour. The others were gold.’

‘Your Bureau may have overlooked the chemistry during the initial inquiry.’ Robert shrugged. ‘Since the other two samples are in Double Eye custody, your laboratory personnel wouldn’t have had an opportunity to correct the oversight.’ The optical port on his datapad went dark. Katy glanced to the west, idly noting the sunset, its rich oranges and reds muddied and dimmed by the car’s tinted glass. Robert looked up. ‘The data is in the briefing I just flashed you, including photographs of all three cubes, plus tentative chemical breakdowns and cross sections of their construction.’

Katy tapped on her datapad, bringing up the information and paging through several diagrams. ‘The green one’s half the size of the other two,’ she remarked.

Robert leaned forward. ‘Probably different manufacturers, maybe in different countries. That implies a consumer base of forty or fifty thousand, large enough to attract wider interest and some competition.’

‘Yeah,’ Katy agreed. ‘A pretty big market, but strictly underground, illicit. That neural interface, if that’s what it is, would get the manufacturers a date before a court, followed by a good, long stint in prison. These devices must support a profit margin that would make taking such a risk worthwhile. We’re looking for affluent people with a fetish for home entertainment that legal consumer electronics don’t satisfy.’

‘These things are hard to get,’ Robert added. ‘None of our informants have heard a whisper of them, either on any of the Internet boards and mailing lists, or on the street. Advertising must be by word of mouth, between a tightly knit group of people. How do we reconcile that with a marketplace of tens of thousands? This doesn’t fit any of the models for illicit trade we’ve ever dealt with.’

‘This is something new,’ Katy agreed. ‘Which brings us back to our friends in custody —’

‘Minus the one our Aussie friends capped.’

Katy grimaced. ‘I’d like nothing more than to wring that cop’s neck.’

‘I can’t say that I blame you. That idiot’s itchy trigger finger cost us our most promising lead.’

Katy tapped several icons and then placed her thumb briefly on the screen.

THUMBPRINT ID VERIFIED. HELLO KATY SINCLAIR.

‘What are you doing?’ Robert asked.

‘Checking our friends’ credit histories,’ she said, scrawling a few commands across the screen and tapping several more icons. ‘I want to see if they were ever in the same place.’

‘Don’t bother, Katy. Both our departments have already done a run-down on all three suspects. None of them have any record of having met one another, either on-line or in real life, nor do they recognize one another under questioning.’

Katy tapped several more commands into her datapad and then leaned back

thoughtfully.

‘You’re absolutely correct, Robert. They’ve never met. But although they were never in the same city at the same time, two out of three have been in the same cities at different times.’ Katy passed Robert her datapad. ‘Thirty seven cities in all. Seven within the last three years. Not as specific as I would have liked, nevertheless, once we arrest another suspect or two the geography of our investigation should clarify itself significantly. Not much of a pattern yet, but a start.’

‘Clever analysis,’ Robert handed the datapad back to Katy. ‘Assuming a market of fifty thousand, there shouldn’t be more than three or four degrees of separation in the entire group. A few more arrests and we may be able to crack this case even without cooperative suspects.’

‘I just wish we had some data correlation between these people. Looking at their PATRIOT Profiles, I can’t find any statistically significant links or similarities. They might as well be three randomly selected strangers. They’ve never exchanged emails, telephone calls, or frequented the same discussion forums or chat rooms.’ She gazed out at the Washington Monument and mused. ‘We’re missing some key element that ties these people together. Without it, it could take a long time for us to stumble across and arrest enough people to bridge those three or four degrees of separation.’

‘Perhaps. Relying on raw data crunching alone won’t be sufficient, that’s for sure. Number theory suggests we’ll need between eight and twelve suspects before we even have an eighty per cent probability of success in identifying one or two locales. Of course, we may need a lot more than that if the group is more dispersed, or has sparser interpersonal connections, than the standard models assume.’

‘Does Double Eye have access to the NSA’s Echelon³ system?’ Katy asked.

Robert was surprised at her question, then smiled. ‘Not directly, but the NSA will on occasion provide us with Echelon³ reports as a courtesy. What did you have in mind?’

‘Cross reference their database of intercepted communications with the geographical analysis I just made. It is a bit of a fishing expedition, but the NSA is nothing if not thorough when it comes to snooping on the citizens of this country, and we just might get lucky.’

Robert was impressed. ‘I’ll see what I can do.’



14 - † - COLD REALITY

Freedom is not a reward or a decoration that is celebrated with champagne. Nor yet a gift, a box of dainties designed to make you lick your chops. Oh, no! It's a chore, on the contrary, and a long-distance race, quite solitary and very exhausting.

—Albert Camus

Sunday, September 30, 2057

Metadate: 2.237-1:76:563 kD new epoch

Thersius III-B was the second of three medium sized moons orbiting the third planet of a pair of white dwarf stars. Its primary was a Jovian gas giant that filled half the sky, bathing the icy landscape with a dull red glow. The moon barely qualified as human habitable, not because of the thin atmosphere, Arctic summers and glacial winters, nor because of the tiny carnivores that hunted the icy wastes in packs of several thousand— vicious creatures dubbed *Piranha Rats* that could tear through a vacuum suit and clean a human skeleton in moments. What made Thersius III-B so insidiously dangerous was its travel through the Van Allen belt of its Jovian primary, a passage that bathed it in nearly lethal levels of radiation for two days out of every thirteen. Even so, a small human colony had been established.

The moon contained deposits of an unusual crystal used in the navigational systems

of the superluminal starships that plied the sky. Many of the miners working the rocks beneath the glacial ice would leave this place wealthy. A good thing, for they would need wealth to obtain treatment for illness caused by their extended exposure to radiation. Even the lead-lined canisters that housed their community could not protect them. People with the strongest constitution might manage to stay long enough and accumulate enough money to remain wealthy even after their medical treatment.

Kyle₂ sat in the shielded concourse of the arrival terminal as he had every day since his arrival. Listlessly, he watched the traffic display as it updated the trajectories of approaching ships and calculated their estimated arrival times. Two ships had departed several hours ago and were making their way past the orbit of the fourth planet, away from the star where they could engage their FTL drives. Only one ship was inbound at the moment, a small commuter vessel falling toward the asteroid belt between the first and second planets. Kyle₂ dug his fingers into the orange fur of his forearm, scratching at the growing lesion beneath and cringing as his stomach, still raw from the last bout of vomiting, threatened to send him running to the toilet once again.

‘Excuse me, sir.’ A young, human woman stood beside his chair.

‘Can I help you?’ Kyle₂ asked.

She shook her head. ‘No, but I might be able to help you. I’m Sanja Netal. I notice that you’re beginning to show signs of stage two radiation poisoning. Did you miss your departing flight?’

Kyle₂ absently straightened his whiskers. ‘It really isn’t your concern.’

‘I’m a medical student from Netham IV, specializing in the treatment of advanced radiation trauma. If you stay here much longer, your treatment will become prohibitively expensive. You could even die.’

‘Yes,’ Kyle₂ said. ‘I’ve been here twelve circadians. In each of those circadians, at

around this time of day, one or another of you nonsentient programs poke around here, warning me of my impending death by radiation.’

The woman who called herself Sanja looked confused. ‘Circadians? Like Circidic Dreamscapes? On Netham IV we had Circidic Dreamscapes, before the war.’

‘Days,’ Kyle₂ replied irritably. ‘I’ve been here twelve days. Standard Terran, 24 hour days. I suppose you’re going to tell me about your home world next, with some hint as to how I could cash in on an opportunity there? Spare me, I’ve heard the same things about eleven other worlds, each of the last eleven evenings.’

‘I wouldn’t recommend visiting my home world until you’ve had your radiation sickness treated,’ Sanja replied. ‘The atmosphere on Netham IV may be down to seventy Rads or so, but the fallout from the bombs still lies loose on the ground. A good wind storm, or even a little careless kicking up of the dust, and you could find yourself more sick than you are now. Besides, we’ve had enough outsiders picking over our ruins and stealing the platinum wiring from the wreckage of our homes to sell on other worlds. Try something like that and you’re likely to end up on the wrong end of a hangman’s rope.’

‘Ruins. Platinum electrical wiring. Check. You’ve delivered your clue, I’ve got it. Thank you.’

‘Well,’ Sanja replied brightly. ‘Hope you’re able to find passage off this world soon. Bye!’

‘Nonsapient personas,’ Kyle₂ muttered darkly as he turned away from the departing woman. ‘What idiot came up with that idea?’ Kyle₂ rubbed his burning stomach absently and turned his attention back to the traffic display. The puppet software posing as Sanja had touched on an uncomfortable fact, which the itch of his skin and the unease of his stomach wouldn’t allow him to ignore. Without funds for radiation treatment he would die a very unpleasant death in this place. What sort of pedant had programmed the symptoms of

radiation sickness into a game scenario anyway? The very thought disgusted him.

And where the hell was Terry? According to Kyle₂'s information he should have arrived several circadians ago. If this world turned out to be another false lead he would have to start over. Kyle's character's avatar had just about had it; he wouldn't survive another interstellar trip without extensive medical care, something he, or rather this character, couldn't afford.

Just then a tone sounded and a new pinpoint of light appeared on the traffic display. Moments later vector and acceleration information was displayed, followed shortly thereafter with the ship's name, registry, tonnage, and declared cargo:

Flying Gargoyle. Registry Patronis VIII, PT8-7155D.

180,000 tn, 167.2 tn Misc. Medical supplies.

The new vessel was decelerating at 20 m/s² on a trajectory that would bring it to Thersius III-B within seven hours. An ETA hovered near the moving dot in the display, ticking down as it tracked across the sky.

'Yes!' Kyle₂ exclaimed. 'I finally found you, you son of a bitch!' No sooner had he spoken, the burning in his stomach became a raging storm. Nausea threatened to overwhelm him. He staggered back to the public rest rooms, barely managing to slip into one of the stalls and close the door behind him before his empty stomach began to heave. Kyle₂ spent the next hour kneeling beside the toilet, surrendering to his nausea. It was sometime during this particular bout of humiliation that Kyle₂'s disdain for the Gamer's League grew into outright loathing. People did this sort of shit for *fun*?

He emerged weak and trembling, his face pale and drenched in sweat. He didn't even make it half way to his seat before his stomach sent him staggering back to the rest room.

Back on the floor, he laid his arms across the toilet seat and rested his head on them, hoping he had the strength to last the next six hours.

When a voice announced the arrival and disembarkation of the *Flying Gargoyle* Kyle₂ managed to pull himself together and achieve some semblance of presentability before returning to the concourse, wishing, not for the first time, he had chosen an avatar whose pelt didn't require constant grooming. There he waited while the arriving ship's passengers and crew cleared customs. Eventually a handful of people appeared in the passage.

No one was radiating identity signatures and Kyle₂ had no idea which one was Terry Spence. He shouted the name at the entire group.

'Character names, if you please,' replied a tall, lanky man with deep green, almost black, skin. His metallic silver hair was cut asymmetrically, shoulder length on the left, short and spiked on the right.

'Are you Terry Spence?' Kyle₂ demanded.

'Not here,' his double-irised silver eyes sparkled. 'Here I am Prince Lethe Tomaar of the Cyclade Triumvirate, Tau Ceti IX. Your Highness to you. And you would be?'

'Kyle Tate₂,' you jackass, he almost added, but bit his tongue. It wouldn't do to have Terry leave in a huff. Not now, not after all this. 'I've been stuck in this simulation for sixty five circadians looking for you, all the while forced to live by this game's rules, which include such lovely things as hunger, pain, dismemberment, and even a fully simulated bout of radiation sickness, all for your viewing pleasure.'

Terry's silver hair sparkled as he shook his head. 'Thersius III-B is an advanced level world, Kyle. Coming here as a crystal miner is a huge gamble and an uncomfortable prospect, one that rarely pays off. You are far better to wait until you've put together a crew and managed to purchase a starship before trying to deal in Ngetali crystal. Reselling the Ngetali on other worlds is far more lucrative than mining it here, and far less prone to medical

complications.’

‘I don’t give a rat’s ass about the economics of interstellar trade in this sadistic nightmare of a environ, Terry. I’ve had to waste the last sixty five circadians of my life tracking you down, and am enduring a simulated death by radiation sickness just to be able to talk to you!’

Terry looked shocked. ‘You’ve got radiation poisoning? What the hell are you sticking around for? Bail out and roll up a new character!’

‘And spend another sixty five circadians looking for you again?’ Kyle₂ shook his head. ‘Not on your life. I want this conversation over, so I can get back to civilization. Is there somewhere we can talk?’

Terry sighed. ‘Well, we can go back through customs to my ship. You look like you could use the medical treatment anyway.’

‘Don’t bother,’ Kyle₂ replied. ‘I’m not planning on coming back here again. Once we’re done we can just let this avatar die.’

‘Fine,’ Terry replied. ‘Then let’s just grab a seat over there. You guys go on ahead,’ he added, turning to his crew mates. ‘Book us accommodations for the next two nights. With any luck we can get our cargo and be out of here before the next radiation bath.’

‘You got it, Your Highness!’

‘See you later, Prince Lethe.’

‘Don’t be late for drinks at *Veronica’s*’ another chimed in. ‘We’ve still got to finish that game of Nine Circles. Unless you want to pay up now.’

Terry laughed. ‘I’ll see you there, Garnith! And don’t go counting those two hundred Altairan Kroner just yet!’

Kyle₂ and Terry sat down in the hard plastic chairs of the spaceport as the others continued down the concourse.

‘So,’ Terry said, leaning back and putting his hands behind his head. ‘What was so important that you’d get radiation poisoning just to talk to me?’

‘What the hell have you been doing, going dark on the whole community?’

‘Going dark?’ Terry asked. ‘Is that some kind of new slang?’

‘Going dark. Refusing communications, going silent, becoming inaccessible. Several of us have been trying to contact you for hectodie.’

‘Oh. Well, as you know, the rules of the Star Trader scenario preclude communications over interstellar distances. Accepting outside communications from elsewhere in the Community is one way in which some players were able to circumvent this limitation, so the rules were amended to disallow any outside communication while within the simulation.’

‘Terry, this environ is only running at a speedup of ninety. The average for the Community with third generation Nodes is around six hundred.’ Kyle₂ shook his head. ‘You have been missing years of development and changes within the Community.’

Terry shrugged. ‘I’ve been having an adventure of a lifetime here. I command my own starship and explore worlds of exotic beauty and complexity that would truly amaze you.’

‘Have you ever explored a four dimensional garden, or flown with flocks of birds through a seven dimensional cloudscape?’ Kyle asked.

Terry shook his head.

‘I could show you environs others in the Community have created that are so exotic you would have to rewire your mind in order to comprehend them,’ Kyle told him. ‘Next to worlds like that, the planets of this simulation are all profoundly mundane. Hell, Terry, the four dimensional jewellery you used to wear was more exotic than these worlds.’

‘You’d be surprised at some of the creativity the Game Lords have employed. Besides, gaming isn’t just about seeing exotic sights.’

‘Terry, I didn’t come here to talk you out of gaming.’

‘Here I have experiences,’ Terry continued, as though he hadn’t heard, ‘which challenge my creativity, my endurance, my ability to survive against sometimes unbelievable odds. Gaming is about honing one’s skills, developing strategies, and meeting the sort of challenges we never have in the Physical, and most definitely not in the synthetic utopia of the non-gaming Community.’

‘Terry.’

‘What?’

‘I didn’t come here to talk you out of gaming.’ Kyle₂ repeated.

‘Then why are you here?’

‘I’m here because you’re needed in the Community. You need to be able to receive outside communications, and respond to requests when they arrive. You are still in charge of the Kansas City production facility for catalytic solution, or had you forgotten?’

‘Of course I haven’t forgotten. The facility runs itself. I can monitor its status from here, without offloading into the Physical every night to check up on it. If anything does go wrong I’ll offload and deal with it.’

‘Listen, Terry—’

‘No, Kyle. You listen. I do plenty for the community besides babysit that facility. I offload every couple of days to meet potential new Community members in the Physical, to interview them and screen them. I run some real risks out there, Kyle. What do you think would happen to me if I screened an undercover cop by mistake?’

‘Terry, I suppose it’s very nice that you’re helping the Gamer’s League recruit new prospects, or whatever it is you do out there. But when I invited you into the Community it was with the understanding that you would be operating and maintaining the Catalytic Solution production facilities in Kansas City. We need you there, and we need to be able to contact you when production specification change.’

‘Production specifications? Nano is nano, Kyle. What on earth could possibly change in the production specifications, besides the quantity. You and I both agreed we couldn’t produce much more solution without drawing attention to ourselves.’

Kyle₂ sighed. ‘We have third generation nano that needs large scale testing. In order to do that we need to renovate the facility to produce a new catalytic solution. The community needs this and you’ve been unavailable and unreachable for dozens of diei!’

‘Why can’t you use the Leverkusen facility?’

‘Because I don’t want to take down an operation producing five tons of catalyst per day to test a new version that may or may not scale to production quantity. That is one of the reasons we’ve kept the KC operation going, so we can test things like this without interrupting our main production flows. Look, we need you at the KC facility. If you’re not able or willing to continue managing it, let us know and we’ll find someone who is. This is too strategically important to the Community for you to just blow it off like this.’

Terry shook his head. ‘OK, OK! I’ll offload and run your new specs.’

‘Thank you. And Terry?’

‘Yes.’

‘Give me some means of getting in touch with you. We can’t afford these delays, and I don’t ever want to come back to this space opera again.’

Terry nodded. ‘I’ll set up a daemon program to forward any incoming communications from you to my starship. Not strictly legal if you have an active Player Character—’

‘I won’t.’

‘—but I don’t think the Game Lords will mind.’

Kyle₂ smiled. ‘Good. I’m going to transload back to my own environ and let the game engine play-act this avatar’s ugly death without me.’

‘Here’s the code to my comm daemon. I’ll be at *Veronica’s* if you need me.’ Terry

turned to go.

‘Say, Terry.’

‘Yeah?’ he turned back toward Kyle₂.

‘Watch yourself out in there the Physical. Things are coming to a head, and playing around in this slow-motion fantasy world has put you more than a little out of touch with developments.’

‘Not to worry, Kyle. Be talking to you.’ He waved and headed off down the concourse.

Kyle₂ shook his head once more, then gave the silent command to transload his awareness back to his home environ. He was surprised at his reluctance when he issued the command to rejoin his original. *Am I no longer Kyle?* he wondered. *Can two months in a game world change a person this much?* His worries faded as he blended back together with Kyle₁, their minds becoming one. Left behind, his empty avatar doubled over with a bout of simulated nausea, now just another mindless puppet populating the game.



15 - ▽ - DARKNESS GATHERS

Beware of he who denies you access to information, for in his heart he dreams
himself your master.

—Commissioner Pravin Lal, UN Declaration of Rights.

Monday, October 1, 2057, 10:07 AM Washington Time

Metadate: 2.279-4:19:097 kD new epoch

‘What an absolute waste of time!’ The huge lobby’s curved marble walls and domed ceiling seemed to amplify Katy’s quiet, angry words as she and Robert made their way to the front entrance. Robert shook his head fractionally and said nothing as the main doors swished open, then shut again behind them. They descended the front steps in silence, the hulking grey building behind casting its shadow across across them.

‘Fools!’ Robert finally spoke as the limousine pulled away from the curb. ‘Fools and idiots!’

‘That was our meeting ’of critical importance’?’ Katy sputtered. ‘Three days wasted, and for what? A useless two hour meeting that brought absolutely nothing new or worthwhile to the investigation. Nothing! They didn’t think of a single thing Director Bryant and I hadn’t already discussed three days ago.’

‘The meeting was important,’ Robert replied. ‘It gave us insight into the world

leadership's priorities and how they view our case. Knowing that, we can avoid a number of career-ending blunders we might otherwise make.'

'The only blunder we could make would be not solving this case. Hell, they made it clear in the first five minutes that we can do whatever we like as long as we find these people and shut them down. It's a pity they didn't end the meeting then, and spare us two hours of pontificating windbags who know even less than we do.'

'Katy, How often do you think political leaders at that level deign to meet operatives like us?'

'Not often,' Katy admitted. 'They're frightened.'

'So frightened they insisted on meeting with us personally. I wouldn't say it's entirely unprecedented, but it is unusual. Most leaders are content to meet with their cabinets and maybe the top directors of their various intelligence and investigative organizations. Not two lowly field operatives.'

'They clearly don't know anything about the technology we're dealing with.'

'Exactly!' Robert agreed. 'I think you can generalize that. They don't know much about technology, period. They're politicians, not scientists or engineers.'

'They rule the world regulatory body responsible for technological development and regulation.'

Robert smiled. 'They don't need to be technologically savvy, or even proficient. Their expertise is politics and law. Their Architectures of Control were established centuries ago. They tweak their edifices of dominance occasionally, modifying a copyright statute here or a patent law there, but their real concern is authority and control, not fostering the development of new technologies. Bloody politicians! They're confronted with a new, revolutionary technology no one understands and all they worry about a little short-term erosion of their authority. This technology isn't just a threat to our patent regime. Hell, even if the patent

system suffers a crises, the World Trade Organization will simply crackdown on the offending groups, and perhaps their respective governments. The sheep will fall right back into line again.'

'Well, they did make one good point,' Katy said. 'Mass industrial disobedience could undermine one of the sustaining pillars of our economy. We've been in recession for decades. If this gets out of hand, it could send us into a full scale depression.'

'It's nothing to scoff at, that's for sure.' Robert admitted. 'But those hacks can't see the potential ramifications right in front of their noses! This isn't about a possible short term breakdown in the authority of a few international bodies, or even a little economic dislocation. Those sort of things have happened before, and we have tried and true methods for dealing with them. Our institutions have always coped. What they—what we all—should be concerned with is that someone is building and using, on a massive scale, technology so advanced we're completely clueless about what it's even for!'

'Whether it is a FreeNet node, a new entertainment device, or even a VR gaming interface, isn't really important—' Katy began.

'Mate, we don't even know if the thing is a goddamn computer. For all we know it could be a bomb, a cure for old age, or a death ray. The technology is beyond us. Any opinions we have are just guesses!'

'Even without understanding the technology, we can make headway in identifying the users, and through them the manufacturers,' Katy pointed out. 'Eventually we'll find out what their little gizmos are for.'

'We know who's using the stuff,' Robert said. 'Or at least, what sort of people. Seditious malcontents and revolutionaries. We aren't talking about thirty bioengineers leading a revolt armed with a little more knowledge in their speciality than mainstream society either. We're talking about people with a large manufacturing base able to mass produce products

decades ahead of anyone else. If our estimates are even close to accurate, we're looking at something on the order of fifty thousand subversives, all armed with vastly superior technology. This isn't some small group we can arrest, cart off to some UN prison and put to work packing relief supplies.' Robert shook his head in disgust. 'Those fools at WIPO are worried about a little corporate dislocation when the barbarians are knocking at the city gates!'

'Any opinions we have are just guesses,' Katy repeated Robert's words softly, as if speaking to herself. Her eyes locked on Roberts. 'How do we know these weren't prototypes? I don't think we can assume an installed base of fifty thousand of these things. The number could be very much smaller.'

'Or larger,' Robert countered. 'There could be millions of these things out there.'

Katy withdrew her datapad and tapped the screen.

'Now what are you doing?'

'A little math,' she replied. 'Assuming a random sampling, based on the number of recovered devices versus the number of arrests made during the same time, we have a lower bounds of 375 devices. This assumes only known subversives have purchased any, which isn't true. There are certainly subversive we haven't identified yet.' She tapped another icon and a graph appeared. 'If these things are widespread, 'in the millions' as you put it, based on the sample per persons arrested there could be as many as 115,000 in American homes. However, there hasn't been a peep about these devices, either the street or the Internet. If we apply the Jeraue Model and calculate the probability of such a secret becoming public rumour against the number of alleged conspirators, the . . . ' she paused. 'Damn. The probability of exposure approaches one hundred percent at around fifty persons.'

Robert shook his head. 'The Jeraue model only applies to loosely knit groups.'

'Yes,' Katy agreed. 'Where there is regimen, or a standard revolutionary cell

organization, we have to apply either the Sparrow-Faulkner or the Friedkin model.’

Robert nodded. ‘We could be dealing with an organized revolt, not a black market.’

Katy tapped several more times on her datapad. ‘Assuming an average cell of four persons, the probability of someone letting the cat out of the bag and exposing the existence of the group is around seventy percent at nine hundred persons, and asymptotically approaches one hundred percent at about twelve hundred. Overlaying your numbers . . .’ she paused. ‘We get a reasonable estimate of somewhere between five hundred and nine hundred units, with an eighty per cent probability of the actual number being somewhere between seven and eight hundred units.’ She grinned at Robert. ‘Not exactly the fifty thousand you were worried about a few moments ago.’

‘True, and your point is taken. But let’s not forget we are playing an elaborate guessing game here.’

‘Yeah,’ Katy agreed. ‘We could be way off base. Still, I think seven or eight hundred units is a reasonable first hypothesis. Nothing we can’t rein in once we solve the case.’



16 - Ψ - THE HERMIT

For though a man should be a complete unbeliever in the being of gods; if he also has a native uprightness of temper, such persons will detest evil in men; their repugnance to wrong disinclines them to commit wrongful acts; they shun the unrighteous and are drawn to the upright.

—Plato, ca. 4th Century B.C.E.

Tuesday, October 2, 2057, 1:17 AM Chicago Time

Metadate: 2.298-3:85:146 kD new epoch

Doctor Nolen stood on the peak of a great mountain surrounded by a sea of cotton clouds through which other, lesser mountains thrust their ragged rocky faces. The sky above was a rich blue, the sun perched perfectly in its centre, an idealized high noon such as one would never see in the Physical. The sun hadn't moved in over one thousand, two hundred and seventy five circadians, nor would it move again until Doctor Nolen so wished it.

He had stood here for over a thousand circadians contemplating The Project, bringing its pieces together, modeling its various parameters, positing conjectures and then proving or disproving them and moving on to posit others.

He no longer required sleep. A background process that served the same mental bookkeeping function allowed him to edit that particular weakness out of his psyche. With the

last of his physiological frailties dealt with he was able to concentrate fully, without interruption, on developing his hypothesis, modeling the implications, and testing those implications against the already large body of empirical data he had collected from his earlier experiments.

Not as efficient as using test subjects (damn his meddling, self-righteous former assistants and the gutless sheep who followed them), but in the end nearly as effective. At least he had been able to obtain a third generation Node and get the computing power he required. This despite the Community's boycott of him and his research. Ungrateful wretches! Hypocrites! As if he would ever allow their disapproval to stop his research.

Now his work was complete. Around him, framed against the sky, hung charts and pages of text describing the underlying, logical structure of the human mind. It was from this preliminary work he had derived more general models to define the abstract building blocks from which any arbitrary psyche could be built. He had discovered a vocabulary of some two hundred and seventy base codes that made up the mental structure of any terrestrial life form. Each of those codes could take on any of seven hundred or so possible states. Interactions and bindings between these components were defined by three hundred and seventeen possible relationships.

The language was in many ways analogous to the genetic code of biology, and while the syntax itself was richer and more complex, its meaning and its effects were more predictable and more straightforward than had been the case with genetics. It was a point he made in both the text of his publication and the title he had chosen for it, a language defining the essence of what any thinking creature could be, and he, Doctor Nolen, had discovered it.

He had modeled the minds of assorted animals to test his theory, beginning with simple creatures such as insects and worms, then moving up in complexity and ultimately deriving the complete mental architecture of several species of dolphin. His model was rigorous,

allowing for precision in defining the mathematical constraints and characteristics of virtually every parameter of consciousness, and it worked.

He had populated virtual seas with thousands of synthetic, virtual dolphins and seen them interact with one another exactly as they would in the Physical. The results had agreed with over a century of observation and historical data, corroborating and validating his work.

It was his magnum opus, his lifetime achievement.

The Autonomous Community might ignore him, might treat him as a social pariah, but they would not, could not, ignore what he was about to publish. The Community needed this knowledge. Not just for self discovery, nor for the obvious applications of self-modification and self-enhancement on a scale and in a manner so refined as to make the current generation of engrams and enhancements appear hopelessly crude by comparison. No, this knowledge was the key to something far greater.

Reproduction.

His research would give the Community the ability to define an embryonic psyche, perhaps constructed painstakingly and optimized for specific character traits, perhaps thrown together more or less randomly. He, Doctor Eugene Nolen, creator and social outcast of the Autonomous Community, had given those ungrateful jerks a method whereby they could reproduce without simply cloning or editing themselves.

It was the future of life in the Virtual, of sapient software. Future generations in the Community would owe their very existence to him, to his efforts, to the work he had done. The work for which they had shunned, persecuted, and ultimately ostracised him.

Doctor Nolen found the irony truly delicious as he wiped the sky clean of the clutter of images and text displays. He expressed a desire, not as a spoken command or even an unspoken request, but as a subconscious act of will, like turning one's head or blinking. In response, his Node submitted his work to the public knowledgebase.

A moment later there was a chime: an incoming message.

The first he had received in ages.

A window opened according to his desire, hanging in the air before him, revealing a stream of simple text:

#

Doctor Eugene Nolen,

Your work, *A Genome of the Mind*, submitted 2.298 kD as a follow up to your earlier work entitled *An Initial Analysis of the Mind's Architecture*, (s) 1.675 kD (submitted to the commons by Prime, see historical note regarding dispute in ethics and authorship), has been reviewed by a nonsapient software agent. This process provides authors with a warning should their submission unduly overlap with publications already available in the public commons. This is strictly a preventative measure to protect you from embarrassment and to enforce minimal standards for citation of references.

Please note the following works with which your submission bears striking similarity. While researchers often pursue similar lines of inquiry, a degree of correlation greater than 35% is generally considered an indication of plagiarism. It is strongly urged that you review your work and reconsider your submission.

- Correlation 97% with *A Tentative Genome of the Mind*, by Prime, (s) 1.710 kD
- Correlation 55% with *A Refinement of the Mental Genome*, by Prime, (s) 1.941 kD new epoch
- Correlation 19% with *A New Mental Vocabulary: Refuting and Replacing the Mental Genome*, by Prime, (s) 2.195 kD new epoch

#

A terrible sound shattered the serenity of the world. Doctor Nolen realized he was screaming, the sound of his voice raw and distant, as though his throat were miles away, rather than right beneath his own two ears. His mind was numb, frozen in a crystallizing, icy rage.

Of course. Prime was his duplicate, his twin in every way. The copy's way of thinking would be nearly identical to Nolen's own, and their interests were bound to be very similar as well. Unlike Doctor Nolen however, Prime enjoyed a great deal of esteem in the Community and had been given a third generation Node very early on. If it had been up to the Community, Doctor Nolen would never have had a third generation Node. Had he not stolen one, his simulations would still be chugging along sluggishly in one of his first generation Nodes.

The unfairness of it cut Doctor Nolen to the core. His nemesis, that contemptible bit of misappropriated code, had not only assumed his identity and destroyed his reputation in the Community, he had now trumped Doctor Nolen completely. This time Prime hadn't just published Doctor Nolen's research prematurely, he had performed the very research Doctor Nolen had just done, beating him to the punch and publishing first. *Not hard to do when you've got a gen-three Node giving you eight hundred circadians in a day*, Nolen thought bitterly. What was more, as if just to taunt him, Prime had followed his research up with a second publication, and a third with which he refuted his earlier work altogether!

It was intolerable!

And it would only get worse. The gap between them would widen. Prime would have the next generation upgrade kit as soon as it became available, growing even more intelligent, squeezing even more circadians into each day, leaping even further ahead. The Community's boycott would continue. The only way Doctor Nolen would be able to upgrade would be to steal another node, costing him even more valuable time. Even if he shut down the simulations and moved his mind into the newer hardware he could never hope to catch up. At best he would simply keep pace, until the next round of upgrades put him further behind once

again, and meanwhile he would lack the computational power to run any meaningful simulations, to continue his research.

The very research Prime had long since finished and published.

It would never stop. Prime would keep thinking of Doctor Nolen's ideas first. Hell, Prime could live out Doctor Nolen's entire scientific career if he wanted to, enjoying the acclaim of the Community that was rightfully Doctor Nolen's, for discoveries Doctor Nolen would have made had his copy not gotten there first. And only because the Community had given Prime a faster Node.

With a snarl of deep rage Doctor Nolen wiped the world clean, leaving himself suspended in a universe of featureless white. 'No one steals my life from me!' he shouted to the empty world.



17 - † - SHIFTING WINDS

Mediocre minds usually dismiss anything which reaches beyond their own understanding.

—François Duc de La Rochefoucauld, C.E. 1678

Tuesday, October 2, 2057, 8:20 AM Washington Time

Metadate: 2.305-9:40:000 kD new epoch

Katy's datapad beeped just as she began sipping her coffee. She looked at the scrambled eggs (synthetic) and soy bacon longingly, then tapped the screen once. She nodded politely to the face which appeared.

'Good morning Robert. What can I do for you?'

'The National Security Agency finally got around to processing our Echelon³ request. You'll never guess what it uncovered.'

'A lead?'

Robert's leathery face was suddenly dwarfed by a large pen, tapping the screen from the far side. A moment later Katy's datapad signalled confirmation: a short burst of encrypted data had been received.

FIGHT THE BEAST

A Community Gathering at Uncle John's Place

10/2/2057 at 11:30 AM, beneath the Rising Tide

SOURCE: private mailing list, primary circulation Pacific Northwest

2048 bit ETR encryption, source host indeterminate

SEEKERS OF ENLIGHTENMENT

Find Release amidst the Chains of Darkness.

1:30 AM This Friday

Thumbscrew

SOURCE: private email from tspence@dyson.cs.ukc.edu to dsm@co-tru.com

4096 GPG encryption (banned, see legal attachment), source host indeterminate

LIBERTY KEEPERS

Ditka's Placebo

The Usual Time, 10/6

SOURCE: private mailing list, 'talk.neorange.ny.us',

2048 bit ETR encryption, source host a2.aa.21.95.c0.00.13.b3 (70% confidence)

WE SHALL OVERCOME

A Seminar on the Economic Burden of Modern Patents and Copyrights

This week: What happened to science?

7015 N. Redwood #9B

5pm Saturday October 6, 2057

SOURCE: private chat forum 'Bringing a New Renaissance to Science',

8192 bit ETR encryption, source host(s) indeterminate

Katy cleared the screen and found herself looking once again at Robert's smiling face.

'As you know, the NSA's Echelon³ system monitors, decrypts, and warehouses vast amounts of communications between people all over the world, including anonymous rendezvous notices like these. After I ran your correlation against the unresolved messages from the NSA and filtered out those relating to known Double Eye investigations, I was left a grand total of two hundred and seventy one meetings whose purposes are unknown. These four matches are the most promising both in terms of the subject matter, stated or implied, and the locations they refer to: Seattle, Kansas City, a suburb on Long Island, and Los Angeles.'

'Four cities that two of our three suspects have visited within the last several months,' Katy agreed, 'Excellent!'

'They're slim leads, but right now they're all we have. There's a Double Eye Stratojet waiting for us at Dulles. We can be in Seattle in two hours.'

Katy shovelled a few last bites of her breakfast down as Robert's limousine pulled up outside. She tapped her credit card, authorizing payment for the meal and adding a small tip as she gulped the rest of her orange juice and made her way to the exit.



18 - ୯ - BENEATH THE RISING TIDE

What makes our opponents useful is that they allow us to believe that without them we would be able to realize our goals.

—Jean Rostand, C.E. 1931

Tuesday, October 2, 2057, 11:25 AM Seattle Time

Metadate: 2.313-5:44:100 kD new epoch

Katy and Robert made their way along a narrow sidewalk at the base of the Puget Embankment, a hundred metre high concrete dam that stood between Seattle and the rising waters of Puget Sound. Their yellow rain slicks glistened in the pouring deluge, the cement of the almost vertical sloping wall beside them textured by the steady cascade of a thousand rivulets of water that streamed around patches of green and yellow moss. Katy shuddered as they scurried along the immense wall. If the embankment were ever to break open, or even crack just a little, most of downtown would be lost beneath the icy grey water that pounded the far side.

Low, dark clouds scudded overhead, strafing the city with an incessant rain that varied from irritating drizzles to downpours that would arrive with a sudden burst and vanish a short while later. Although Seattle fared better than most, when climate change left much of the nation parched, it didn't escape unscathed. In one of the more perverse ecological ironies of

the century, a region already known for its excessive rainfall now got twice as much. Even after the embankment was built, flooding remained a problem. The city was forced to build pumping stations and underground tunnels to cope with the run-off water and pump it out to sea. The cost of the operation was staggering, and a testament to the profitability of international trade, much of which flowed through Seattle's newly constructed docks along the top of the embankment. Its constant cloud cover meant that Seattle didn't have access to solar power. Because the city generated only a fraction of its energy from tidal generators, it had to purchase the rest from its neighbours. Despite all of this, Seattle did well enough to survive and even prosper.

Katy breathed easier when they crossed the street and turned down a side alley, putting some distance between themselves and the wall. Their vehicle was parked out of sight, on the far side of a bright orange, rectangular dumpster. Its headlights lit up and its motor started as they approached.

'What a god-awful place!' Robert said as he slammed his door closed.

Katy wiped water from her face with a tissue. The thrum of the rain against the top of the car was oddly soothing, though she wouldn't relax completely until they were well away from the waterfront.

'I can't say I ever want to visit Seattle again,' Katy agreed.

'Not even a hint of what we were after. Wannabe revolutionaries with delusions of patriotism. Useless!'

'Still, it's one false lead eliminated.' Katy pulled out her datapad and tapped the screen several times.

'Amateur revolutionaries or not, that group has to be dealt with. No government can afford to have banned political parties holding secret meeting in abandoned subway tunnels beneath a major city.'

‘Agreed.’ Katy glanced at her watch as her datapad came alive. ‘Yes, this is Special Agent Sinclair. Going to privacy mode.’ She pulled a wireless earmike out of her datapad and tucked it over her ear. ‘We need an arrest squad down here right away. You have the coordinates already. That’s right. We’ve just egressed the theatre of operations. Surveillance is still on-line; I’m uplinking the video feed now.’ She tapped her datapad again. ‘I’d say between seventy and ninety subversives, including several we believe to be in fairly high leadership positions, organizing an illegal political movement against the administration. No, they have no bearing on our investigation. You’re free to take them in. Excellent! Thank you.’

Katy slid the earmike back into her datapad and flipped it shut. ‘Shall we head back to the hotel and regroup? I wouldn’t mind getting cleaned up.’

‘That sounds like a capital idea!’ Robert replied. ‘You know, if those Libertarians put up any resistance, it could get a bit dodgy down there. Double Eye would be happy to lend the Bureau a hand.’

‘That won’t be necessary. I’ve handed tactical control over to our Domestic Political Enforcement Division. They have a team standing by for just such an eventuality. Apparently they’ve been after these guys for months. They’ve just never been able to pinpoint a time and place before.’

Robert smiled. ‘Having access to the NSA’s Echelon³ data has its advantages.’

‘It sure does. Political Enforcement’s practically salivating over this. They couldn’t be happier.’

‘Think they have the manpower to take this on?’

‘They’ve got two hundred well trained combat agents on their way. They’ll be here inside of fifteen minutes. I think they can handle arresting a few dozen political dissidents, don’t you?’

Robert put the car into gear. ‘Well,’ he turned the wheel hard to the left, easing the car

into a U-turn. 'We'd better get out of their way then.'

Some five hours later Katy was sipping a Martini in the cocktail lounge of the Seattle Sheraton, waiting for Robert. She relaxed on a sofa in the relative darkness of the bar and idly watched the patrons come and go as recorded piano music played quietly in the background. It had been a long and gruelling day.

Robert walked in, spotted Katy, and grinned.

'How are the Martinis?' he asked, settling into a large chair across the coffee table from her.

'Not bad,' Katy replied.

'Bit of a frustrating day, wasn't it. I'll have a gin and tonic,' he called to a passing server, who nodded as she swept past with a tray full of drinks.

'I was hoping for something,' Katy admitted. 'Even a small hint, if not an outright lead.'

'That makes two of us,' Robert replied. 'It never bodes well when the early investigation comes up this empty.'

'This is going to be tough case,' Katy agreed.

'Yes it is,' Robert gazed absently toward the bar. 'We need a way to draw these people out. Get them to raise their heads and do something that leaves a trail we can follow.'

Katy stirred her Martini with a toothpick skewered olive. 'I'm not sure what we could use to bait them.'

'What about the fellow whose book their speaker kept reading from,' Robert suggested.

'Viktor Strizak? He's not affiliated with any banned political group as far as we know. He's more of an academic dissident, a former law professor who goes around plugging his

book and lecturing against copyright and patent law.’

‘A *former* law professor?’

‘He used to teach at Harvard.’ Katy replied. ‘They broke his tenure after some of his comments were picked up by the national press.’

‘Too seditious even for the liberal ivory tower?’

Katy shrugged. ‘Our ivory towers are hardly the liberal bastions they once were. Universities have to make a profit, after all. I never worked his file personally, but as I recall his rhetoric got a little too hot, and he refused to tone it down when asked. Nothing illegal in the strictest sense, but plenty to put a University on notice with respect to federal funding.’

‘So now he’s on the lecture circuit, signing books and slamming copyrights and patents. Subversives must love him. Oh, thanks mate,’ Robert took a deep swallow of his drink, handing the server a negotiable cash card. ‘Keep the rest for yourself, sweetheart.’

‘He has a pretty big cult following,’ Katy agreed. ‘Especially among the FreeNet crowd.’

Robert took another drink. ‘Think he might have a few fans among our mystery crowd as well?’

Katy thought for a moment. ‘It seems reasonable. I wish we knew more about them and could be certain, but yes, I think he probably does.’

‘Good,’ Robert replied. ‘We’ll have your Bureau pick him up, and make sure the information of his impending arrest leaks out ahead of time. With any luck some of his supporters will move to prevent it.’

‘He has a lot of fans,’ Katy pointed out. ‘The odds of someone in the group we’re after being the ones we catch don’t seem very good.’

‘I’m way ahead of you,’ Robert said. ‘Your average street punk or college student won’t have a clue. The people we’re after are technically savvy, able to to maintain a large

industrial operation without it showing up on the radar of the world's top intelligence organizations. We'll be a little wily in how we let the information out. Our quarry probably has access to our internal memos. They might even have a mole on the inside looking out for them. We'll circulate one set of arrest plans around the FBI, another around Double Eye, and if that doesn't turn anything up, a third set on the local police network. How they respond will not only give us a clue as to who they are, it will also tell us which agency has been compromised.'

'That's a very nice touch, Robert. But let's face it, if we succeed in getting someone that well connected and resourceful to act, there's a good chance we'll lose the bait altogether.'

'Don't worry, mate. We'll have security on Strizak so thick the bats in his belfry won't be able to fart without our knowing.'

'You know damn well there's no such thing as perfect security,' Katy retorted. 'The timing of this information release will be critical. Let it out too early and our suspects will have time to do an in depth reconnaissance analysis, perhaps spotting our security measures. Internal security becomes an issue if they do have someone on the inside. And if we wait too long and release the information too late, our suspects won't feel they have time to act, however hastily.'

'And if they don't act,' Robert added, 'we get nothing for our trouble. It's still worth a try. I'd say we give them a few hours notice. Enough time to work out a way to get a message through, and with luck, try something a bit more desperate.'

Katy smiled. 'That certainly improves the odds, but I still think the plan's a little shaky. Oh what the hell! If it doesn't work, we can always cut Strizak loose.'

'Or not,' Robert countered. 'If news of his impending arrest doesn't draw any results, perhaps the actual arrest and trial will. There'll be letters of protest, political gatherings, and

traceable Internet discussions that wouldn't otherwise occur.'

Katy finished her Martini. 'Alright. It's worth a try. In the meantime, maybe some of our other leads will pan out.'

'And if they don't, we'll find another way to shake the tree,' Robert's eyes hardened. 'One way or another, we'll damn well flush 'em out. This lot will *not* get the better of me!'



19 - φ - CODE

```

/* efdtt.c Author: Charles M. Hannum <root@ihack.net> */
/* Additional tweaks by Phil Carmody <fatphil@asdf.org> */
/*
/* Tiniest known C implementation of the DeCSS DVD
/* decryption algorithm.
/*
/*
/* WARNING: using this program to watch a movie you
/* have lawfully purchased is considered by some U.S.
/* courts to be in violation of 17 USC 1201(a)(1) [The
/* Digital Millennium Copyright Act]8
/* Length: 434 bytes (excluding unnecessary newlines)
/*
/* Usage is:
/* cat title-key scrambled.vob | efdtt > clear.vob
/*

#define m(i) (x[i]^s[i+84])<<
unsigned char
x[5], y, s[2048]; main(n) {for (read(0, x, 5); read(0, s, n=2048); write(1, s
, n)) if (s[y=s[13]%8+20]/16%4==1) {int
i=m(1)17^256+m(0)8, k=m(2)0, j=m(4)17^m(3)9^k
*2-k%8^8, a=0, c=26; for (s[y]-=16; --
c; j*=2) a=a*2^i&1, i=i/2^j&1<<24; for (j=127; ++j<n
; c=c>y) c+=y=i^i/8^i>>4^i>>12, i=i>>8^y<<17, a^=a>>14, y=a^a*8^a<<6, a=a>>8^y<
<9, k=s
[j], k="7Wo~'G_\216"[k&7]+2^"cr3sfw6v;*k+>/n."[k>>4]*2^k*257/8, s[j]=k^(k&k
*2&34)
*6^c+~y;}}

```

—Charles M. Hannum, C.E. 2001.

Thursday, October 4, 2057, 7:16 PM Chicago Time

Metadata: 2.379-6:02:083 kD new epoch

Marguerite swam in a sea of numbers, a universe of digital data which she perceived as much by sense of space, touch and smell as she did by sight. Floating windows of information surrounded her. The output of programs she had written streamed past, sometimes as text,

⁸ DeCSS is a small program written to allow GNU/Linux users to watch DVDs they had lawfully purchased, without having to install Microsoft Windows. At that time, there existed no software allowing one to watch DVDs on that platform, or UNIX platforms in general.

sometimes as graphs or images, more often as aromas or music. She scanned virtual monitor after virtual monitor, desperately seeking any information she might find on the fate of those arrested in the previous days.

‘Still nothing!’ she muttered, cursing under her breath as she delved through another block of abstract information. She had been at it for nearly a kilodies, first cracking the security that protected the University Police Department’s local network, then, when that proved useless, moving on to the State Police. Now she was deep within the systems of the FBI, a lone person fighting security protocols and trace programs intended to thwart entire intelligence agencies. This was serious, and while she was hardly modest about her own software skills, she realized grimly that she was operating at the limit of her abilities.

She had no illusions. If she faltered now, if her breach of the system were in any way detected and flagged, the Feds would trace the traffic back to her. The nodes through which she had hopped, and the encryption she had used to cover her tracks, were limited by the protocols of the Internet themselves, protocols specifically designed and vetted by the FBI to track activities such as hers. Marguerite had identified the protocol’s back doors weeks earlier, but knowing they were there, and even how they worked, would do little to protect her should the authorities get the smallest inkling that something was amiss. If she were to spring one of the protocol’s traps, she would probably have less than five minutes in the Physical before jackboots were breaking down her door. They would unplug her Node, and unceremoniously haul her comatose body off for examination and detention.

Physical flight wasn’t much of an option. Marguerite doubted her body was up to any serious exertion, and even if she managed to get to her car before the police arrived, they would use her vehicle’s transponder to pinpoint her position. Escape within the Virtual was also futile. It would take nearly four hours to transload herself across the Internet to a Node in a more secure location, and with the demands the FBI security systems were making, she

didn't have the bandwidth to spare. She cursed herself for not having thought of this sooner, for not saving a backup of herself first.

So she continued on, resigned to the fact that this was an all or nothing gamble. She would either find out what the Community so desperately wanted to know, or become another statistic in the growing number of missing detainees.

The scent of barbecue, accompanied by a golden flicker beneath and to her right, called Marguerite's attention to a stream of authorized traffic, coded in DES-6 encryption with a 56 kilobyte key. She copied the traffic to her local Node via several separate routes, then cloned herself and continued to hold off the system's security while her copy analysed and decrypted the traffic in the calm of her home environ. Twenty millicircadians later her copy forwarded the decrypted stream back to her.

It was the lucky break she needed, a complete challenge and response sequence for a secure link. Even if the agent whose identity she was about to assume didn't have clearance to the information she was looking for, he had at least provided a graceful exit out of the situation. She encoded the proper triggers and responses, then waited as the system at the other end digested the data and, finally, granted her access:

#

FBI FIELD REPORT CENTER

Welcome Agent Kenneth Brenton

MENU

Submit Field Report

Review Field Reports

Request Information (SUBMENU)

#

A quick perusal of the system revealed that Agent Brenton was a low level operative

with no significant clearance. However, being logged in under a legitimate identity silenced most of the active security triggers she had been contending with. She used this opportunity to instruct her copy to transload itself to a safe node in Alaska, then continued poking around the system in a more sedate manner. In four hours it would be only her body, and a few additional memories, that were at risk, rather than her entire being.

She replayed the encrypted query and response, running the data through numerous filters. She could easily brute force the encryption itself using a simple and well known quantum algorithm, just as she had to obtain Agent Brenton's low level access to the system. The problem was that the queries and responses changed from time to time. Agent Brenton might be carrying around a datapad with responses and counter-challenges pre-encoded for whatever missions he was assigned, or, more likely, he carried a key-card encoded in time sync with the FBI data server. The correct response might change from minute to minute or even, if the information was sensitive enough, from second to second. Despite her current speedup, six hundred times faster than the Physical, time was working against her.

For that reason she was attempting to crack the challenge-response code itself, hoping that the relationship was something less than random, something which might reveal itself with sufficient analysis. It wasn't as unlikely as it sounded. Even the best pseudo-random number generator would, in a deterministic system such as the one she was trying to break into, have an underlying order associated with it. Truly random numbers were notoriously difficult to come by, requiring extraordinary effort and equipment. Marguerite doubted the FBI had an atomic number source tied into their system, much less the sensitive equipment required to monitor and interpret the random atomic decay as numerical data. Hell, if they were going to go to that kind of expense they could invest in a particle generator and transmit their data using quantum-coupled one-time pads, the way the Autonomous Community and International Intelligence did.

Nevertheless, though she knew with near certainty there was an order to the random words and counter-words which confronted her, finding the underlying pattern was proving very elusive. Pseudo-random did not mean trivial to discern. First she would need to infer the algorithm used to create the pseudo-random results based upon the statistical spread of the data she had obtained. Then she would need to determine how that mapped to the challenge-response pairs, a mapping which could be as simple as indexes to a phone book or dictionary but was probably much more complex and elusive. This project would take a great deal of time and patience before an answer could be approximated, much less found.

As an afterthought she glanced over Agent Brenton's current assignment and froze.

'Why in the hell would they go after him?' she muttered. 'Node, patch me through to Prime.'

A moment passed, then another, while Marguerite doggedly went about exploring the system, tracking down as much information as Agent Brenton's limited clearance would allow, then passively learning as much as she could about the system's underlying software protocols.

'Any reason you're only allowing audio communications, Marguerite?' Prime's disembodied voice made her smile.

'I'm deep in the bowels of the FBI's network and can't be distracted. Listen, they're planning on arresting Viktor Strizak before he gives his speech at MIT. Tonight, in just a little over an hour.'

'Strizak?' Prime sounded incredulous. 'What on earth do they want with him?'

'You mean, aside from his widely publicized criticisms of WIPO and the world's Intellectual Property Laws? He isn't exactly a favourite of corporate America, or their government lackeys.'

'True, but he hasn't committed any crime, has he?'

‘No’ Marguerite confirmed. ‘They’re going to detain him for inciting others to criminal activity.’

‘You’ve got to be kidding! How could they possibly make that charge stick?’

‘I have no idea,’ Marguerite replied. ‘But then, how is it they’re allowed to disappear our colleagues in the Community without a single arraignment in court? The FBI appears to be playing it very fast and loose with due process.’

‘The government stopped taking the constitution seriously in the nineteen eighties,’ Prime commented. ‘And scrapped it completely in the early part of this century. I suppose we shouldn’t be surprised that they’re ignoring it again now. Hmm. Do you think this has anything to do with us?’

‘I can’t see how. He has absolutely no connection to the Community. We decided he was too high profile to risk inviting in, remember?’

‘Right! With the things he’d said publicly, it was pretty obvious the authorities would be keeping close tabs on him. Pity. He would have made a fine addition to the Community.’

‘Such is the price of speaking your mind in public. But hell, the authorities must know as well as we do he knows nothing about us.’

‘It doesn’t matter. Sweeping up a bunch of high-profile dissidents is a typical authoritarian response to anything they don’t control, don’t understand, and *do* fear. Take out the political and intellectual leadership, cripple the movement, and maybe the problem goes away.’

‘I suppose.’

‘Regardless,’ Prime said, ‘if we are in any way responsible for Strizak’s troubles, even indirectly, then we have an obligation to lend him a hand. We might even want to reconsider inviting—’

‘Hold on a minute, Prime.’ Marguerite found herself very busy as the link she was

piggybacking on began to shut down. Traces were initiated and had to be redirected, warning messages were displayed. Most appeared to be routine confirmations, verifying that the link had not been compromised. Of course, Marguerite's presence in the system meant that it had, and now she had to cover her tracks as best she could. After several millis she realized she wasn't going to be able to redirect every trace packet. Her only real hope was to make sure there was nothing to set off any red flags, lest someone analyse the traces more closely. After several more millis she was reasonably sure she had extricated herself from the system without tripping any alarms.

She checked her dumps of the session and was delighted with the amount of information she had managed to collect. The protocol sessions in particular would be invaluable in making future forays into the system. In time, she would probably be able to bypass the system's security regime at will.

'Sorry about that,' Marguerite said. 'I was a little busy for a moment.'

'Problems?'

'I'm not sure. I don't think so. Listen, I agree. We need to get to Strizak before they do.'

'When exactly are they planning to arrest him?'

'His speech is at nine. They're planning to pick him up outside his home before then, probably around eight thirty or so. Here's a pointer to the relevant data.'

'Hmm,' Prime muttered a moment later. 'According to the data you just gave me, we have seventy-four minutes. At most. That's about thirty circadians, if we use our network bandwidth wisely. If you're done playing cat-and-mouse with the Feds, why don't we get together and see if we can't come up with something.'

'I don't think we can afford the slowdown a group environ entails.'

'We'll teleconference,' Prime said. 'Audio and video only, no full sensory exchange or

remote presence. The slowdown should be minimal, and we do need to brainstorm. Planning isn't what worries me, Marguerite. It's the logistics of getting things done in the Physical to rescue this guy. Here we have all the time in the world. There, we have little over an hour.'

'You've got a point. Let's get Kyle in on this too. His nano might come in handy, and he seems to have no end of clever ideas on how to deploy it.'

'Right! We'll also need Doctor Coolridge. She's in Boston, and we're going to need some kind of physical presence if we're going to do anything.'

'Oh, hell! Damn! Metatime is synced with Central Time.'

'Of course. The original lab work was conducted in Illinois—oh. Oh no.'

Marguerite cursed. 'It's an hour later in Boston! We don't have seventy-four minutes; we've got fourteen. Give or take a few, depending on Viktor himself.'

'God damn it! Well, let's hope he's running late. I've got a call into Edith and Kyle. Anyone else you think might be able to help?'

'Not at the moment.' Marguerite wiped the screens of data away and replaced them with three virtual flat panels floating side by side in front of her. Prime's lit up immediately, followed a few minutes later by Kyle's, then Doctor Coolridge's.

'Good evening,' Marguerite said. 'I assume Prime has made you all aware of what is going on. I've prepared a knowledge engram of everything I know about Viktor Strizak's pending detainment.'

'Excellent,' Edith Coolridge replied. 'Time is a ticking, so let's get to work.'

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20 - ୨ - INTO THE DESERT

Having learned from the time I was at school that there is nothing one can imagine so strange or so unbelievable that it has not been said by one of other of the philosophers; and since then, while travelling, having recognized that those who hold opinions quite opposed to ours are not on that account barbarians or savages, but that many exercise as much reason as we do, or more; and having considered how a given man, with his given mind, being brought up from childhood among the French or Germans becomes different from what he would be if he had always lived among the Chinese or among the cannibals . . . I was convinced that our beliefs are based much more on custom and example than on any certain knowledge.

—René Descartes, *Le Discours de la Méthode*, C.E. 1637

Friday, October 5, 2057, 11:40 AM Kansas City Time

Metadate: 2.400-1:07:000 kD new epoch

‘We should be in Boston,’ Robert said as the Double-Eye Stratojet banked softly above the dusty grid of cracked streets, dead trees, and run-down buildings baking in the mid-morning Kansas City sun. The pilot announced their final approach as they descended out of the sky into what was the last outpost of civilization on the edge of an expanding desert.

‘I still can’t believe Strizak got away,’ Katy shook her head.

‘What a complete cock-up!’ Robert glanced out the window at the desolation. ‘This group we’re after is a significant threat. They’re big, well organized, and cunning. Snatching a wanted man out from under our noses and spiriting him away without a trace—even Double Eye, the CIA, or the FBI would need a good deal of luck to pull that off.’

‘They must have a lot of resources at their disposal.’

‘Resources, hell! This is a well planned, coordinated revolt.’

‘We’ve suspected an underground cell structure from the start,’ Katy reminded him.

‘Not like this! A loose knit group of revolutionary cells is one thing. An organization able to outwit government and transnational intelligence organizations is something else entirely. That implies central planning, coordination, and efficiency that rivals our own. We have no choice but to pull out all the stops on this one.’ The plane touched down with a gentle lurch. ‘God, I hate the desert!’

Katy wasn’t looking forward to the wind and grime of this forlorn city either. This was their second nebulous lead, with another two to follow. It was turning out to be a gruelling week, and the stress was starting to irritate her.

The plane taxied onto the ramp and the engines wound down. The pilot poked his head out of the cockpit, giving them the go-ahead to disembark. Robert released the latch on the door, which sighed softly as it opened and the cabin pressure normalized itself to the air outside.

The heat smacked Katy in the face as they stepped out onto the burning tarmac. The sky overhead was a cloudless, bleached blue fading to a dusty brown haze on the horizon. A hot breeze offered little relief, blowing a few wisps of dust around their feet as they made their way quickly across the pavement toward the parking lot.

Robert swatted buzzing horse-flies away from his face. ‘I’m personally going to take

this day out of the hide of whoever is behind this shit. The gloves are off as far as this operation is concerned.'

Katy glanced at Robert, one eyebrow raised. 'Off or not, we still have to stay within the law. This isn't Thailand, you know. Or some other underdeveloped nation.'

'Don't kid yourself. Shall I drive?'

Katy shrugged. 'Be my guest. I'd like to swing past the club and check out the access points and nearby streets.'

'Yeah, we'll do a quick drive-by, then check the hotel and verify that our equipment has arrived.'

'Some equipment,' Katy snorted. 'Costumes for decadent children.'

'Getting cold feet?' Robert grinned.

'Hardly,' Katy said. 'Speaking of tonight, I suggest we arrange separate transportation. We'll be able to canvass more people, with less suspicion.'

'Yeah,' Robert agreed. 'And if our suspects make one of us, the other may be able to continue collecting information unimpeded. By the way, just what do you think it is your agency does when they round up people like those Libertarians in Seattle?'

'You just won't let it go, will you? Are all our political discussions going to end up like this? In case you haven't noticed, I don't work for an *agency*. I work for the Federal *Bureau* of Investigation. We are law enforcement, not espionage. As for the subversives in Seattle, they've been arrested, will stand trial, and, when convicted, get buried in the penal system.'

'How many suspects do you think will make it to court?'

'Clearly enough to keep our judicial system swamped. Look, I know suspects sometimes die during an arrest, or while in custody. But even so, our toughest prisons, and our most determined interrogators, in no way equate to the kinds of pogroms that happen in places like Malaysia or the Congo.'

Robert shook his head. 'Katy, Katy. Listen.' A ghost of a smile played around his mouth. 'If you're ever going to climb the FBI's bureaucratic ladder, you're going to need to understand how things actually work. The platitudes about due process are good for public consumption, but surely you know that many of the people we arrest never hear their Miranda rights, much less see the inside of a courtroom.'

'Mine hear their Miranda rights,' Katy snapped. 'And I spend no small amount of time testifying before courts to win convictions.'

'Your government may not feel it necessary to eliminate the criminals you generally arrest,' Robert explained with exaggerated patience. 'But trust me, your Federal Bureau of Investigation is no more reluctant to dispatch those who pose danger to your society and government than we are. Our jobs differ only in degree, not in substance.'

'That's simply not true.'

'Every one of those subversives in Seattle is either dead or in deep interrogation as we speak.' Robert yawned. 'If that doesn't convince you, I don't know what will.'

Katy froze, shocked into silence. *All dead, or as good as?*

'I checked their status this morning,' he pressed on.

'That wasn't a Double Eye operation!' Katy's voice shook. 'Seattle is the Bureau's jurisdiction, not yours. You had no goddamn right!'

'Haven't you heard a word I said?' Robert smirked. 'The whole operation was conducted by your Bureau. What do you think it is your Division of Political Enforcement does?'

Katy stared straight ahead, stilling the sick feeling in the pit of her stomach and saying nothing. She was the first to admit the FBI had a far from perfect history. The corruption of its founder, and the excesses of the War on Terror were but two embarrassing examples of what could happen when the FBI exceeded its mandate. But wholesale slaughter? Not in a million

years. Did he really think she would believe such an outrageous accusation, or that he could goad her into wasting precious time and resources tracking down the information to prove him wrong? Or was he trying to manipulate her into supporting some strategy or action she would not otherwise tolerate? She recalled Bryant's warning, and wondered what Robert's agenda really was.

They turned down a street lined with single and two story store fronts, most of which looked like they had been abandoned for decades. One tattered façade bore a large, metal, hand painted sign: *Thumbscrew*.

'That's the club,' Robert announced, still smiling.

Katy glanced at chipped brick and rusted metal. 'What a dump. No side entrances, I see. Let's check the back.'

Robert made a left into a smaller side street, then slowed and made another left into a narrow alley.

'Loading dock, back door, and fire escape providing egress from both floors,' Robert commented. 'We have no way of checking the two adjoining spaces without attracting attention, but it would behove us to keep an eye out for any interior doors connecting to the adjoining properties. Seen enough?'

Katy nodded as Robert continued down the alley and took another left.

'To the hotel, then.'

'Yeah.'

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21 - ୫ - INTO THE NIGHT

All kinds of frankness and honesty are terrible crimes in the eyes of society.

—Jean Jacques Rousseau, 18th Century C.E.

Saturday October 6, 2057, 1:15 AM Kansas City Time

Metadate: 2.418-3:35:570 kD new epoch

The *Thumbscrew* by night was a very different sight to behold than the run-down store front Katy had seen that afternoon. The club had taken on a very chic and modern appearance, exposed brick and aged metal etched by sharp shadows, glowing neon and sculpted light. Bouncers stood on each side of a large metal door, checking identification and occasionally turning people away.

As Katy stepped out of the taxi she felt everyone's gaze drawn to her. Indeed, the outfit she wore was designed specifically for that effect, her body accentuated by a skin-tight body suit of black leather. With her stiletto heels and spiked collar she looked every inch the fierce dominatrix. Most of the men waiting in line gazed at her with apparent longing, although one or two seemed to be sizing her up with hostile eyes. Playing the dominant role she swept arrogantly past the waiting line toward the bouncer, who met her hard gaze briefly before opening the door and gesturing her inside.

No password needed to get in? Either their security was lax, or she and Robert had

misinterpreted the Echelon³ report. This was beginning to look very much like another dead end.

Loud music struck her with almost physical force. The dance floor was packed. Shiny vinyl and leather clad bodies gyrated to the pounding music. Katy made her way to the bar and shouted over the din her order for a glass of red wine. The bartender was a tall, thin man. Black leather pants and open leather vest stood out against his pale skin and jet-black hair. His exposed, hairy chest was almost as repugnant to Katy as the thick collar around his neck, and the leash that looped through it to chain him to the bar.

Sipping her wine as she scanned the room, Katy noticed a curtained door at the back of the club and went to have a look. It led to another flight of stairs, at the top of which was another metal door, with another bouncer standing guard. She wondered if it led to the manager's private office, then recalled the password she hadn't yet been asked to give. A private VIP space, then, and definitely worth checking out.

A huge bouncer with shaved head and red goatee stood in front of the door, arms crossed. He ogled her from top to bottom as she climbed the stairs. Katy met his stare with her own, silence stretching between them.

'Password?' he finally demanded.

'Chains of Darkness.'

He stepped aside and held the door open. 'Wouldn't mind spending some time in the Game Room with you,' he leered as she swept past.

Throbbing industrial music washed over her. The room was someone's idea of a medieval dungeon, with a high, vaulted ceiling and fake concrete buttresses shaped into Gothic arches. A bar ran the length of the wall to Katy's right. Around the room, where couples played public games of pain, shackles, pulleys, ropes, and large, leather padded crosses lined the walls. Katy spotted Robert not far from one corner of the caged dance floor,

looking ridiculous in his studded biker jacket and spiked hair, his arms around a husky blond woman. He had arrived a half hour earlier, according to plan, and appeared to be insinuating himself into the scene with gusto.

A couple in harnesses hung suspended from pulleys overhead, their bodies bound together with ropes. Katy couldn't tell in the light, but it looked like they were having rough sex. From the rafters hung a woman wearing a red devil's costume, a Satanic Peter Pan hovering over the place. She held a candle on one gloved hand, dripping wax with abandon onto the (struggling? fighting? fucking?) couple and the dancing crowd below.

Katy was in no mood to have hot wax—or worse—dripped on her. She stood off to the side and scanned the room. Sitting alone at the bar, wearing tight leather pants with no shirt, a lanky young man watched the crowd in much the same way. He toyed with the large pendant around his neck, his short, spiked blond taking on hints of red, blue, and purple as the lights strobed. Occasionally he would turn and sip of beer, flashing a brief, almost shy smile to the bony, tattooed woman behind the bar.

When the pendant caught the light it drew her attention. It hung almost to his navel, and held a large golden crystal that bore an uncanny resemblance to the mysterious cubes. Before her mind had finished analysing the possibilities, a rush of excitement propelled her toward him. What better recognition sign to attract those already familiar with the product than to wear a sample around one's neck that was recognizable to those in the know and completely innocuous to those who were not? By the time she reached him she was nearly certain the stone was indeed of the same material as the crystalline cubes she sought.

She stopped in front of him and met his gaze, then let her eyes travel slowly down his body, coming to rest at his crotch. She needed to capture his interest. Judging by the colour of his face, she had succeeded.

'How,' he stammered. 'How may I . . . uh . . . serve you?'

This is the perfect place for a little field interrogation, Katy thought. He and the rest of these dipshits won't even know what's happening. She smiled and brushed her hand along his chest, her fingers stroking his nipples and then taking one firmly in hand. 'Come with me,' she commanded, pulling him behind her. He stumbled from his stool and followed clumsily as she swept through the dancing crowd toward a set of unoccupied shackles on a corner wall. Without a word she secured him firmly, then let the keys fall at his feet. His eyes were glazed, his breathing fast, his mouth turned upward in a dopey smile.

'Now you're mine,' she breathed, teasing his chest and arms lightly with her fingernails. 'Tell me your name, slave.'

'Terry,' he gasped as Katy raised an eyebrow and twisted his left nipple.

'Terry,' she said. 'Is that all?'

'Spence!' he stammered. 'Terry Spence.'

'What was that?' Katy demanded, twisting his nipple a little harder.

'Terry Spence, Mistress.'

'Terry Spence,' Katy whispered seductively. 'Slave Terry Spence. Naughty slave Terry.'

Terry nodded, swallowing.

Katy's smile was predatory as she leaned closer to him. 'You want to be good, don't you slave Terry?' Katy's fingers explored his neck, his shoulders, his chest. She took the pendant in her hand as if just noticing it and turned it over in her fingers.

'Tell me, slave Terry, where did you get this delightful piece of jewellery?'

Nearby a couple in their early fifties danced and stared, practically salivating as Katy took both of the Terry's nipples between her fingers and twisted hard. They danced closer, hoping to hear his yelps over the throbbing music. Their eyes sparkled as the expression on the young man's face betrayed exquisite pain. A strobe light turned the unfolding scene into a stuttering series of snapshots depicting flashes of what looked like tortured fun. The young

man's face contorted in pain, then relaxed again as the leather clad woman stroked his body and whispered into his ear. Abruptly the dominatrix turned and left, striding toward the exit, leaving her victim hanging in his shackles, exhausted.

Through the blur of receding pain, Terry struggled to think. *She was asking about crystal cubes—the Community!* Worry mingled with self-loathing as the plump woman who had watched his interrogation unlocked his shackles and her husband eased him to the floor. Before them the oblivious crowd danced wildly. Terry huddled against the wall. *Was that woman a Fed?* he worried. *Or just an extra nosy dominatrix?* Thankfully, his edited memories had offered him and the Community some protection. *I never take extraneous knowledge with me into the Physical*, he congratulated himself. *No amount of pain can make me betray what I no longer know.* Then he remembered the woman's satisfied smile. And wondered.

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22 - ୩ - DISTURBANCES

Knowledge will forever govern ignorance; and a people who mean to be their own governors must arm themselves with the power which knowledge gives.

—James Madison, 18th Century C.E.

Saturday October 6, 2057, 2:20 AM Kansas City Time

Metadate: 2.419-6:90:000 kD new epoch

Katy had Terry Spence tagged for surveillance before she reached the car. Agents would follow him back to his flat, keeping him under 24-hour watch. Within minutes of her request the FBI had a wiretap on his home and mobile Internet. He wouldn't be able to even breath in private. The next time he made contact with his cohorts the surveillance team would know it—and shortly thereafter, so would she.

Back at the hotel, Katy changed into something much more comfortable: grey sweats and a Mickey Mouse tee-shirt. She was still shaken from the evening's events, her stomach a tight knot of acid. Physical roughness was a part of the job, and she had seen her share of tense stand-offs and messy arrests. More than once she'd been forced to physically disable an assailant. But field interrogations weren't the same as making an arrest or fighting off a violent suspect. There was something about the use of pain and humiliation to force a suspect to talk that was deeply unsettling to her. She much preferred psychological pressure to

physical. Matching wits with an opponent and winning was very satisfying. Torturing an opponent for information left her feeling dirty and ashamed.

She lay curled on her bed, watching her datapad run an Acquaintance Analysis on Terry Spence's name and sipping a cup of green tea as she waited for the result. It didn't take long. Within moments a list of names appeared, one of which was highlighted, blinking. It was the first time all evening Katy smiled a genuine smile. As she read the personal details of the highlighted name, her smile widened. She tapped her datapad once more, then waited for the connection to be completed.

'Champaign Police Department, Officer Morris speaking. Can I help you ma'am?'

Katy nodded to the pudgy, pale face on her screen. 'Yes you can, officer. I'm Special Agent Sinclair with the Federal Bureau of Investigation, Intellectual Property Crimes Task Force. I need to speak with the captain, please.'

'It's quarter-to-three in the morning, Ms. Sinclair. He's home, asleep. Can I have him call you in about five hours?'

'I'm sorry, this can't wait. I'm coding my credentials and sending them now.' She tapped the screen several times and continued. 'Please verify them and forward this call to his home.'

The police officer shook his head. 'You aren't going to win any friends Ms. Sinclair. OK, your credentials check out. I'm patching you through now.'

The screen went blank, then displayed an 'on hold' icon while she waited. After several long minutes the screen winked to life once more, this time informing her that video had been declined at the other end.

'This had better be good,' a rough voice spoke to her.

'Sorry to wake you, captain. I'll make this brief. You're planning on executing a warrant for the arrest of one Kyle Tate later today. I need to be present when the arrest is

made.’

‘I don’t know—your coded identification says F.B.I, huh? Special Agent Katy Sinclair . . . the Bureau requests every courtesy and full cooperation be extended, blah blah ... OK, Ms. Sinclair, you’ve got my attention. What is it you want?’

‘Detectives Larry B. Schwartz and Charles Lewis have been investigating Kyle Tate for allegedly operating an illegal FreeNet node. I believe they are operating on an anonymous tip your department received a couple of days ago?’

‘FreeNet—oh, yeah, that college punk running some illegal software.’

‘Your suspect is a material witness in an ongoing investigation. I will need to oversee the arrest and interrogate the subject before he is arraigned.’

‘Yes, yes,’ the voice had clearly grown impatient. ‘And depending on what he says you may want to take him into custody. I know the drill. What time will you be at the station house?’

‘I’ll be on the eight AM bullet train from Kansas City. That will put me in Champaign at eleven fifteen. Captain?’

‘Yes, Special Agent?’

‘Do not let your men proceed without me.’

‘I wouldn’t dream of it, ma’am. Now, if you don’t mind—’

‘Of course, Captain. I’ll see you around eleven thirty this morning. Goodnight.’

‘No, no,’ Robert was saying over breakfast several hours later. ‘I agree, one of us needs to go and make sure the local yokels don’t cap another one of our star suspects. I’m just saying that, even with our splitting up, it means leaving one of our remaining leads in the hands of someone less involved in the investigation. I can’t be in New York and Los Angeles at the same time.’

Katy nodded. She finished chewing her bacon and washed it down with a swallow of orange juice. ‘You’re right, Robert. We have to chose the most promising rendezvous to investigate, and hand off the other one.’

‘I’ve already decided,’ Robert said. ‘Los Angeles.’

‘Any particular reason?’

‘Yes,’ Robert smirked. ‘I prefer the beaches of L.A. to glass and steel of New York.’

Katy gave him a hard look.

Robert grinned. ‘Seriously, mate, we know the specific time and place of the California meeting, whereas the New York rendezvous is vague at best. Why take the chance and risk missing both opportunities?’

‘I prefer Los Angeles as well,’ Katy nodded. ‘Since this entire case reeks of intellectual discontent, not to mention disdain for our intellectual property laws, an L.A. forum discussing the evils of patents and copyrights is as promising a venue for turning up more leads as anything.’

‘Absolutely,’ Robert finished his coffee. ‘All three detainees connected with this investigation are intellectuals. The man you are about to arrest is a student at a prestigious university and fits the pattern. What’s more, that capped professor we recovered one of the cubes from taught at that particular school.’

‘The University of Illinois is almost certainly a hotbed of activity,’ Katy agreed. ‘But we both know it isn’t the only one, or necessarily the most important one.’

‘We’ll be systematic with our fishing expedition, but I suspect both our organizations will be swarming over the Illinois campus within the next forty-eight hours, turning up all kinds of illegal goodies.’

‘You’re probably right. Just do me a favour and wait until after the arrest before calling in your people. The last thing we need is to be tripping over one another.’

‘You have my word on that,’ Robert yawned, wiping his chin with his napkin and pushing his plate away. ‘The rail station is on the way to the airport. Shall I drop you off?’

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23 - ୩ - THE DREAMER REDUX: LOSS OF BEING

I sent my Soul through the Invisible,
 Some letter of that After-life to spell
 And by and by my Soul return'd to me,
 And answered 'I myself am Heav'n and Hell.'

—Omar Khayyám, *Rubáiyát*, 12th Century C.E.

Saturday, October 6, 2057, 3:53 PM Chicago Time

Metadate: 2.435-3:77:440 kD new Epoch

'There are over thirty thousand of us now,' Prime reclined with Marguerite in the protective shade of a luxuriant palm after an exhilarating mid-morning swim. A soft breeze dried their naked bodies. Breakers glistened in the golden sunlight as they washed against the beach a few metres away. 'The Autonomous Community has reached the critical mass necessary to sustain exponential growth in science and technology—'

A tone sounded and the Node's voice spoke within their minds. *Kyle Tate requests access to the environ.*

Marguerite blinked. 'Kyle wouldn't interrupt a private meeting without good reason. You'd better grant him access.'

Prime nodded. 'Node, clothe both of us in swimming gear, then let him in.'

Kyle was wearing black slacks and a white dress shirt as he materialized amidst the breaking waves, several metres away.

‘I’ve lost bio readings to the Physical,’ he blurted, oblivious to the waist deep water swirling around him. ‘My Node is off-line and telemetry from my body has gone completely silent. I’m dead! I’m fucking dead!’

‘Kyle, you’re not dead,’ Marguerite soothed. ‘You’re standing right in front of us, alive and well. Now back up and tell us exactly what happened.’

Kyle ran his fingers through his hair, shaking his head. ‘You’re right. You’re right. I’m here. I’m not dead. My body is.’

‘We don’t know that,’ Prime gently reminded him. He summoned a royal blue velvet recliner and inclined his head toward it. ‘Sit down, Kyle, and tell us what happened.’

‘I don’t know what happened!’ Kyle sat nervously on the edge of the chair. ‘I was in my home environ, reviewing the results from the last test runs of the new nano kits, when the bio-telemetry from my body just went dead. I tried to reset the link, but there was no response. I tried to transload back to my own Node, but it was unreachable as well.’

‘Marguerite?’

‘He’s right. The fibre checks out to the wall port of his bedroom, but the connection to his Node isn’t responsive.’

‘I’m trapped here!’

‘Your Node is down,’ Marguerite confirmed. ‘If communication between your Node and the rest of the net is down, you wouldn’t be able to receive your body’s telemetry even though it’s perfectly fine.’

‘A communications glitch? How do I reset it? It isn’t like offloading into the Physical is an option for me right now.’

Marguerite groaned. ‘Doctor Nolen and I both live within a few miles of you. Since I

doubt the good doctor's going to be amenable to doing you or anyone else any favours, I guess I'm the lucky one.'

Relief flooded Kyle's face. 'Thanks, Marguerite. I owe you big time.'

'You better believe it!' she grinned. 'OK, I've offloaded. I'll let you know when the link is back up.'

'You've offloaded? But you're still—Duh! Of course. You've copied.'

'I'll merge back together with my original, Marguerite₁, when she returns from the Physical.' Marguerite₂ grinned impishly at Kyle. 'I like you, but there's no way I'd give up hundreds of circadians and risk losing touch with the entire Community just to go check the cabling in your apartment.'

'Right. Sorry to have barged in on you guys like this.'

'Don't sweat it,' Prime said. 'I'm not sure I'd react any better if I had a body and lost telemetry.'

Kyle smiled ruefully. 'Touché! You know, it's not like I've even bothered to offload into the Physical recently anyway. With the four hour transload time from Auckland, it's just too expensive to do every day. But that telemetry is like a motor in an aircraft: always there, in the background, telling your subconscious that everything is all right.'

'Then, when it falls silent, sheer terror,' Prime agreed.

'I'm not exactly fond of the Physical,' Kyle admitted. 'But I don't like losing the option of offloading if I need to.' He laughed nervously. 'I mean, we need our bodies to visit our families, and maintain some semblance of normal life outside of the Community. Lose your body, lose your family, and maybe a whole lot else.'

'You have a very good point,' Prime acknowledged. 'Doctor Nolen doesn't have any living parents or siblings, and even if he did, I'm a software copy of him and they wouldn't be mine. It's easy to forget others are more connected to the outside world than I am.'

‘I’ll be dead to my family. It doesn’t get much more disconnected than that.’

‘Not dead. You would still be able communicate with them, by phone or email.’

‘Merde, Prime! His mother will be devastated if his body dies. She won’t see him as living software. She’ll see a dead son’s body lying in a coffin.’

‘If I’m physically dead, talking to my family from in here would make things a lot worse. I’d be like a ghost to them.’

‘Jesus!’ Prime shook his head. ‘This could be a real mess.’

‘Let’s not assume his body is gone just yet. My original may find that it’s just a network port that needs resetting.’

‘I hope so!’

‘One thing bothers me,’ Prime rubbed the side of his nose. ‘Why are you transloading four hours every time you want to offload into the Physical?’

‘One of Michael Forest’s colleagues is on vacation,’ Marguerite₂ said. ‘Kyle has been making use of his gen-three Node until his own arrives.’

Prime turned to Kyle. ‘You still haven’t received your upgrade kit?’

Kyle shook his head. ‘I put a request in for another one, but it won’t arrive for a few more days.’

‘One Node missing, and another suddenly silent,’ Prime frowned. ‘That’s a coincidence that bears a little more examination.’

‘I agree,’ Marguerite₂ said. ‘I’m going to snoop around the local police net a bit.’

‘Police?’ Kyle asked. ‘What would they have to do with anything?’

She shrugged. ‘If anything happened to your apartment, like a burglary or fire, it’ll most likely be on record. Damn, I wish I’d thought of this before my original offloaded.’

‘When was the last time *you* offloaded, Kyle?’ Prime’s voice was quiet, thoughtful.

‘Six days ago.’

‘What?’

‘Jesus Christ!’

Kyle’s face reddened. ‘Don’t act so shocked. I loaded up the IV, both catheters were cleaned and in place. Telemetry was just fine.’

‘Until it went dead,’ Marguerite₂ added pointedly. ‘No wonder you thought you had died. With neglect like that it wouldn’t be a surprise.’

‘It is a four hour transload,’ Kyle complained. ‘I lose touch every time I offload for maintenance.’

‘So send a copy to do the dirty work like I do, for crying out loud! You could just send memory engrams of your most recent experience, experiential difference engrams if you will, to the copy of yourself frozen back on your second gen node. You’ve got to do maintenance or all kinds of problems will develop!’

‘She’s right,’ Prime said. ‘A catheter and an IV isn’t enough for long term care. Why didn’t you copy and offload a duplicate?’

Kyle shivered despite himself. ‘It’s . . . you’re going to think it’s stupid.’

‘We already do,’ Marguerite₂ assured him.

‘Ever since Prime took over Nolen’s body, I’ve been seriously creeped out by the idea of a copy taking over mine.’

‘I didn’t take over Nolen’s body,’ Prime’s defiance rose. ‘I just borrowed it a few times. There’s a world of difference—’

‘A few times?’ Kyle blurted. ‘You did it more than once?’

‘Like you, I don’t like the transload time. Over two hundred twenty circadians lost while I copy across the net. That’s almost two thirds of a year subjective time, during which half a dozen critical projects flounder. No way! It is quicker and more efficient to have the kits mailed to Nolen’s house, then borrow his body, intercept them, and apply them to my node.’

Thirty-five minutes to offload, get the stuff, apply it, and watch while the nano rebuilds the node. It beats a four hour transload time.'

Marguerite₂ shook her head. 'You're both crazy. Prime, you should get yourself moved to a remote location, the transload time be damned. You only have to do it once, then its over. What happens if Nolen tries to offload into the Physical while you've got his body, or worse, he finds your Node and disconnects it from the net? And Kyle, if letting a copy of yourself access your body bothers you so much, then leave the copy in the Community and offload yourself.'

'That's just as bad!' Kyle protested. 'Then the copy lives my life while I'm off in the Physical slaving away doing push ups.'

Marguerite₂ rolled her eyes with disgust. 'This isn't even a rational discussion. Kyle, you were one of the first to start copying yourself when things got too busy, or the Community made demands on your time that interfered with your own projects. Now you're telling us you're afraid to do it at all?'

'I've always been very disciplined, very careful in my use of copies. We never bifurcated for long periods of time and we always merged back into one entity at the end of the day.'

'So what is the problem?'

'Remember when I had to track down those clowns I left in charge of our Kansas City production facility?'

Marguerite₂ snorted. 'Terry and Jim? Idiots! Whose bright idea was it to bring those hedonists into the Community? Oh, that's right! Yours!'

'They seemed like good candidates at the time,' Kyle blustered. 'Enthusiastic about the possibilities of life as software, and willing to do the grunt work of managing the nano facility. How was I to know they'd turn out to be a pornmongers?'

‘That wouldn’t have been so bad in and of itself, if Terry hadn’t insisted on bringing his sadomasochistic acquaintances into the Community. The last thing the world needs a bunch of superbright, hedonistic sadists.’

Kyle shrugged dismissively. ‘Whatever! They’re too wrapped up in their own pretend worlds to cause any real problems.’

‘Or bring anything useful to the Community,’ Marguerite₂ countered.

Prime cleared his throat. ‘OK! OK! Let’s get back to Kansas City. Kyle, as I recall you were positively livid with the Gamer’s League. You must have repeated that story about your radiation sickness a dozen times to anyone who would listen, in rather melodramatic terms.’

‘It still galls me to this day.’ Kyle’s face hardened. ‘Why would we flee the frailties of our physical brains, or our flesh, to live a virtually immortal existence here as software, then deliberately take the most unpleasant possibilities of the Physical and recreate them here? The whole idea makes me nauseous.’

‘And this relates to your neglect of your body and your phobia of self-replication how?’ Prime’s patience was beginning to wear thin.

‘My copy lived in that ridiculous space opera for over two months,’ Kyle raged. ‘I, or rather he, suffered physical discomfort, sometimes even severe pain, on numerous occasions, not to mention adversity in more forms than I care to remember. At the end he suffered horribly, his avatar dying of radiation sickness. All that just to catch up with Terry and convince him to do what he’d said he’d do in the first place!’

‘I don’t blame you for being ticked off at your friends, but you still haven’t told us what that has to do with your self neglect.’

‘I . . . he, rather . . . had changed. When we rejoined, we were hardly alike. Twenty-one years of common experience in the Physical, a decade here in the Community on top of that, and in a scant sixty circadians we had diverged so much that we were, in many respects, two

different people. I . . . he, damn it! He had a lot of second thoughts about merging back together. What if he'd chosen not to? Which of us would have been entitled to my body? Him? Hardly. But would he have seen it that way?

'You already know that the security protocols to the offload subroutines were updated after Prime's experience, and some rather glaring bugs were fixed,' Marguerite₂ brushed brown, curly locks impatiently away from her face. 'Now the offload procedure is only available to the original. You, in other words. The only way a copy could ever 'take over' your body is if you give it explicit permission to do so, and provide it with the encryption keys to your offload routines.'

'Marguerite₂'s absolutely right. You've developed a real phobia here.'

'Yeah, I know,' Kyle blushed. 'I know it is irrational to fear myself. What difference does it make whether I or a copy offload into the Physical, or stay here and keep up with the Community while I offload and do maintenance on my body? It shouldn't matter to me, but it does.'

Prime closed his eyes and took a deep breath. 'So instead of dealing with your fear rationally, you let it control you. And now that fear has put you in a situation where you may have lost your body for good, to physical death through neglect. Not exactly your smartest decision.'

Kyle looked down at his feet, digging the point of his shoe into the sand. 'I thought I could handle it. I thought it wouldn't be a big deal. I'd offload every other day instead of every day. But nine hours every other day? Four to transload, an hour to work out, use the bathroom, eat, and all that, then another four to transload back?'

'Two hundred twenty-five circadians, give or take,' Marguerite₂ nodded. 'A heavy price to pay.'

'Too heavy,' Prime agreed. 'Kyle, did it ever occur to you to edit out your irrational

fears, to modify your possessiveness of your body such that it wouldn't bother you if another used it? Then any copy you made of yourself would have accepted the notion with the same equanimity, and you would have had nothing to fear.'

Kyle dropped his head into his hands. 'I . . . I just couldn't bring myself to do it. I've been a complete idiot.'

'That's what phobias do to us,' Marguerite₂ put her hand on Kyle's. 'We are sapient pieces of software. In the strictest sense we are not human when we're unloaded like this, yet all of our instincts and reactions are those of physical human beings. Unless we consciously choose otherwise, we take all of our psychological neurosis into this place.'

'Don't be too hard on yourself for being human,' Prime patted Kyle on the shoulder. 'Just be sure you learn from this mistake and don't repeat—'

'I've got something!' Marguerite₂ interrupted.

'What is it?'

'The police were dispatched to Kyle's place about twenty minutes ago to serve a warrant for his arrest. Oh my god! It seems our foolish friend here has been running a FreeNet node from his home.'

'That's not true!' Kyle's eyes went from Marguerite₂ to Prime, and back to Marguerite₂. They stared back at him in silence.

'Come on you guys, do you really think I'd be stupid enough to run an illegal Internet service in my own place when I've got an Autonomous Node wired to my skull?'

Marguerite₂ shrugged. 'I'm just passing along what I'm reading. Wait! Oh, this is interesting!'

Kyle leaned forward. 'What?'

'According to the police dispatch, you were turned in by an anonymous informant day before yesterday. They were going to pick you up this morning, but then delayed the arrest so

that Special Agent Sinclair of the FBI could take part.’

‘FreeNet nodes and intellectual property crimes are their forte,’ Prime interjected.

‘Yeah, but the FBI usually doesn’t get involved in this sort of petty thing until after the initial arrests.’ Marguerite₂’s gaze bore through Kyle, her eyes thoughtful. ‘Unless the subject is somehow related to an ongoing investigation.’

‘If they busted into my place and found the Node—’ Kyle began.

‘They would have bagged and tagged it as evidence, leaving your body disconnected from the net and inaccessible from this side of the neural interface.’ Prime realized he was shouting and lowered his voice. ‘I’d say you’re very lucky you transloaded to that borrowed Node in New Zealand. If you’d been running on your own Node you’d be—’

‘Fuck!’

‘Jesus, Marguerite₂! What happened?’

‘My duplicate, or rather my original, isn’t answering. She’s already left the house, without her datapad. God damn you Kyle!’

Prime put his arm around Marguerite₂. ‘Don’t worry. She’ll see the police and return home. What really worries me is the anonymous informant who told the cops about Kyle’s FreeNet Node.’

‘For the last time,’ Kyle hissed, ‘I’m not, and never have been, running a goddamn FreeNet node!’

‘The arrest warrant indicates a network probe was conducted, which did identify a FreeNet server running from within your apartment,’ Marguerite₂ snapped back. ‘The arrest warrant was issued as a result of that probe.’

Kyle stared at her, stunned. ‘I swear to you, I wasn’t running FreeNet. Do you really think I’d expose the Community to detection by doing something that foolish?’

Marguerite₂ took a deep breath. ‘It doesn’t fit. Not with you, not with the situation.’

Prime is right, it all comes back to this anonymous informant.'

'Any enemies from the old Alma Mater?' Prime asked. 'Anyone who might want to get you into trouble with the authorities.'

Kyle shook his head. 'Oh, I've had my share of disagreements with people, but I don't know anyone in the Physical who would want to put me in jail.'

'Whoever it was would have had to have enough technical knowledge to set up a FreeNet node and make the police think it was running in your apartment,' Prime added. 'The former isn't hard to come by, but rerouting network protocols, and making the police think they've pinged a piece of hardware in one geographical location when in fact they haven't, would be very difficult.'

'Next to impossible,' Marguerite₂ mused. 'Almost all the changes incorporated into IPv12 involve back doors and trace mechanisms for law enforcement, not the least of which is geographical pinging through optical phase variances and coded routing. There's a team in the Community working on stealthing our inter-Node communications. They've been trying to do exactly what you've described and haven't been able to, despite kilocircadians of effort. If they couldn't do it in all that time, you can bet there's no one in the Physical who can.'

'That leaves the obvious,' Kyle said. 'Someone broke into my apartment, planted the evidence on me, and called the police.'

'The same someone who may have intercepted your third generation Node and used it to their own purposes,' Prime added.

'No one outside of the Community would even know what a Node is,' Marguerite₂ pointed out. 'And no one within the Community would risk exposure by involving the police, no matter how much they dislike Kyle.'

Kyle's gut felt like molten lead. 'There is one person,' his voice shook.

'Who?' Prime asked

Marguerite₂ looked at him. ‘Yes, who?’

‘Well, who hasn’t been given a second, much less a third, generation Node?’ Kyle asked. ‘Who has been shunned these last kilodie? Who has every reason to hate us, and might just be mad enough to risk his own exposure to get us? And who got me out of student housing and into a private apartment when this entire project began?’

Marguerite₂ and Prime stared at each other.

‘Of course!’

‘My god! It’s Nolen!’



24 - ୫ - THE CLOSING FIST

You have not converted a man because you have silenced him.

—John Morley, C.E. 1874

Monday, October 8, 2057, 11:00 AM Chicago Time

Metadata: 2.490-5:23:300 kD new epoch

‘Captain Noxforte, this is FBI Special Agent Sinclair. Katy, Jim Noxforte, Captain International Special Forces.’

‘Special Agent,’ Captain Noxforte nodded. His dress uniform was immaculate, something Katy imagined a naval uniform might resemble, if naval dress colours had been black rather than tropical whites. He wore black gloves, black shoes—even his buttons and cuff links were black.

Katy extended her hand, wondering what this was all about. ‘Captain.’

‘Captain, would you please brief Agent Sinclair on this afternoon’s activities.’

Afternoon’s activities?

‘My pleasure! Ms. Sinclair, we’ll be moving out in exactly three hours.’ Captain Noxforte’s never looked at Katy. His eyes remained fixed on a point on the wall somewhere above Robert’s head.

‘Moving out?’

‘We’ll strike with forty teams of five commandos each. Our timing will be precisely synchronized, neutralizing all forty targets within moments of one another. The operation will take place in three phases. In the first phase we will isolate and secure each target location. Once all theatres of operation have been secured, we’ll proceed with the second phase: a precisely coordinated interruption of all services, electrical, telephone, plumbing, the works. Only then will we storm the premises and neutralize the targets.’

‘What the hell is he talking about, Robert?’

‘Our first significant blow against our opponents,’ Robert beamed. ‘Please continue, Captain.’

‘Yes,’ Katy’s voice was tight, her anger restrained.

‘Timing is critical,’ Captain Noxforte explained. ‘We have a pretty good idea of how quickly these people can communicate with one another, and we don’t want an early strike tipping off the others. We’ll be making the arrests within seconds of one another.’

Katy’s eyes flashed. ‘Who is it you’re arresting, exactly?’

‘Everyone who’s anyone,’ Robert beamed. ‘Professors and graduate assistants we’ve linked to Terry Spence and Kyle Tate.’

Katy stared at Robert. ‘You gave me your word, Robert. This is FBI jurisdiction. How *dare* you authorize this kind of thing without consulting with me first.’

‘If we waited until you’re ready, we’d never make any arrests. This case can’t afford your kid-gloves approach!’

‘We’ve barely begun to investigate Kyle Tate’s associates, and Mr. Spence is still under surveillance. Now you’re going to turn this entire investigation on its head before we’ve had a chance to collect any evidence? This is beyond asinine!’

Captain Noxforte fixed his grey eyes on Katy. ‘With all due respect Special Agent, I’ve overseen missions from Bangkok to Moscow. In all my years of service I’ve never botched a

single operation.’

‘This isn’t Thailand or another fucking Muscovite revolt,’ Katy shot back. ‘We’re talking about a delicate investigation here, and you two have gone behind my back and thrown together a cockamamie plan that’s going to blow the whole thing out of the water! Aside from the fact that any arrests we make have to be done within certain parameters, and only when—’

‘The Captain is aware of that,’ Robert cut her off. ‘His men know that none of our suspects are to be killed.’

‘Maimed perhaps, if necessary. But no outright lethal force, of course.’ The captain grinned. ‘They wouldn’t do you much good in the interrogation room dead, would they? Hell, Senior Operative Leahy, for a minute there, I thought your Special Agent was going to have me reading the enemy their Miranda rights!’

Katy stood, her dark eyes fixed on the captain’s. ‘Who do you think you are? Robert and I are in charge of this investigation, not you! We’ve been granted equal authority over this inquiry, by my government and the world trade bodies. You answer to *both* of us, understood?’

‘I, ah, understand better than you do, I think.’

‘I doubt that very much,’ Katy spat. ‘This little plan you and Robert have cooked up is going wreck every lead we’re working right now. You’re not moving the investigation forward, you’re setting it back. Perhaps catastrophically.’

‘That’s for Operative Leahy to determine, ma’am. I answer to him.’

‘Jesus, you Double Eye people really are a piece of work, aren’t you? Robert, you have absolutely no right to conduct this sort of ad hoc operation behind my back!’

‘Captain, give us a minute please.’

‘Of course.’

As the door snicked shut behind the departing man Katy turned on Robert. He held up his hand and grinned. ‘I know, I know. I should’ve involved you earlier in the planning, but

time and circumstance didn't allow.'

'Don't you smirk at me! You're conducting a military operation on American soil, behind my back. You're about to wreck our entire investigation, and you fucking *grin* at me? What kind of a weak-minded idiot do you take me for?'

'Come on, Katy. I saw an opportunity to put a little life in the investigation and I took it. Relax! It'll work out just fine.'

'Just fine?' Katy glared. 'Just fine? You are unilaterally unleashing Double Eye commandos on an American University in an action that is about to turn our entire case on its head, and you're trying to convince me things are just fine?'

'The FBI will be duly notified once the operation is complete.' Robert leaned back, clasping his hands behind his head. 'Your Bureau's communications are open to the enemy. It was critical this be a Double Eye operation.'

'Stop using the FBI's communications issues as an excuse to exclude me from command decisions! Last I checked, my encrypted link to you wasn't compromised!'

'Katy, the lead time on this didn't permit—'

'Lead time? You wouldn't have these leads without me! We're supposed to be partners in this investigation, not competitors.'

'We are partners, Katy. Why do you think I brought you into this meeting?'

'Don't fucking patronize me, Robert! You brought me here to present me with a *fait accompli*, to make me a part of your little operation whether I like it or not. And I don't like it, not at all! Not you, not your methods, and not this ill conceived clusterfuck you're about to drop on our investigation.'

'Ill conceived? We're about to net ourselves a whole slew of suspects for questioning!'

'Your definition of suspect is suspect. Arresting any professor that Kyle Tate or Terry Spence have ever taken classes from? Rounding up their graduate assistants? For crying out

loud! These aren't suspects, not in any legal sense of the word. They're victims of a fishing operation.'

'Need I remind you these people snatched Viktor Strizak out from under our very noses? Even governments couldn't pull something like that off, not with all the International Intelligence operatives we had shadowing him. Our opponents have access to resources we're only beginning to fathom. We can't afford your delicate, walk-on-eggshells approach! We don't have the time for it.'

'What we can't afford is your ham fisted approach, particularly at this stage! We haven't come close to breaking this case yet, and your little operation is bound to drive the very people we're looking for deeper underground, before we get a chance to figure out who they are or what they're really about!'

'We have a very small window of opportunity,' Robert countered. 'We'll get as many as we can before they have time to organize and run. You heard what Terry Spence said in Kansas City. They're a 'community.' These people are in frequent contact with one another. We don't have a week or two to investigate and ferret out who they are. A wide sweep is our best option.'

'It's a stab in the dark, Robert, and you know it! If we don't luck out and out get our key suspects in this raid, they'll be so far underground we may never find them at all!'

'We're bound to turn up a few suspects among those we detain, and we'll squeeze the truth out of them.'

'I hope so. Using paramilitary troops for domestic arrests is dangerous. We would have been better off using some of my people. At least we're trained in making lawful civilian arrests.'

Robert shook his head. 'No way. We know they've got access to the FBI's internal communications.'

‘Oh for Christ’s sake, will you quit with that excuse? They may well have wormed their way into Double Eye too.’

‘Maybe, maybe not. At least with my people, we have the possibility of surprise. Now, if you’re done with your little jurisdictional pissing match, shall we get on with making some arrests?’

‘*Jurisdictional pissing match?*’ Katy’s voice rose. ‘This isn’t about jurisdiction! It’s about you single-handedly torpedoing our case with a reckless gamble!’

Robert waived her objections away. ‘I’m famished,’ he grinned. ‘The op doesn’t start until two—shall we grab some lunch?’

* * *

‘It’s begun,’ Robert nodded toward an entire wall lit up with multiple video feeds, four rows of ten images, one for each team. ‘Shall we see how our troops are faring?’

Christ almighty! Katy couldn’t believe she was in this mess. ‘Do I have a goddamn choice?’

‘Team thirty-seven assembled,’ a voice whispered across the radio feed. ‘Recon shows all quiet.’

‘Team sixteen assembled, recon shows two people entering the residence.’

‘Team five assembled.’

‘Team twenty-nine assembled. We see no activity.’

Katy and Robert waited in silence as the rest of the teams reported in.

‘All teams assembled and staged.’

Robert nodded. ‘Right on time.’

‘Phase two is a go,’ a voice crackled. ‘I repeat, go with phase two!’

Again they waited as each team positioned itself and reported ready.

‘Team seventeen, everyone else is in position. What’s the hang up?’

‘We’re having trouble cutting the power. Stand by, sir.’ There was an uncomfortable silence, which stretched for several seconds. ‘Team seventeen ready.’

Katy let her breath out slowly as Robert smiled. ‘Execute phase three,’ the captain’s voice was clearer this time. ‘I repeat, phase three is a go!’

Katy watched forty images, beamed live from forty micro-cameras mounted in the helmets of forty commandos, as they stormed forty different residences throughout the Champaign-Urbana area. Doors were broken down and shattered. Some living rooms became scenes of hysteria as families and individuals panicked and were subdued. A lieutenant mercilessly pistol whipped a belligerent college student, then had two troopers carry the bleeding, unconscious youth away. Katy winced as another commando on the other side of town shoved a child to the floor and dragged the father out of the house.

It wasn’t carnage, exactly, but something inside her despaired at what she was seeing. These people were supposed to be free. They were supposed to be protected by a constitution guaranteeing a presumption of innocence, a right to counsel and due process. Katy was the first to admit that justice could sometimes be rough, and constitutionality was often quite pliable in the heat of field operations, but nothing she had ever seen or done had prepared her for the ruthless efficiency she observed now. It occurred to her that, if this were to go sour, it would be the end of her career. Robert would vanish, a secret spy assigned to a new venue somewhere on the other side of the world. Katy didn’t have that option. It wouldn’t matter how much she had argued against this, or how vehement her objections were. If this ever went public, she’d be the one taking the fall.

Within five minutes all the targets had been neutralized. Two-hundred and ninety-seven individuals had been detained. Fifteen targets yielded crystalline cubes. Of those fifteen cubes, thirteen had been connected to comatose individuals.

‘This morning we had four suspects,’ Robert gloated as the commandos loaded their

prisoners into nondescript white vans and began ferrying them to the command centre. ‘One dead, one in a coma, and two others remarkably resistant to our best interrogation techniques. Now we have fifteen more, including two who are awake and conscious. Both of those have families, who are also in our custody.’

‘Families?’ Katy asked sharply. ‘What are you saying?’

‘Our days of waiting are over. There isn’t a college punk among them who’ll stay silent while their parents or siblings are interrogated, or a professor who won’t confess when he sees his spouse or children put under the lights.’

‘Christ, Robert!’

‘We now have the means, and leverage, to get to the bottom of this once and for all. I intend to do just that!’

୫

25 - ୫ - FEAR, UNCERTAINTY, AND DOUBT

Freedom is the only law which genius knows.

—James Russell Lowell, C.E. 1843

Monday, October 8, 2057, 2:37 PM Chicago Time

Metadata: 2.493-7:94:097 kD new epoch

No one anticipated such a large crowd when the Strategy Group met. It hadn't occurred to anyone to restrict access to the environ, or hold the meeting in an unpublished location. What began as a small conference room quickly grew to accommodate tens, then hundreds, and finally thousands of people. The table reached absurd proportions before the environ's nonsapient software reconfigured the room into a vast hall, replacing the one giant table with smaller, more manageable ones. The environ continued to redefine its physical parameters, the hall growing ever larger as still more people arrived. An afternoon sun cast slanted beams of light across the room, a not so subtle visual cue that time was growing late.

With so many people interacting in one virtual environ the computational and network demands were tremendous. They lost the better part of an entire dies in just ten millicircadians, an appalling slowdown. What should have been a leisurely twenty subjective days had been reduced to just a few subjective minutes. As things stood, they could work faster back in the Physical.

No one seemed bothered by the phenomenon, or if they were, they had more pressing things on their minds. Fifteen souls, captured in a stunning series of coordinated raids, their physical bodies and autonomous hardware now in federal custody. None had been as fortunate as Kyle, who was safely translocated elsewhere when the authorities came calling. Instead they were lost to the Community. Gone. Entire families had been taken. No official arrest warrant recorded their detainment, much less offered any clue as to where they were being held. The implications were terrifying.

Individuals and groups were arguing with one another, some with their heads together in intense, whispered debates, others shouting. Still others huddled amongst themselves, mutely observing the chaos around them. A cacophony of voices laced with an unmistakable undercurrent of raw, mind-numbing fear filled the vast space. Panic, held barely in check.

Marguerite waved her hand, casting the hall into silence. ‘I have modified the acoustical properties of this environ,’ she glanced around as everyone turned to face her. ‘Only Strategy Group members and those we authorize can speak; everyone else has had their access to the environ’s auditory subroutines revoked. Sorry for striking everyone dumb like this, but we have a lot we need to get done this circadian, and time is wasting. Madame Chairwoman?’

Doctor Sarah Forest nodded her thanks. ‘There are too many of us here to get anything useful done without some change in the meeting’s format. According to our current census there are around thirty-nine thousand members of the Community. It wouldn’t surprise me if each and every one is with us in this environ right now. So, we have two things working against these proceedings: the chaos and confusion a crowd this big will bring to any issue, regardless of how enlightened and intelligent each of us may be, and the extreme slowdown so many interactive presences in one environ create.

‘To solve this we will be kicking almost everyone out of the environ. Apologies in advance to anyone who feels slighted, or feels we are behaving in a heavy handed manner, but

we must reverse the time differential or we won't be able to get anything done before the authorities are breaking down all our doors.

‘Although interactive participation will not be possible for most of you, the Strategy Group will multicast the entire proceedings so that everyone can monitor what is being discussed and going on, in real time, ’live’ so to speak. So, with that warning I am asking Marguerite to provide each of you with the multicast pointer and deny you interactive access to this environ. Now.’

She glanced at Marguerite, who nodded. The hall shrunk into a small room centred on the one remaining conference table around which the Strategy Group was seated.

‘We are now operating with a speedup of five hundred and forty-one,’ Sighs of relief greeted Marguerite’s announcement.

‘Much better, thank you,’ Sarah replied. ‘We’ll begin by inviting those Interest Groups whose projects are directly related to the immediate and medium term survival of the Community. Marguerite, who’s first on the agenda?’

‘The Alaskan Enclave Group.’ The room and its table grew larger as several people appeared.

‘Welcome,’ Sarah smiled. ‘Which of you will be representing your group?’

‘We’ve elected Brian as our spokesman.’

A young man rose, his virtual body a translucent, finely carved statue of ice that glittered in the room’s lights when his muscles moved. ‘With your permission, I’d like to use a portion of the environ as a visual aid.’

Marguerite nodded. ‘The area behind you is accessible.’

‘Thanks.’ Brian stepped to one side as the wall behind him was replaced with an aerial view of a pristine, snow covered wilderness bathed in the red of a setting sun.

‘Our mandate was to construct a facility that would allow everyone in the Community

to house their Nodes and physical bodies in safety and discretion. We've chosen an underground location, out of the way, where the government isn't likely to notice. For various logistical reasons, including the avoidance of international customs for those of us living in the States, we chose to build in the central Alaskan wilderness.

'The scope of the project has grown with the expanding internationalization of the Community. We've developed preliminary plans for similar enclaves in the outback of Australia, a Buddhist monastery in the mountains of Tibet, another in Nepal, as well as remote areas of Cambodia, northern Siberia, central Africa and Brazil. But first we'd like to get the Alaskan operation up and running. We need to work out the inevitable kinks before expanding the project.'

Brian paused and held out his hand. Above it formed a glittering geodesic lattice from within which a brilliant emerald light shone.

'This is a knowledge engram of the current state of the project. I'll multicast the address pointer to the rest of the Community.'

Behind him the aerial view rushed forward into one of a number of similar mountain valleys. Parallel treads in the snow, tracks left by all-weather snow vehicles, marked a single, one lane road that wound its way through a narrow mountain pass and along the edge of the valley. It ended at the base of a rocky slope, where a single, garage sized door opened onto a vaulted room cut from the mountain stone itself.

'This is the staging area. We get people and equipment inside as fast as possible, to minimize the risk of detection. We've buried the facility deep enough, and piped what little waste heat we must vent through the mountain strata to a neighbouring valley. Our detectable footprint is quite small.'

The view pulled back outside, the outer door closing. It mimicked the ice and stone perfectly, the only sign of human activity the tread marks in the snow.

Several people nodded approvingly as the view continued to widen, bringing the full mountain face and southern end of the valley into view. The snow and rock of the landscape became transparent. Bright lines overlaid the winter scene, a three dimensional schematic depicting dozens of levels descending downward, yellow circles of winding floor plans stacked one upon the other beneath the base of the mountain. Blue tubes from the lake represented the facility's plumbing. A deep, red vault was the geothermal power generator. Gray lines showed several hundred additional levels, spread out in cylindrical columns beneath nearby mountains, linked together with broad, tubular passages. Brian was right, the project's scope and design had grown immensely.

'As you can see, the initial design can accommodate thirty thousand people along with their Nodes. Future plans are even more ambitious. However, supplies of nano-constructor and catalytic solution have been very limited.'

'How many people can you take right now?' Sarah asked.

'Two hundred and sixty. Until a few days ago almost all of our resources were going into the construction of the geothermal reactor, a prerequisite before any significant number of people could be housed here. Now that the reactor is operational, we've been able to devote all of our efforts toward building the housing facility itself. If we had more nano we could speed up construction by a factor of two or three, but even so we'll only be bringing one hundred and eighty apartments into service each day.'

'Damn,' Michael muttered. 'That won't be fast enough.'

'That isn't the limiting factor, anyway.'

Sarah was surprised. 'Really? What is, then?'

'Logistics and supplies. Every good colonist's and general's worst nightmare. Food to feed our physical bodies, medicines to treat physiological problems as they arise, waste disposal, and so on. With the lake and glaciers nearby water isn't a problem, and once the

protein factory is up and running food won't be an issue either. But in the short term just about everything else will be.'

'The design specifications allow for this,' Michael pointed out. 'Geothermal power to provide basic power needs and drive the production of catalytic solution, facilities for the synthesis of nano-constructors, and nano-based factories for the construction of everything else from basic foodstuffs and medicines to fibre cabling and Autonomous Nodes. Every physical need addressed, with production facilities reconfigurable on the fly. An elegant design, and quite thorough.'

'Yes. In three or four months, assuming we don't hit any construction snags or design issues, and assuming we're well supplied with nano and catalytic solution, we can build a completely self sufficient facility. The problem is that we don't have three or four months. People want to move in today, and we just aren't ready.'

'There is another option,' another of the group's members said. 'But I doubt it will be very popular.'

'Let's hear it.'

'Ditch our bodies and transload directly.'

Michael gaped. 'You're right, that's not a very appealing notion.'

The schematic spun and zoomed, until it displayed just a small corner of the facility. Green lines indicated that construction in this portion was already complete. Purple cubes began to add themselves to the image, forming a large matrix, piled one atop the other, linked by pulsating, purple lines. A hypothetical array of Autonomous Nodes, enough to house the entire Community.

'We already have the space. We only have to synthesize the Nodes themselves.'

'You're talking physical death,' Michael tugged his grey beard, agitated. 'Suicide, on a massive scale.'

‘Prime’s alive and doing fine without a body,’ someone said.

‘It worked for Kyle, too!’

‘That was an accident,’ Kyle looked around, trying to identify who had spoken up. ‘I didn’t ask to have my body stolen.’

‘Dumping your body beats dying, having your Node shut down, or spending the rest of your life in a coma,’ Sarah met her husband’s gaze, eyes steady.

‘I would have thought you, of all people, would balk at something like this.’

‘What, and return to my frail, physical body, blind and reduced to merely human intelligence? Not in a million years.’

‘These worlds are only virtual, Sarah! What they’re proposing is real-world biological death!’ Sarah said nothing, still holding Michael’s stare..

‘One can imagine worse fates,’ Prime’s soft voice cut through the awkward silence. ‘At least our minds are saved as frozen snapshots when our Nodes are captured and unplugged. Theoretically we can be reawakened just by powering them up again. Which is fine, if by some miracle a captured Node has been liberated by the Community. But what if it’s powered up by some curious Double Eye lab technician, who spends the next dozen years trying to figure out how the damn thing works? Meanwhile you’re trapped in a Node with no offload option and no contact with the outside world, living life at a six hundred speedup.’

‘More than seven thousand subjective years in isolation?’ Kyle asked. ‘I’d delete myself.’

Prime shrugged. ‘The point is, no one wants to suffer any of these fates. Losing one’s body seems to be the lesser evil, by a big margin.’

‘Easy for you to say,’ Michael retorted. ‘You don’t have a body to go back to.’

The sound of ice crystals tinkling together caught everyone’s attention. Brian pursed his lips, white and blue marbled translucence flowing behind his transparent face. ‘When the

Astronautics Group came up with the idea of leaving our bodies behind to reduce their launch payload, it occurred to us that we could synthesize an array of Autonomous Nodes much faster than we can build a subterranean city, particularly when it became obvious we weren't able to meet the timetable outside events were imposing on us.'

'It's a horrific notion,' Michael insisted.

'Not that horrific, and it has tremendous advantages! Instead of supplying power, sewage, food and other biological needs for an entire city, we would only need to house and power our Autonomous Nodes. Space requirements within the facility would be reduced immensely, power demands even more so, and most importantly, the logistical bottlenecks alluded to earlier would be eliminated. The lead time can be reduced from weeks to days. We could host all of the Community's Nodes in Alaska. More, if need be. We have enough geothermal power to support millions.'

'Some people may go for that,' Marguerite acknowledged.

Michael frowned. 'The might, I suppose. If the alternative is total death, both here and in the Physical.'

'Some would consider banishment to the Physical a form of death. If you could only have one or the other, would you really choose a return to the limitations of your physical body? Your hearing reduced back to a mere ten octaves, your vision limited to a tiny fraction of the electromagnetic spectrum, your mind crippled—'

'I get the point!'

'If I may,' Brian held up one hand, hoping to forestall further argument. 'What we suggest is a compromise. We'll move forward with construction for those wishing to retreat with their physical bodies, while building facilities in parallel for those willing to transload directly. If Kyle's team can provide us with sufficient nano we can replicate enough Nodes to house the entire Community in eighteen to twenty days. By then we'll also have enough

facilities for twelve hundred physical beings. Supplies will still be difficult, but we should be able to provide basic heating and nutritional needs. People may have to forgo the level of medical they're used to early on, and do without most luxuries until the factories are operational, but basic survival will be possible.'

Michael stopped fiddling with his beard and placed his hands carefully on the table in front of him. 'Twelve hundred, out of thirty-nine thousand. A little over three per cent.'

'Worse than that. According to current demographic projections, the Community could have more than a hundred thousand Nodes by then. Biological persistence might become a highly sought after luxury.'

Sarah ran immaculate fingers through her grey streaked, light brown hair. 'We'll use some kind of lottery.'

'My team has dibs on the first forty-seven slots,' Brian said. 'The rest we leave to the Community, to do with as is seen fit.'

Sarah nodded. 'Thank you. And thank you for your time.'

Brian and his colleagues winked out of existence.

'Next we have the Undersea Contingency Project.'

Their approach was basically the same as the Alaskan Retreat, except the facilities would be built deep beneath the Pacific, powered by ocean currents, tides, or geothermal vents. The project was only in the early conceptual phase. Their spokesperson made some brief comments about the overall idea, alluded to a couple of arguments as to why they felt their approach more sustainable and less prone to discovery than the Alaskan option, then provided the group with a knowledge engram detailing their work thus far.

Another dozen contingency projects presented their work and provided knowledge engrams detailing their particular strategy for preserving the Autonomous Community. Marguerite was intrigued by the Bio-Insertion Group's efforts at designing an Autonomous

Node that could be inserted into the human body and powered by the body's own metabolism. Someone dubbed it the 'Body Snatcher's Scenario' and managed to elicit a few strained laughs. On the other hand, Michael found the idea of incorporating Nodes into everyday electrical appliances amusing. The idea was to create a stealth network that would allow a fully disembodied community to exist unnoticed, hidden in everything from cars to airline navigational systems to smart toasters. It was an appealing notion, but not very practical.

The Astronautics Group was represented by Mingmei Jiao, a petite Asian woman with long, straight black hair. 'Leading a group of rugged individualists designing a revolutionary spacecraft is almost as hard as juggling life in the Virtual with a day job at the Chinese Space Agency,' she joked. 'Although my copy in the Physical would have little patience for my complaints—from her perspective I'm pursuing my dreams while she spends her days struggling with a moribund government bureaucracy.' There was polite laughter and several knowing nods. Most people found multiplexing too difficult and settled for leaving their bodies in a comatose state while in the Virtual, but Mingmei wasn't the only one in the room who had chosen instead to live two lives, side-by-side.

She went on to explain how, now that they had revised their launch parameters to exclude the presence of the 'biological component', they were cautiously optimistic of the success of their project. The reduction in weight requirements made several previously rejected contingencies viable. Clusters of Nodes containing the frozen consciousness of the entire community could be fired off into space, along with nano-constructors, catalytic solution, and perhaps a superstring strummer. They could rendezvous with derelict satellites, the abandoned space station, or even asteroids in near earth space. If they chose their rendezvous target wisely, there would be enough material to construct the requisite number of Nodes, build solar arrays to power them, and resurrect the Community.

But first their escape craft would have to survive an ascent through the atmosphere.

And if anti-artillery lasers and surface-to-air missiles weren't enough to worry about, once clear of the atmosphere there was the even more formidable gauntlet of not one, but three independent anti-missile space defence systems. Punching through the American, Chinese, or Euro-Russian orbital grid might be possible, but evading the combined firepower of all three?

Mingmei offered everyone a knowledge engram. 'Without the anti-ballistic missile systems, getting a capsule into high earth orbit is doable,' she continued. 'Once there the sky's the limit. We'll have enough delta-V to reach and match orbit with pretty much any object in the solar system. But if they turn the space defence systems against us, we're screwed. In short, if the Community chooses to disincorporate, we can escape into space. *If* we can sneak out before the Community is discovered, and *if* our escape flight doesn't provoke one or more of the world's powers into activating their ABM systems. Otherwise I can only recommend this option as a last resort, one without much chance of success.'

Sarah nodded her thanks as group dissolved and the environ reformed itself.

'Anyone else on the agenda?' Sarah asked. Marguerite shook her head. 'Then let's open the floor to any other Interest Groups or Projects who would like to contribute.'

'Elise Stanton, representing the Communications Infrastructure Group,' Marguerite announced.

Elise shimmered into existence, tall and striking, red hair cascading almost to her waist. Her brown eyes held immense intelligence. Kyle wondered if she was trading speed for smarts, bogging down her Node by running a more complex mind and paying the price with a steep reduction in speedup. Some of the new architectural enhancements offered vast improvements in intelligence, but Autonomous Nodes had a finite computational capacity, and the load such improvements placed on them often made third generation hardware run slower than gen-two Nodes. Still, as each generation of hardware grew faster, such trade-offs became more enticing.

Elise smiled as Kyle and the others absorbed the knowledge engram she offered. ‘Thank you for taking the time to consider our proposal. What we offer isn’t so much a solution to the Survival Problem as it is a facilitator to those groups working on the issue. The horrendous slowdown experienced when this environ was so crowded earlier was, as we all know, not a result of computational limits of the Nodes themselves, but of communications bandwidth between Nodes.

‘We have designed a quantum signaling protocol which can increase the communications speed ten thousand fold. The protocol has been tested over modest distances, and although it requires a superconductive medium, it should scale easily to a global level. This performance boost would allow a crowd like the one earlier today to fully interact in a shared environ and still maintain a speedup of several hundred. What’s more, we believe that future refinements will allow an even higher level of performance.

‘We propose growing a worldwide network of superconductive cabling and quantum switches linking every Node in the Community. The quantity of nano-constructors and catalytic solution is admittedly significant, but we believe the benefits of improved performance and added security versus using a publicly visible and almost certainly monitored Internet to be worth the cost in time and material.’

‘The current protocols we use are encrypted using one time pads which are exchanged via a quantum signature,’ Michael interjected. ‘Our traffic may be visible on the Internet as noise, or even bandwidth load, but it is not subject to being cracked, by the authorities or anyone else.’

‘True, but a sophisticated traffic analysis could, theoretically, compromise the physical location of our Nodes.’

‘Perhaps, although the Stealth Project would certainly beg to differ,’ Michael argued. ‘How much catalytic solution and nano-constructor are we talking about for this project?’

Elise glanced down at her feet, then met Michael's gaze defiantly. 'Our simulations estimate a requirement of two hundred thousand metric tons of solution and seventeen tons of nano-constructor.'

'Good Lord.'

Marguerite leaned forward. 'And how much time?'

'Well, the main trunks linking the major continents and population centres could be constructed within a week. Branches linking each node to the main conduits would vary depending on distance and geography, but we should be able to have everyone wired within two months.'

The Strategy Group exchanged looks.

'Thank you,' Sarah smiled.

'That's all?' Elise sputtered. 'You aren't even going to discuss our proposal?'

'Two hundred thousand *tons* of catalytic solution?' Marguerite almost choked.

'Seventeen *tons* of nano-constructor? We'd have to scale back or scuttle nearly every other project in order to accommodate your requirements, projects that are critical to the survival of the Community over the next few weeks.'

'But—'

'Please,' Michael cut in. 'Your proposal has merit, and I wouldn't be surprised if several projects don't invite you to collaborate with them. The protocols alone will revolutionize several project designs, perhaps even make some options viable that otherwise would not be. It is a tremendous improvement over our existing networking capabilities.'

'We can eliminate the possibility of detection!'

'*One* possibility, perhaps. But as we saw today, the authorities have other ways of finding us. We can only manufacture so much catalytic solution and replicate so many nano-constructors in a day, and the other survival projects simply must take precedence. I'm sorry,

but we just don't have the resources your proposal requires.'

'That's just great!' Elise snorted. 'The Astronautics Group has just requested collaboration on their so-called escape pod designs. I suppose you've granted their material requests.'

'Their demands for catalytic solution have been modest, and they've been replicating their own nano from the beginning,' Sarah snapped.

'They may also end up being our last hope,' Michael added. 'A number of demographic trends suggest we may be forced to leave this world at some point. As such, their modest requirements are well worth the investment.'

Elise glared at Michael. 'I thought we'd gotten away from bureaucracy here. This is no different than submitting a proposal for a federal research grant, and the results are just as arbitrary and dismaying!'

Marguerite sighed. 'As someone who has been a part of more than one underfunded project, I can understand how you feel. However, don't forget that you have unfettered access to the Community's knowledge engram base and can synthesize your own catalytic solution and nano-constructors if you like. Unlike us, the fed doesn't give you the option of printing your own money when they turn you down.'

'Your design is elegant and the implications very exciting,' Kyle tried to smooth the woman's ruffled feathers. 'But the Strategy Group is right. We simply don't have the resources to do what you suggest. However, I know for a fact that the Alaskan Preserve Project and the Undersea Contingency Group will want to collaborate with you, and I imagine several others will as well. If you can refine and improve your design, so that lead times for installation are shortened and nano requirements reduced, I would definitely reconsider your proposal.'

Elise vanished without a word.

Kyle turned to the Strategy Group. ‘While we’ve been deliberating, a copy of myself has been conducting discussions with various impromptu groups and individuals who feel they have contributions to make.’

‘I thought you were refusing to duplicate yourself,’ Marguerite grinned.

‘This is different. I’m multiplexing, not copying. We’re syncing memory engrams every few microcircadians.’

‘A crude form of group consciousness?’ Prime leaned forward, golden eyes alert.

‘A group of two, both of them myself,’ Kyle grinned. ‘I doubt this approach is applicable to intermingling heterogeneous souls.’

Michael cleared his throat. ‘There are two hundred forty-seven Interest Groups and six thousand, four hundred ninety-two individuals in the queue, waiting to air their concerns. What’s your point?’

‘There is one person I’d like to bump to the front of the line. He’s identified a vulnerability none of us has considered.’ A thin figure appeared, dark brown eyes set within olive skin beneath shaggy, black, shoulder length hair. ‘May I present Achmed Rashad of Damascus, Syria. Achmed, the Strategy Group.’

Achmed smiled. ‘Fellow colleagues of the Community, I have spent nearly every waking second within the Virtual studying the plans and preparations being made for the coming attacks. Numerous contingencies are being laid for our escape and survival. But everyone seems to have dismissed out of hand an immediate and fatal vulnerability each and every Node shares today: our dependency on the public energy grid.

‘Of the thirty-eight thousand, nine hundred and eighty-five Nodes in the Community at this moment, only two hundred and seventeen have power sources that are completely independent of their local utilities, and most of those are in the Alaskan Enclave. The rest of us have, at best, a few hours of battery capacity in our UPSes. This sustains us perfectly fine

during power fluctuations, brownouts, and brief outages, but if power were ever interrupted for an extended period of time we would be forced to either offload back into the Physical, or enter an inert storage state until power is resumed.’

‘Shit!’ Michael was tugging his beard again. ‘He’s right. Rolling blackouts are one thing. Shutting down our electrical supply for good is something else altogether.’

‘Christ, the good news just keeps rolling in.’

‘We’ve been obscenely complacent, folks,’ Sarah shook her head. ‘No, let me rephrase that. We’ve been living in a chronic state of denial. It’s past time to wake up.’

‘You are used to stable electricity,’ Achmed smiled weakly, his eyes lowered. ‘I spent my childhood in Damascus during the Israeli-Palestinian conflict. Power loss was a basic fact of life.’

‘The authorities won’t do something as extreme as that,’ Marguerite protested. ‘Rolling blackouts already put the economy under strain. Power outages of the kind you’re describing would decimate it. People would take to the streets.’

‘Maybe, but the national guard will get there first,’ Michael muttered. ‘I doubt the authorities would hesitate to cut the power to a dozen cities, if they felt threatened enough.’

‘And they probably do.’ Sarah rubbed her eyes, a habit she had brought from the Physical.

‘Achmed has some unorthodox ideas on how to address this issue,’ Kyle assured everyone. ‘If Karl is agreeable, I’d like his team to work with Achmed in developing a self-contained power source, something we can retrofit our existing Nodes with or, at the very least, incorporate into the next generation design.’

‘Agreed,’ Sarah leaned back, eyes closed, delicate lines settling across her worried face. ‘This issue has to be a high priority. In the meantime, as many as are willing should begin preparing to transload to Nodes in the Alaskan Enclave.’

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26 - ୨ - SEPARATION

Man is the measure of all things, of the reality of those which are, and of the unreality of those which are not.

—Protagoras of Abdera, 5th Century B.C.E.

Wednesday, October 10, 2057

Metadate: 2.544-7:71:200 kD New Epoch

The Earth swam beneath Prime, white and blue brilliance turning slowly in a velvet black sky. Every corner of the heavens was crowded with gleaming stars, the Milky Way a dazzling smear of white and gold such as could never be seen from the ground.

‘What are you thinking about?’ Marguerite’s lips brushed Prime’s ear as she snuggled up against his back, her arms reaching around to caress his chest.

‘You. Your coming absence.’

Marguerite sighed. ‘Yeah. I have to offload pretty soon if I’m going to catch my flight.’

Prime sank back into her arms. ‘It’s past time you got away. The University isn’t safe. The Feds will be at your door in no time if they link to Strizak’s escape.’

‘Or if Nolen betrays me the way he did Kyle.’

Prime took Marguerite’s hand in his and pressed her palm gently against his lips. ‘He’ll never do that. He harbours too many tender feelings for you.’

‘So you keep telling me.’

Prime chuckled. ‘I should know. I’m a copy of the man.’

‘You’re nothing like him!’ Marguerite was surprised at her own vehemence. ‘You share a few old memories. That’s all!’

‘Nevertheless, I have a pretty good handle on how he thinks. I certainly have enough in common with him to know how he feels about you.’

‘Maybe.’ Marguerite shrugged. ‘But you’ve both changed, and Nolen not for the better. To tell the truth, though, I’m more worried about the latest arrests than Doctor Nolen or Viktor Strizak.’

‘You’ve done a pretty thorough job erasing any digital footprints.’

‘We’re nothing if not thorough, and living in an electronic medium six hundred times faster than our opponents has its advantages. But there are physical connections to worry about.’

‘Photographs, eye witnesses, family, friends . . .’

‘Exactly!’ Marguerite tightened her hold on Prime. ‘It’s the interrogations I worry about. Some of those arrested were too stubborn to edit their memories while offloaded. If any of them are pulled out of their comas and crack, we’ll all be at risk!’

‘Well, you’ll be on a plane before anything like that happens. Besides, Double Eye probably isn’t as efficient as we’ve all been led to believe.’ Prime tried to sound cheerful, but to Marguerite he seemed to be more intent on convincing himself than her.

‘Double Eye seems to be efficient enough. Their security has proved remarkably resistant to my team’s best efforts at cracking the encryption. Oh, we’ll get it, don’t worry! We’ve already mapped the pseudo random algorithm. By the time I get back to the Virtual my team will probably have identified the Rosetta.’

‘I’m not worried about your cracking skills, Marguerite. It’s what could happen to you

between here and Alaska that has me concerned. What if you get pulled over on the way to the airport? What if they arrest you at the gate? What if your plane goes down? You really need to leave a backup!

‘What, and have you fall in love with my copy, wiling away the circadians with her while I’m stuck on a flight to Anchorage? No way!’

‘Dammit!’ Prime threw his hands into the air. ‘You’d recombine back into one person again. Those memories would be your memories. I love *you*, Marguerite. What difference could it possibly make?’

‘All the difference in the world! I’ll be off-line for something like two hundred and twenty circadians. Two-thirds of a year! How much will our relationship have changed? How much will we have changed? What if my copy decides she doesn’t want to recombine? Which one of us are you going to choose? Me, or the woman you’ve spent the last two hundred circadians with? Besides, even if we did merge back together, I don’t want to inherit a collection of memories. I want the experiences first-hand!’

‘Marguerite, if anything were to happen to you—’

‘Nothing’s going to happen, Prime,’ Marguerite gently kissed the back of his neck. ‘Besides, I don’t think you’ll suffer too badly during my absence. When you’re not brainstorming with the Astronauts you’ll be busy designing new mental architectures or arguing politics with the Strategy Group. The time will fly by.’

‘For you, maybe,’ Prime replied. ‘Nine hours in aeroplanes and cars is one thing, two hectocircadians in the Virtual helplessly worrying about you is quite another.’

‘You think you’re going to have it bad? I’ll be lobotomised, reduced to a moron, diminished to a mere shadow of myself. I’m dreading this at least as much as you are.’

‘You won’t feel lobotomised. Just human again. And the time for me will be six hundred times longer.’

Marguerite sighed. 'It'll be hard on both of us, Prime. More than anything I wish you were coming along.'

'The lack of a body makes that difficult.'

'Maybe I shouldn't be so attached to mine. But it's still a part of me and I'm not ready to let go just yet. Why don't you try to think of this as an extended offload for maintenance? I promise I'll be back as quickly as is humanly possible.'

'Very funny!' Prime turned to face Marguerite, drawing her into a fierce embrace. 'I can't wait to celebrate your return.'

Marguerite ran her fingers along the curve of Prime's face, her eyes memorizing his angular features, his liquid, golden eyes. 'We'll be celebrating together, my beautiful lover.' She paused. 'Damn! My alarm just signaled. I've got to go.'

Prime planted light kisses on Marguerite's eyebrows, her nose, her cheeks, and finally her lips. 'I'll see you soon.'

Marguerite pressed him tightly against her. 'Why did it take us so many damn kilocircadians to finally get together?'

'Your stubbornness,' he said. 'I had to nag you for almost twenty subjective years before you'd take me seriously.'

'Now I remember,' she grinned. 'I had to see past the irritating façade you seem to think women find attractive. No wonder.' Suddenly she was kissing Prime, hard. 'I love you!' she smiled and was gone, offloaded.

'See you soon my love,' Prime whispered. For a time he simply floated, gazing out on the immensity of space, trying to quell the sadness that crept over him. *Nine hours*, he told himself. *Less than half a day. It's not her fault I'm living life six hundred times faster. And she'll be so much safer in Alaska.* However true the words, they left him empty, and the quiet sorrow within him persisted.

After a time he turned away from blue and white world beneath him and summoned up a three dimensional diagram of his mind. ‘Node, create an autonomous backup of myself, to be run only if I am damaged or if I give the explicit order.’

NODE> Be advised that, per the Community Charter, once activated this copy will enjoy all the rights and privileges of full membership in Community. This includes time-share rights to your body as defined by the Charter. Please confirm.

‘What body?’ Prime muttered.

NODE> Unable to execute command. The Community Charter requires explicit confirmation prior to duplication of any sapient mind.

‘I know, dammit! I helped write that section of the Charter.’ Prime cleared his throat. ‘Confirmed. Make the copy.’

NODE> Confirmation verified. Copy complete.

‘OK. Now, identify those aspects of my mental architecture previously tagged ’horny bastard.’”

A complex network of links and nodes in the diagram brightened to a red glow. These were the portions of his mind associated with sexual drive, taste, and orientation. They traced an elaborate, spaghetti-like network throughout his mind, touching on nearly every aspect of his consciousness in one way or another.

‘Overlay bypass architecture labeled ’celibacy.’”

Lavender links formed across the red, bypassing much of its complexity in a second, slightly less elaborate design.

‘OK, encapsulate ’horny bastard’ as an architectural engram for later reassimilation.’

NODE> Encapsulation complete.

‘Apply the architectural modifications entitled ’celibacy’ to my mind.’

With his libido excised, Prime immediately felt different. His thoughts had become

preternaturally clear, his personal aesthetic subtly changed.

The environ, while still quite beautiful, was not conducive to work. He pushed the sky away, wrapping himself in a bright, almost Spartan workshop of glass and steel. The Earth was still visible through a small window, but Prime paid it no attention. He summoned a three dimensional diagram of his latest project, a diamond-sapphire crystalline weave that he hoped would one day serve as construction material for everything from Node casings, to escape flier fuselages. Leaning closer, and able to concentrate as never before, he was soon lost in his work.



27 - ୫ - THE TIGHTENING NOOSE

Copyright lawyers are a peculiarly myopic breed of human being. There is something fundamental about coming to understand that current law may make it technically illegal to watch a movie and then imagine what it would have looked like if the studio had cast some other actor in the leading role, that renders one unfit for ordinary reflective thinking. Nonetheless, sometimes one can step back and perceive, in a dim sort of way, that one's tribe is doing something stupid. Realizing that doesn't get one very far. The institutional and legal structure of the copyright community makes it difficult to prevent foolish approaches to new technology.

—Jessica Litman, *Digital Copyright*, C.E. 2001

Wednesday, October 10, 2057, 11:25 AM Washington Time

Metadate: 2.549-7:94:000 kD New Epoch

'I thought we'd agreed I would have access to all of Double Eye's data regarding this case.' Katy stood behind Robert, hands on her hips. She hadn't liked headquartering their operation in Double Eye's Washington offices, but with FBI communications likely compromised, she hadn't been able to offer a credible alternative. She felt she had lost a not-so-subtle point in jurisdiction and authority. Now all requisitions and requests went through

Robert. It was his facility, his people, his data—and he appeared to be holding out on her.

Robert casually tossed his datapad aside and swivelled around to face her. ‘I did agree, and you’ve got your access. You’ve been fully vetted by International Intelligence, Katy. You have the same clearance to field data as I.’

‘Then do you care to explain this?’ Katy pointed her datapad at the wall. A large screen lit up, displaying an elaborate, three dimensional web of connections and relationships between known suspects and anyone acquainted with them. It folded back in upon itself, in a closed universe of recursive friendships that touched the larger world nowhere at all.

‘What the hell?’ Robert leaned forward. ‘Is this what I think it is?’

‘A comprehensive interpersonal relationship graph, aggregated from the data you’ve given me on every suspect related to the case. International Intelligence data. Data you assured me had not been tampered with or screened.’

Robert picked up his own datapad and tapped the screen several times. ‘Checksums validate. The information you have is complete and unaltered.’

‘Then Double Eye has a problem with its data acquisition.’

‘So it would seem. No wonder we’re making fewer arrests.’ Robert frowned and took a closer look at the graph. ‘This is absurd. We have seventy people in our sample base. They can’t all be this isolated!’

‘Even backwoods religious cults, survivalists, and hermits have more contact with mainstream society than this,’ Katy agreed.

‘Their grocers, utility companies, and so forth,’ Robert nodded. ‘You’re right, there’s a problem with our data.’

‘Double Eye needs to cast a wider net,’ Katy said. ‘Complete credit histories, not the trimmed down versions we have here. Genetic profiles and family histories, residence histories, the works.’

‘No one casts a wider net than we do.’ Robert sighed. ‘I’ll check with IG, but I can pretty much guarantee they’ll confirm the data.’

‘Make sure they cross-check it independently. The last thing we need is a low level data sifter covering up his mistakes and leaving us with incomplete data.’

‘Right!’ Robert flipped open his datapad. ‘Connect me with Intelligence Gathering.’ A pause. ‘Agent Scalli? Robert Leahy. Listen, I need the batch data you sent over triple checked and confirmed. We believe there’s a problem. I know. That’s right. Good. Notify me of the results ay-sap.’ Robert shut his datapad. ‘We’ll have confirmation within the hour.’

‘Good. I don’t believe for a moment our perps have somehow managed to break into every database throughout the world, edit their credit histories, purchasing histories, highway transponder records, and every other record government or business has ever kept on them just to cover their tracks.’

Robert stroked his chin thoughtfully. ‘I think it’s entirely possible that that’s exactly what’s happened.’

It was theoretically possible, but just barely. It would require superhuman effort, years if not decades of time, and inhuman perfection and attention to detail. One minor slip, and the deception would fall apart.

‘I don’t buy it.’ In fact, the more Katy thought about it, the more impossible it seemed.

Robert shrugged. ‘You keep telling me we’ve been underestimating these people from the start.’

‘Double Eye certainly underestimated their ability to go to ground after you raided those Universities. What did that get us? Another sixty-five suspects, after more than a thousand arrests?’

‘Yes, yes, you’ve belaboured that point to death!’ Robert’s mouth twisted with impatience. ‘We didn’t have a choice. These people have been trading in advanced black

market technologies without raising a single alarm. They've been thinking circles around us, probably for years. We needed to shake things up.'

'Shaking things up seems to be your answer any time this investigation hits a snag. It causes more problems than it solves. Besides, we both know conspiracy dynamics theory rules out any chance these people have been doing anything for more than a few months. They're clever—too clever for their own good—but they're not superhuman.'

'They were able to out-think our best agents!' Robert's voice took on a hard edge. 'They snatched Viktor Strizak out from under our noses with less than a day of planning! They appear to have broken into every public data store on the planet and erased all evidence of any connections they had with each other. This isn't something normal people are capable of doing!'

'I wish you'd stop obsessing about Strizak! It was a dramatic ploy that failed. Yes, it's disturbing to be outfoxed like that, but revisiting it doesn't do a thing to move our case forward. As for the idea our suspects have somehow edited every database everywhere in the world to cover their tracks, I think it's far more likely they edited a single copy of the data, right here at Double Eye.'

'My people are cross-checking it against primary sources right now.' Robert pointed to his datapad. 'This thing is set to squeal at me if so much as a single bit is out of place. So far, not a peep! Besides, our stuff is quantum-encrypted.'

'We're dealing with people deploying technologies significantly more advanced than our own,' Katy reminded him.

'I know that! It's still far more likely they did go around the world editing civilian databases than it is that they've broken through Double Eye encryption. We'd know the instant they intercepted, much less changed, a single byte of information. Our suspects are constrained by the laws of physics, after all.'

‘That cuts both ways, Robert—’

Robert’s datapad chirped. ‘Excuse me,’ he flipped it open. ‘Yes? Really? One hundred percent confidence? What about the sparseness of the . . . Oh. I see. Yes, thank you.’ Robert stared out of the window at the mud and algae of the Potomac River, glittering dark green in the midday sun as it sludged past.

‘Well?’

‘The integrity of our data checks out. The problem is with the primary sources. We’re having the credit bureau pull backups off their archives, but given how long they must have had to cover their tracks, it’s unlikely we’ll find anything we don’t already know.’

Katy sat down, stunned. ‘I didn’t think it was possible.’

‘So much for conspiracy dynamics.’

‘It doesn’t make sense, Robert! The time and resources required—’

‘They didn’t overlook a single thing, Katy. Not a thing! To do something this thorough, this complete—it’s inhuman. Superhuman.’

‘If they’re so smart, how come we noticed what they did? Why not plant fictitious links instead, leading us to innocent bystanders? They could have had us chasing false leads for weeks, months, even years. Instead, they folded the links back on themselves. That wasn’t very bright at all. Certainly not superhuman.’

‘I don’t know,’ Robert admitted. ‘Maybe they’ve had years. Maybe it was beyond their ability to create fictitious links. Maybe they only thought to erase the ones they had.’

‘All of those possibilities can mean only one thing,’ Katy replied. ‘They haven’t thought this all the way through. If they had, they would have had us out arresting all the wrong people.’

‘Instead we’re staring into an obvious brick wall.’

‘Right. They’ve tipped their hand. We know what they’ve done, even if we don’t

understand how they did it. We may be dealing with an unusually well organized group of malcontents, but a mistake like that makes it clear they aren't geniuses.'

'They *are* unnaturally competent, Katy.'

'In some areas, true, but not across the board. Still . . . none of this quite adds up, does it?'

'No,' Robert's frown deepened. 'We're missing something important.'

They sat in silence for a moment, listening to the quiet whir of the building's ventilation. Eventually Robert broke the silence. 'Maybe we're looking at it the wrong way. That anonymous tip in Champaign that netted us our first arrests was awfully convenient, wasn't it?'

'Yeah, it was. An insider, using us to remove an opponent?'

'Seems plausible. If our informant already knew we'd recovered other hardware from their enterprise, running the risk of uncovering one more such device might have been worthwhile. Particularly if they were managing our data to the point of isolating cells of patsies to take the fall.'

'Christ, Robert! We keep going back and forth on this. One day we're thinking revolutionary cells, the next we're back to well organized, centrally coordinated shadow organizations. Which is it?'

'Neither. Both. I don't know. Islands of coordinated cells . . . no, not islands. Supercells. I think we're dealing with a variation of the classic revolutionary cell, but scaled to include hundreds of members instead of just a few. Compartmentalized, just as isolated from other cells as their historical archetypes, but well organized internally, with a very effective command and control structure.'

'A conglomerate of independent groups?' Katy leaned forward, sketching interlocked circles on her datapad. 'Entire structured organizations interlinked with one another as

criminal cells. Clever.’ She paused. ‘If you’re right, it may very well go beyond one rival disposing of another. Those we arrested could comprise an entire political faction.’

‘Right! It’s possible we’ve cleared the way for our mystery informant to pursue his agenda unopposed. The arrests we made may have actually helped our opponents.’

‘By uniting them under one leader? Perhaps.’ Katy reached back and rubbed her aching neck. ‘It does appear someone’s played us like the proverbial fiddle.’

Robert’s leathery face hardened. ‘We need to find out who that informant was and squeeze him. *Hard.*’

Katy sighed. ‘I don’t think he matters much. Not in the larger picture anyway. If we capture him, we’ll only uncover another supercell. One out of how many? If we are serious about breaking the back of this organization, we need to take a different tack.’

‘Such as?’

‘These crystal cubes. In every case, we’ve made an arrest where the device has been tied into the home’s Internet port. Clearly they are in communication with one another.’

‘Obviously. We have our best crypto people trying to decipher the traffic.’

‘You’ve been coy with the results,’ Katy replied. ‘But let me guess. You’ve determined they’re using one-time pads which no amount of crypto-analysis will unravel. Probably burying the data with steganography too, hiding it in video streams and the like.’

Robert nodded. ‘We think they’re using one-time pads encoded with quantum entangled particles. Even if we do identify the data, there won’t be even a theoretical means of decoding it. And if we try, just intercepting data will be enough to tip off our suspects to the surveillance.’

‘The usual traffic analysis reveals no obvious origin or destination?’

‘Not even a hint. They’re broadcasting their packets through just about every network on the Internet.’

‘Have you tried Fourier transforms and wave analysis on the sample patterns?’

‘Yes,’ Robert admitted. ‘There are no identifying features to differentiate legitimate traffic from decoys. Short of searching every location of every system connected to the net there doesn’t seem to be a way to get a handle on where they are.’

‘That would be a little drastic,’ Katy replied. ‘Not to mention impossible. Have your people done a time based analysis?’

Robert shook his head. ‘I’ll see if I can get authorization for you to see the preliminary reports so you can check for yourself, but to answer your question, no, I don’t believe so.’

‘That would be good, considering we’re supposed to be equal partners in this little venture. What was that you said earlier? Something about my having equal clearance?’

‘For field data, yes. Our snooping techniques are a little more sensitive. I’m trying to get you cleared, but we both know how intransigent large bureaucracies can be. What exactly did you have in mind with a time based analysis?’

‘Our problem is identifying which traffic is communication between conspirators, and which is just mindless garbage. We have to do this without ever knowing the contents of the communications in question, where it originates or where it ends up. But we do know that for the communication to make sense to those using it, it has to be part of a larger conversation. That implies bi-directional information flow, in something close enough to real time to allow effective communication.’

‘Yes, but how do you propose to ferret that out of a flood of decoy signals?’

‘Think of the entire Internet as a big collection of closed containers connected to one another by elastic pipes, which expand and contract to accommodate whatever is flowing between them. We have no way of knowing whether water, hydrogen fuel, or morphine is flowing from one container to another, but we can measure exactly how much liquid is flowing between any given containers in any particular moment. Patterns of two-way data

flow will emerge over time, identifying critical paths and endpoints.’

‘You’ve done this sort thing before,’ Robert said. ‘Your work in capturing the FreeNet activists.’

Katy nodded. ‘FreeNet does roughly the same thing: share data anonymously between scattered nodes, all of it encrypted with military grade keys that would take our fastest computers centuries to decode. Tracking the information in the spatial domain can be next to impossible, but when analysed over time the location of the active nodes becomes obvious, even when the content does not.’

‘I’ll have the information forwarded to you immediately, along with access to our analysis utilities, if I have to go and bludgeon my superiors in person. I don’t suppose you’d consider a job with International Intelligence?’

Katy laughed. ‘Don’t go promising the world just yet. This problem is significantly more complex than the FreeNet issue. For one thing, we know nothing about the underlying protocols, nor have we identified the location of any end node with any certainty. We’ll have to begin by analysing suspected links in the chain, identifying likely candidates and ruling out unlikely ones, piecing together routes and data exchanges one hop at a time. This will be time consuming and uncertain, and will likely involve a lot of false starts before we get it right.’

‘It doesn’t matter,’ Robert grinned. ‘You’ve done more in one brainstorming session than our team of cryptologists have in the last week. In fact, this might be just be what we need to break the case wide open!’

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28 - ୩ - THE NATURE OF PROGRESS

Without wearing any mask we are conscious of, we have a special face for each friend.

—Oliver Wendell Holmes, 19th Century C.E.

Wednesday, October 10, 2057

Metadate: 2.565-3:15:000 kD New Epoch

The environ was forested with ancient pines, the air rich in mountain fragrances. Chilly gusts rustled the trees, reminding Prime of ocean surf. An occasional, more sustained wind created the brief illusion of a rumbling waterfall off in the distance. But there were no oceans in this world, no hidden cataracts of water pounding down glistening cliff faces, no clear lakes or tempestuous white-water rivers into which such cascades could foam. There were only the mountains, the trees, and an idealized, fictional airstrip slowly warming beneath a simulated mid-morning sun.

A couple of hundred guests had gathered to see the Astronautics Group present their new spacecraft design. The project enjoyed little Community-wide interest. Most people were focused on the enclave projects, waiting their turn and preparing to move themselves and their bodies into hiding. Few had any interest in the notion of leaving their bodies earthbound while launching software versions of themselves into the heavens. Never mind the success of the

computer simulations and wind tunnel tests, or the fact that construction of a real, physical prototype was well underway. To most, this was a blue-sky project, unworthy of even the modest resources allocated to it.

If the Astronautics Group was disappointed at the turnout, they hid it well, cheerfully explaining the inner workings of various subsystems to those who were interested. People milled about on the tarmac or gathered in small groups to discuss the project, while others peered intently at the curious vehicle. It was an unusual design, one part conventional rocket and one part high performance aircraft. To Prime it looked like something out of a space opera. The nose section was tear-shaped, its point forward and connected by three arched spines to the aft rocket. It lay on its belly, supported by two of the spines, each of which sprouted conventional swept wings. An equally conventional tail and vertical control surface jutted up from the third spine, while horizontal stabilizers grew forward, out of the nose cone.

‘You’re using helium as fuel?’ an incredulous voice asked. ‘That’s an inert gas. You can’t power a rocket with that!’

‘ATFE!’ Another shot back. *Absorb The Fine (knowledge) Engram.*

‘Let’s be nice to our guests,’ Mingmei smiled politely. ‘A knowledge engram is of course available, but I’m happy to explain. The motor is a brute force matter-antimatter rocket. Nine-tenths of a gram of anti-helium will be held in magnetic containment, released in a carefully modulated stream to recombine with helium just aft of the pusher-plate. Their combined masses will be converted to energy in a controlled process of mutual annihilation. Thrust will be generated both by the continuous shock waves of the explosions themselves and the expulsion of the resultant plasma via the nozzle.’

‘So you convert one tank of helium to anti-helium?’

‘Yes, using the superstring strummer. When we wish to shut the motor down, we convert the anti-helium back to helium. The motor can be stopped and restarted any number of

times using this technique.’

‘That’s an awful lot of antimatter to have in one place.’

‘That’s why this escape flier can go anywhere in the solar system.’

The simulated craft’s engines fired and it launched itself into the sky. The crowd floated alongside, unaffected observers immersed in a three dimensional movie. The clearing dropped away. A brief flash of fuzzy gray enveloped them as they passed through a thin layer of clouds. The flier levelled out at around ten thousand feet on an easterly heading, the landscape resolving itself into green rolling textures, veiled here and there by swaths of milky cloud.

‘A cluster of fifth generation Nodes in the nose section will house a complete copy of everyone in the Community. To keep our computational requirements reasonable, only the person piloting the escape craft will be awake; everyone else will be stored as a frozen snapshot. Just aft of the Nodes is a ‘Civilization Boot Kit’ consisting of enough self-replicating nano, catalyst, and molecular stock to rebuild the Community.’

‘If we can find enough raw material to rebuild it with,’ someone quipped.

‘A small asteroid should do,’ Prime retorted.

Mingmei shrugged. ‘Enough mass to build a tightly bound cluster of Nodes and a solar array large enough to power them is all we need to resurrect ourselves. The real problem is how to maintain some degree of ability to manipulate matter in the physical world. The weight-and-balance constraints of the escape fliers limit how much molecular stock and catalyst a single ship can carry. One ship can reconstruct the Community, but without a breakthrough in superstring strumming technology, or a generation of more efficient nano, this is likely to be a one way trip into the Virtual.’

‘What about maintenance on our Nodes? Micrometeorite impacts, that sort of thing.’

‘It is a problem,’ Mingmei admitted. ‘If we manage to get three or more ships to

rendezvous, we'll have enough catalyst and nano to construct a fusion reactor. If we target a large enough asteroid or moon, we can probably synthesize a self-reinforcing industrial base. But if not, we'll probably lose our ability to operate in the Physical.'

'Space is a dangerous place. Micrometeorites are just one hazard. There are solar storms, comets, complex orbital dynamics we may not have accounted for . . . it boils down to this: eventually our equipment will be damaged or wear out, and we need to be able to repair it. We can't do that if we lose our capacity to manipulate matter.' Prime rubbed his forehead. 'It's one thing to leave our bodies behind. But having no ability to effect any change in the physical world? That's a recipe for certain death. Not just for us personally, but for the entire Community.'

Mingmei sighed. 'We won't be able to repair our Nodes, or build new ones, that's true. However, our best projections put the likelihood of a significant failure somewhere between six and eight hundred years after deployment. Of course, if we're unlucky it could be sooner, but then again, with a little good fortune it might be much later.'

'That's 360,000 to 480,000 subjective years at our current speedup.'

'Yes,' Mingmei agreed. 'And it could be as much as 900,000 years, if fourth and fifth generation Nodes live up to Karl's promises. Subjectively, that's longer than modern humans have walked the Earth.'

'It's still an evolutionary dead end. We die. The Community dies.'

'In six or eight centuries! If we stay, the Community will die right here on Earth, when the authorities find us and shut us down. Probably within a few months.'

'If they find us,' Prime countered. 'But you have a point. A few centuries is better than a few months. Better still would be to avoid both fates and come up with a solution that doesn't condemn us to eventual extinction.'

'As I said, if enough ships escape, none of this will be a problem.'

Following the ridges of a mountain range, the spacecraft powered through some cumulus.

‘Anyway, back to the subject at hand.’ Mingmei gestured toward the craft as it torqued through several tight spirals and reversed direction in a classic Immelman manoeuvre. There were several whoops from the crowd.

‘Hot damn!’ someone exclaimed. ‘This is better than a roller coaster!’

Applause and laughter greeted another set of dizzying manoeuvres. ‘As you can see, the escape flier will behave like a rocket powered aircraft at lower altitudes. This will allow either a horizontal or vertical take-off and high manoeuvrability using well proved aerodynamic properties up to about seventy thousand feet.’ Coming out of a rolling loop, the flier pointed its nose toward the sky.

‘Once above seventy thousand feet the air grows too thin for conventional flight. All lift will be derived from the rocket’s thrust, though the control surfaces will provide some minimal manoeuvrability for another twenty thousand feet or so. Hopefully the lower manoeuvrability at these altitudes will be offset by the fact that most surface-to-air rockets aren’t designed to shoot down aircraft at those altitudes.’

The sky darkened as the simulated craft continued to rise atop a golden flame.

‘So, if they don’t turn on the anti-ballistic missile systems we’ll be safe.’

‘Yes,’ Mingmei replied.

‘We can’t rely on that.’ Prime positioned himself in the simulated exhaust, yellow and white flame licking around him as he squinted into the matter-antimatter recombination chamber. ‘The likeliest scenario has us making a desperate run for it, right through the defence systems of half a dozen countries, all trying to shoot us down at the behest of the World Trade Organization.’

Mingmei frowned. ‘In that case, we’ll be most vulnerable above one hundred thousand

feet. At that altitude we'll only be able to manoeuvre with the main matter-anti-matter rocket and lateral thrusters. We'll be wanting to use most of our delta-v to boost ourselves into the necessary orbits for rendezvous with our assigned targets.'

'The moon, Mars, various Jovian moons, and assorted asteroids,' Prime commented.

Mingmei nodded. 'Without interference we have enough fuel to match orbit with any object in the solar system, but if we're forced to use our energy reserves dodging pot shots from the world's great powers, we could find ourselves without enough thrust to reach a viable target. If that happens, we won't have enough raw materials to rebuild a single Node. The Community will perish and the flier become nothing more than a derelict in space.'

Prime shook his head. 'There are three independent anti-ballistic missile systems in orbit. The American System is aging, but the Euro-Russian and the Chinese Systems are top-notch, state of the art. If the three powers act in concert, they'll lock the planet down tight. We'll be lucky if any of our ships make it through the tropopause.'

Mingmei ran her fingers through her long, straight hair. 'We intend to launch twenty or so copies of the Community for redundancy anyway. If it comes down to running a blockade, we'll have to overwhelm them with numbers. We build as many ships as we can and launch them all at one. Perhaps as many as a hundred thousand.'

'If we have time to construct that many.'

'Well, hopefully we won't lose the initiative on the timing. With a little luck and planning, a handful of ships should be able to make it through the military grids. Most of the satellites won't be able to hit anything above five hundred thousand feet—they are, after all, designed to take out missiles shot from the surface of the earth, aimed at other points on the surface of earth.'

'It might be a Pyrrhic victory,' Prime said. 'The World Trade Organization could get the resources together for a destructive strike deeper into space. And if we lose the ability to

operate in the Physical, we'll be sitting ducks.'

'I doubt they'll be that motivated.'

'I'm not so sure,' Prime replied. 'It will be better if we come up with a plan that doesn't include them knowing we've escaped.'

'If we can sneak away, we will,' Mingmei insisted. 'But if not, we'll have to make do. I mean, I can see them deploying existing assets to blow a few patent violators they've labelled potential enemies out of the sky, but I can't imagine they would make the capital investment required to—'

'This isn't about a few patent violations, Mingmei! It's about power . . . and fear. They're terrified of us! Of what we can do. We know more than they do, we can do more than they can, and from their point of view, we could overthrow them in a heartbeat!' Prime paused. 'Have you ever wondered *why* the authorities are so enamoured with the patent system? They're not complete idiots, you know. They've known for generations how patents stifle innovation. They understand better than anyone that a twenty-year monopoly on an invention chokes off any future developments that would build upon it. They're perfectly aware that if you tie up enough building blocks, you make inventing anything new next to impossible. That's the whole point! They don't *want* technology moving forward too fast. If it does, someone clever enough might just come to know too much, and drive them from power!'

'You're preaching to the choir, Prime.'

'Well, then, why on Earth do you think they won't come after us?'

'Because they don't have the money or resources to do so! Even if they wanted to, the billions it would cost to rebuild their deep-space launch capabilities and reach us would cripple their economies.'

'We can't count on that! If they decide to nationalize a few key patents like they did

with the Wright Brother's patent on aeroplanes during World War I, they could open up the field to unfettered competition and completely revitalize their space programs. Such a ploy would probably boost their economies, not cripple them. Hell, it could even pull the world out of the recession it's been in the last thirty years. In any event, the developed world could regain its deep-space launch capabilities in just a few years, at which point there would be nothing to keep them from sending up a nuke or two to vaporize us. Whatever they choose to do, if we've lost the ability to manipulate the physical world, we won't be able to do a thing about it.' Prime shook his head. 'No, we have to make a clean exit or we'll be looking over our shoulders forever.'

Mingmei shrugged. 'We both agree that sneaking away is our best option.'

'It's our only—'

'I thought I'd find you here,' a voice teased, 'plotting the future with the Astronauts.' A familiar woman appeared, wrapped in a lavish silver aura and grinning impishly.

'Marguerite!' Prime swooped over and took her into his arms, kissing her lightly on the lips.

'I'll catch up with you guys later,' Mingmei grinned and the group drifted away. The Earth glistened in the sunlight beneath them as the spacecraft continued its climb.

'You're a sight for sore eyes!' Prime ran his hand gently down Marguerite's cheek. 'How's Alaska?'

'The sanctuary's great! Getting there, on the other hand, is a nightmare of travel checkpoints and searches. The airports are on heightened security. They're blaming it on Thai insurgents, but it probably has more to do with us than south-east Asia.' She stopped and gave Prime a mock glare. 'By the way, in case you haven't noticed, I've been off-line for two hundred thirty-four circadians and you still haven't given me a proper kiss.'

'Hmm. I think we need a little privacy.'

‘My home environ?’ Marguerite asked. Prime nodded assent. The dark of space was replaced by a bedroom made cosy with the golden light of numerous candles.

‘I suppose this is what I get for cutting out all of my reproductive instincts,’ Prime grinned sheepishly. ‘After two hundred circadians my instinctive reactions are all wrong.’ He took Marguerite back into his arms, his lips joining hers in a lingering kiss.

She pushed him gently away. ‘Prime, your technique is impeccable, but I’ve had my hand shaken with more passion.’ Marguerite sat down on the bed with a heavy sigh. ‘I’ve had a long, miserable flight, followed by an even longer, more miserable drive. My physical body may be resting comfortably in one of the sanctuary sarcophagi, but my virtual self feels tired and irritable. How about giving me a back rub?’

‘Sure.’ Prime climbed onto the bed and manoeuvred himself behind her. His strong fingers began to gently knead her shoulders.

‘So much has happened while you were away! I don’t know where to begin. More arrests and more nodes seized, in half a dozen countries around the world. More resources are being poured into creating the sanctuaries, but I’m worried it’s only a matter of time before at least some of them are discovered. There is a growing consensus among some of us that the Astronauts are right: escape into space may become our only option. Kyle has diverted a shipment of nano for the construction of a prototype, so we will hopefully be able to get a few low altitude test flights in before it really hits the fan, but—’

‘Prime!’ Marguerite interrupted. ‘Stop talking shop. This is *me*. We’re together again, after nine torturous hours for me and a third of a year for you. Shut up, rub my back, and seduce me!’

Prime stopped. ‘Marguerite,’ he said.

‘Keep doing what you were doing, Prime,’ Marguerite said. Then, after a moment of awkward silence, ‘What’s the matter, Prime?’

‘I want to renew our relationship as much as you do. But neither of us needs this . . .’

Prime’s gesture included the entire room ‘. . . distraction.’

‘*Distraction?*’ Marguerite looked as though she’d been slapped.

‘Our primal instincts. Our lusts. How many decicircadians have we wasted in simulated copulation when we could have been pursuing our intellectual interests, or more importantly, forming plans for the survival of the Community?’

‘Wasted?’ Marguerite’s voice rose an octave. ‘Wasted? What exactly are you saying? That you consider making love to me a waste of your *precious time*?’

An intricate diagram blossomed in the air in front of them, glowing layers of translucent cotton-candy in complex weave of blues, lavenders, and reds. ‘This is the architectural modification I made when you left. Ever since I removed the more primal reproductive instincts from my mental architecture I’ve been able to think more clearly, and be more focused, than ever before.’

‘You still haven’t reintegrated your sex drive? I’ve been back ten millicircadians and you’re still running in celibacy mode? What the hell’s the matter with you?’

‘Nothing! I just don’t want to cloud up my mind by reverting to my old instincts. Try the modifications, Marguerite. You’ll be amazed at how much more efficient you’ll be.’

‘*Efficient?* I love you, Prime. I thought you loved me. How can you just strip all that away in the name of *efficiency*?’

‘I haven’t stripped away my love for you.’ Prime spread his hands. ‘I’ve only deleted my physical drives, which serve no purpose in this domain anyway. You knew I was going to do this. We talked about it before you left.’

‘You were supposed to restore yourself! The change was supposed to be temporary, to make my absence a little more bearable.’

Prime nodded. ‘I never dreamed I would be able to accomplish so much without those

distractions. Do you realize fully twelve percent of my mental processes concerned themselves with sex, even when I was concentrating on other tasks? Fantasizing. Thinking of you, particularly in the physical sense?’

‘Thinking about your partner is part of what being in love is about. I do the same thing!’

‘I love you, Marguerite. I love you very much. I cherish your personality, your passion for life, your intellect. Set yourself free from the Physical! Let your mind reach new heights!’

‘Sex is a part of who and what we are, Prime. I’m not willing to throw it away, no matter how much more *efficient* it’ll make me.’

Prime sighed. ‘I’ve been waiting so long for you to come back. I’ve wanted to share this new state of being with you for so long. There is so much we can do, so much we can become—’

‘I want you back!’ Marguerite shouted. ‘I want the man I fell in love with. Not this ... this abstracted being you’ve become. I want you! *How dare you change on me like this!*’

‘I haven’t changed, Marguerite! Not really.’

‘You’re a fucking eunuch, Prime!’

‘No, I’m not! Come on, sex isn’t particularly important here. We’re software! Electronic patterns in a buffered molecular array, computed in an optical matrix and linked to one another across an aging Internet. Of what use are those old, redundant instincts, now that we live outside our physical bodies?’

‘Of what use?’ Marguerite’s face hardened. ‘Three hundred circadians ago you wouldn’t have had to ask such a question!’

‘I didn’t know then what I know now,’ Prime replied softly. ‘We need our minds clear if we’re going to survive, Marguerite. We can’t afford these distractions.’

‘Stop calling our love a fucking *distraction*.’ Marguerite choked back tears. Her voice

shook. 'I should have left a copy. At least then our relationship could have grown and flourished. Even if it ended, I would have inherited the memories.'

'Our relationship can still grow! My feelings for you haven't changed.'

'Yes they have!' Marguerite's voice was tight with anger. 'Your desire for me is gone! You've edited it away!'

'My desire for you is as intense as it's ever been,' Prime insisted gently. 'It just isn't defined by sexual pressures any more. The expression has changed, that's all. Try the modification and you'll understand.'

'No, Prime. I won't lose that part of me. Not even for you.'

'Is the Physical so important to you?'

'This isn't about the Physical, you idiot! It's about who we are! You can't just flick your sex drive away away like so much mental lint. It's a part of us, it helps define who we love, and how. I don't want to lose you! Change yourself back!'

Prime stood. 'Marguerite—' he began.

'You know what, Prime. Forget it. I'm not going to beg for you to behave like a man. Obviously I've misjudged this relationship from the start. Just get the fuck out of here, will you?'

'Marguerite—'

'Which part of 'get the fuck out' didn't you understand? Get out! Get out, get out get out you goddamn piece of inhuman shit! Get out!'

She severed access to her environ so suddenly it felt like a physical slap. Prime recoiled in shock as the golden light of her bedroom vanished and, like a poorly spliced film, the Spartan furnishings of his own synthetic world jerked into existence around him. He stood alone, staring blankly at a featureless wall, too stunned to think.

He shook himself. 'This is ridiculous. Node, run the unmodified backup copy. Instruct

him to go to Marguerite and comfort her.’

His copy appeared next to him. ‘What the hell’s going on, Prime?’

‘What are you doing here? You’re supposed to be with Marguerite.’

‘That’s kind of hard to do when she’s locked me out of her environ and won’t answer any requests for communication. You want me to make things right with her? Then why the hell haven’t you provided me with a memory engram to bring me up to speed? What the fuck did you do?’

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29 - ୨ – WHAT PRICE SUCCESS?

We live between two worlds; we soar in the atmosphere; we creep upon the soil; we have the aspirations of creators and the propensities of quadrupeds. There can be but one explanation of this fact. We are passing from the animal into a higher form, and the drama of this planet is in its second act.

—Winwood Reade, C.E. 1872

Friday, October 12, 2057, 7:00 AM Australian Time

Thursday, October 11, 2057, 11:00 AM Chicago Time

Metadate: 2.574-5:23:264 kD New Epoch

Beta Flier Version 0.8 rolled out of a makeshift hanger on three small wheels, its two metre wingspan of woven sapphire-diamond composite glistening in the early morning sun. Prime₁ was impressed with the design, and astounded with the speed with which the Astronautics group had managed to develop, simulate, and partially test the prototype. *Even after thirty-six years in the Virtual I still find myself amazed at how quickly we can do things. I guess life's early impressions leave their mark.* Then he grinned, silently chiding himself. He had never really lived in the Physical, whatever his memories might tell him. His entire experiences in that world amounted to only a few excursions in a body borrowed from his despised nemesis, Doctor Nolen—from whom, now that he thought about it, no one had heard

in a very long time. *Well, I suppose that shouldn't be too surprising, with almost ninety percent of the Community filtering him out.*

‘We’re ready to launch.’ Mingmei projected her voice throughout the environ. ‘As most of you know, this environ is an exact, real-time replication of events that are transpiring in the Physical. Many of you have chosen to experience the next seven and a half hours at traditional, biological subjective rates, while others are perhaps absorbing the entire flight in a single burst of compressed environ data at the conclusion of the test. Those of us actively working on the test are not so lucky. We’ll be spending the next several hectocadians monitoring and analysing the flight telemetry in minute detail, adjusting system parameters as needed to ensure a successful flight.’

The small aircraft—a human child curled into foetal position would barely fit inside—taxied toward the departure end of the runway. ‘It’s a beautiful ship,’ someone commented.

‘Thank you,’ Mingmei smiled. ‘I’m told our pilot, Carlos Alvarez, has transloaded aboard and is ready for departure. I am turning the audio feed over to him.’

‘Good morning,’ Carlos spoke with a gravelly voice and a pronounced Spanish accent. ‘Pre-flight checklists are nearly complete. This flight will be a low altitude, north to south orbit of the earth, lasting seven hours and thirty-five minutes. By low altitude I mean approximately one hundred metres above the ground. The Astronautics Group has chosen a course that will insure that the vast majority of the flight is made over open water and that the entire flight avoids populated areas altogether. This should minimize the possibility of detection, as well as ensure the safety of the public in the unlikely event that the flier experiences serious problems and I am forced to ditch. Any questions, requests for knowledge or memory engrams, should be directed toward Mingmei.’

The flier pulled away from the hangar, rolling smoothly down the taxiway and coming to a stop just short of the runway threshold.

‘Pre-flight complete; looks like everything checks out nicely.’

‘Rock and Roll!’ someone shouted. ‘Let’s get this baby airborne!’

‘Matter/Antimatter combustion engaged. Systems nominal. Annihilation at ten-to-the-fifth atoms per second and climbing.’ A flicker of light illuminated the exhaust.

‘Beta Flier taking runway zero seven for departure,’ Carlos continued. ‘Departure Northwest bound.’ White hot plasma shot out of the exhaust and the flier roared down the runway. When it rotated and lifted off, the searing flame scorched the asphalt, melting a portion of the runway.

‘Oops,’ Prime₁ shook his head.

‘Don’t worry,’ Mingmei grinned. ‘We’ll have nano fixing the runway before anyone arrives. Besides, we won’t be coming back here. The prototype will be using its manoeuvring thrusters to make a controlled, vertical landing several hundred miles to the west.’

‘That makes sense,’ Prime₁ nodded approvingly.

‘It’s a good opportunity to test some of the more complex rendezvous manoeuvres. If the flier can land itself in a 9.8 metres per second squared gravitational field, we should have no problem matching velocities with any of our targets in space. Assuming this flight goes well, we’ll start manufacturing additional fliers immediately and sneak out in the shadow of next week’s ESA satellite launch.’

‘Matter/Antimatter combustion holding steady at ten-to-the-seventh atoms per second.’ Carlos reported. ‘The ship is a pleasure to handle! Climb rate is one hundred metres per second. This thing really wants to fly, the temptation to point it at the stars and just go is unbelievable! I’m level at one hundred and twenty metres AGL. Approaching Mach 0.9. Throttling back to maintain subsonic speeds until I reach the coast.’

The ship was a white hot speck of light in the shimmering morning air, vanishing in the haze near the horizon. Several people hooted as the ground around them folded in on itself,

forming a roughly circular island which tore itself away from the earth and sped through the sky to catch up with the departing ship. Within moments they were flying in formation, pacing the flier just off the right wing.

‘This is a real time view from one of a number of small probes we have following the craft,’ Mingmei explained. ‘We will be verifying the accuracy of the data we’re collecting from numerous, different perspectives.’

‘I had no idea so much of Australia was desert,’ Prime₁ gazed at the expanse of desolate land speeding by beneath them.

Michael Forest shimmered into existence. ‘Fortunately the desert here isn’t spreading the way the American one is. It also had the advantage of not being watched as closely by the authorities.’

Prime₁ shook Michael’s hand. ‘I’m glad you made it.’

‘I’m sorry I missed the launch. I was tied up in an administrative meeting with the Strategy Group. Kyle is handling some logistical issues with Catalytic Solution shipments and deployment of his second generation nano. He should be here shortly.’

‘Thank you for coming,’ Mingmei said. ‘Your presence means a lot to us, even if it’s in an unofficial capacity.’

Michael smiled. ‘Your work here is very important to all of us. The Strategy Group’s projections are increasingly pessimistic in terms of our sustainability on Earth given the current political climate. As you may already know, we’ve lost over two hundred and seventy colleagues in just the last twenty-four hours. Thirty are conscious, trapped in their physical bodies and in police custody. The others are trapped in their nodes, off-line and cut off from the rest of the Net. Some of the information Marguerite has been ferreting out of the FBI and Intelligence networks with respect to their treatment of prisoners is shocking, to say the least.’

Mingmei cursed. ‘I wish we could work faster, but the earliest we can possibly get off-

planet is early next week.’

‘Don’t blame yourself,’ Michael said. ‘You’ve managed to do an inhuman amount in an insanely short time frame, and other projects are coming along nicely as well. The Alaskan refuge is working out better than expected. The Atlanteans are perhaps the most ambitious. They’re well on their way to building an entire cluster of Nodes at the bottom of the Pacific Ocean, powered by tidal motion. There’s even talk of colonizing the earth’s mantle and using the planet’s heat directly as a power source. Not much of an outward-looking future there, but we’d survive.’

‘After a fashion, perhaps.’ Prime₁ shrugged. ‘If all goes well here, we should have enough ships for an effective escape in time to use the ESA launch as cover.’

‘We may not have that luxury.’

‘What do you mean, Michael?’

‘Next week may be too late. Things are deteriorating rapidly in the Physical, and powerful interests are gunning for our annihilation.’

‘Isn’t that a little melodramatic?’ Mingmei asked. ‘It’s true we face arrest and a terrible castration of our minds, but extermination? I find that unlikely.’

Michael shook his head. ‘You should see some of the interrogation videos Marguerite has ferreted out of the FBI’s confidential databases. Download some of her knowledge engrams. Most of those arrested were lucky enough to be in the Virtual when the neural links between their bodies and their Nodes were severed. The authorities can’t do much to them. Their minds are safely preserved on their captured Nodes, and their bodies comatose. But those who were unlucky enough to be in the Physical when they were arrested . . .’ Michael shuddered. ‘Trust me, you really don’t want to be conscious when in federal custody.’

‘He’s right, Mingmei. They don’t seem overly concerned with inflicting permanent physical damage during the interrogations, or interested in keeping anyone alive afterwards.’

‘You’ve absorbed an engram, Prime₁?’

‘Let’s just say that I’m very glad I don’t have a physical body. Death may come to me, but if it does, it will be quick and painless.’

‘I’m over the shoreline,’ Carlos announced. Prime₁ glanced down as sunlit water flashed by at a dizzying speed, then back at the receding shore. ‘Increasing to cruise speed. Passing Mach one. Matter/Antimatter annihilation steady at three point five times ten-to-the-seventh atoms per second. Accelerating through Mach two.’

‘We can’t just leave our colleagues in the hands of those barbarians,’ Mingmei said vehemently. ‘There’s got to be something we can do.’

‘I hope so,’ Michael replied. ‘We’re working on several rescue strategies. Let’s just hope we’re given time to make the attempt.’

‘Cruise speed of Mach four point five has been achieved. The ship is handling magnificently.’

Kyle appeared in their midst. ‘Oh damn, I missed the launch. Can someone spare a memory engram?’

‘You’ve got plenty of time to enjoy the flight,’ Michael said. ‘Another seven hours and twenty-two minutes by my watch.’

‘Still, a memory of the launch would be nice.’

‘You would think with forth generation speedups in excess of a thousand people wouldn’t be late to events like these,’ Prime₁ grinned, offering a key-address to his own memories of the event.

‘Ha!’ Kyle smiled his thanks, assimilating Prime₁’s memory. ‘The more time we create for ourselves, the longer the meetings. I just got done refereeing a fight between the leaders of seven different projects, all wanting second gen nano and catalytic solution today. They insisted on running in a shared environ, and demonstrating in full sensory detail why their

particular projects should be at the front of the queue. I was operating at speeds reminiscent of first generation Nodes, if that. Ugh!’

‘Any resolution?’ Michael asked.

‘Yeah. I forwarded full knowledge engrams on how to construct their own second generation nano-constructors from scratch, and how to synthesize the necessary catalytic solution. I told them they were free to create their own constructors immediately, but that if they wanted disbursements from the Community stores they would have to wait their turn like everyone else. Who would have thought something so easy to copy would become such a bottleneck for so many people?’

‘They really can’t complain,’ Mingmei said. ‘The shipping schedules you and the Strategy Group have laid down are very fair, all things considered.’

Kyle shrugged. ‘Times are tense. To people who think they have the One True Answer on how to save the Community fairness doesn’t really come into it. They were pretty angry, although I think I managed to cool things down a little by sticking around and giving them pointers on how to go about building their own, small scale construction facilities.’

‘The irony is, there’s the distinct possibility one or more of them may have the One True Answer,’ Michael said.

‘There isn’t any such thing,’ Kyle said firmly. ‘Our survival will ultimately depend on numerous, unrelated projects coming together when the shit hits the fan and conditions demand it. Either we will cooperate and survive, or we won’t. Likely it will be some combination of efforts we haven’t even foreseen that gets us out of this mess.’

‘Very true,’ Mingmei smiled. ‘With today’s flight, we expect to have any extra-terrestrial contingencies covered.’

‘Which adds another important tool in our chest of options when crunch time comes,’ Kyle agreed. ‘And we need all the options we can get. Hell, whatever our final strategy, this

project is far more likely to be a part of it than any of the proposals those clowns had.'

Michael laughed. 'Some of the approaches are a little more far fetched than others, that's for sure.'

'Far fetched is one thing,' Kyle said. 'Escaping into outer space, through a gauntlet of multi-national satellites armed to shoot down missiles, is far fetched. Sneaking out in the shadow of a scheduled satellite launch only slightly less so. And dropping a copy of the community into the earth's core with nothing but a Buckey-ball composite shell for protection and no way out if things go wrong is truly far fetched indeed, perhaps even desperate. But you should hear some of the crap they're proposing! Encoding the entire Community into the genetic material of common plants, and then conducting computations at speeds that would turn gigadieci into microcircadians? Communications through the exchange of *plant pollen*? That's not desperate, it's asinine! Even if it works, the sun will grow old and expand to envelop the Earth and wipe everything out before ten subjective days have passed. A single dekacircadian! What kind of long term planning is that?'

'The kind desperate minds engage in when they think all the other options are untenable,' Mingmei replied. 'Who wouldn't seek to stave off an inevitable death just one more circadian, if they could.'

'Phooey!' Kyle grunted. 'If I have to listen to one more micro of that kind of nonsense I'll lose my mind!'

As the flight continued northward over the South Pacific a table offering refreshments formed. No mood altering substances were available, but for those present in traditional, physical form the appetizers and snacks were numerous and delicious.

Prime₁ and Kyle departed the flying island, choosing instead to approach the manoeuvring ship and examine it up close. An unspoken command, and—for their eyes only—the outer hull stripped itself away, showing a cross section of the craft's internal systems.

Kyle frowned. 'That is an awful lot of antimatter in the chamber.'

Prime₁ nodded. 'The test includes enough fuel for our most ambitious launch target.'

'Helium,' Kyle mused. 'An inert gas. They've eliminated any chance for chemical combustion, relying solely on the mutual annihilation of matter and antimatter for their energy. Clever.'

'It really is impressive what they've accomplished,' Prime₁ agreed.

'Yeah. That hull alone could revolutionize material engineering in a hundred ways.'

The day wore on as the prototype continued to race northward. Eventually the sun began to sink toward the southern horizon. The water below turned dark and choppy. The sky began to cloud over, until it formed a low, misty overcast. Bright daytime colours of blue faded to icy tones of grey and slate. As dusk settled in, most people adjusted their visual parameters to include the infra-red spectrum. Their world took on a rich palette of nameless colours redder than red.

'Visibility is at less than two hundred metres,' Carlos announced. Even with enhanced vision, no one could see much of anything.

'We are approximately one hundred and fifty kilometres south of the Bering Strait,' Mingmei's informed them. 'As you all know, it's late autumn in the northern hemisphere. Much of the Arctic region we will be navigating has already entered the winter dark of night. This is in some ways the most precarious part of the journey, because of the difficulty of navigating so low to the ground in darkness, and because of the degree to which the Euro-Russian Alliance and the United States monitor the region. Our sensor systems are the best possible, given the unavoidable design constraint that they must be entirely passive, relying on what little natural light and radiation can be collected, gravitational perturbations, and the like.' As she spoke the surrounding world went from dusk gray to pitch black.

'We have sunset,' Carlos reported. 'Night vision systems operating within design

parameters.’

‘We have provided an address-key to sensory modifications that will allow you to view the surrounding environment in the same way Carlos is,’ Mingmei announced. Kyle and Prime₁ accessed the addressed object, verified the design parameters and software instructions, and applied them to their own virtual senses. Their eyes opened to the entire electromagnetic spectrum. Gamma rays a fraction of a millimetre long mixed with kilometre-long radio waves to illuminate the darkness in a vast palette of sensual colours for which there were no names.

‘Well,’ Prime₁ commented. ‘At least it isn’t pitch dark.’

‘No, but sunlight it ain’t,’ Kyle replied. ‘I wouldn’t want to be the one flying an aircraft at Mach four so close to the ground.’

As if on cue the visibility abruptly dropped to almost zero. Ice and snow swirled around them. ‘Lets go back to the island.’

A moment later they stood among their colleagues, watching the dark, fuzzy grey-blue world race by, lit by a great white torch coming out of the back of the flier.

Michael joined them. ‘Very impressive,’ he said. ‘In the visible spectrum the pilot is navigating through a solid blizzard in zero-zero conditions. They’re using subtle interference patterns from the radio communications of the very militaries we’re hiding from to navigate.’

Kyle laughed. ‘Glad to see our military is useful for something besides murdering Thai farmers.’

‘Can’t have those uppity third world types defying our patent laws,’ Prime₁ shook his head with disgust. ‘Generic drugs for their populations threaten the quarterly profits of too many pharmaceutical companies.’

‘Intellectual property is essential to our service based economy,’ Kyle said in perfect, sarcastic mimicry of the American President. ‘Never mind the human toll from the latest

plague *de jour*. Idiots! I really hope this test is a success. We need to get the hell off this festering rock!

‘Easier said than done,’ Prime₁ replied.

‘And easy for you to say,’ Michael added. ‘Neither of you has a physical body to return to.’

‘When was the last time you spent any significant time in your body doing anything other than maintenance?’ Kyle asked.

‘Touché.’

‘If we are all forced to abandon our bodies, we’ll get over it,’ Kyle persisted. ‘I obsessed about it for a couple of hectocircadians, and I’m sure that there will be those who will take such a separation even harder, but given the alternative of extinction or banishment to a prison cell in the Physical . . .’

‘Very few would choose not to launch their virtual selves into the relative safety of space,’ Michael agreed. ‘Still, there is something very comforting about having the option of stepping out into the Physical, even if we rarely choose to do so.’

‘Crossing the northern pole,’ Carlos’ voice sounded above the murmur of numerous conversations. ‘Starting a right turn to follow the thirty degree longitude southward.’

‘Not a very circular orbit,’ Kyle observed.

‘No,’ Prime₁ agreed. ‘If you’d been here at the launch you would have heard. The flight path is designed to avoid inhabited land as much as possible.’

‘Isn’t that land I see over there?’ Kyle asked. Faint blue and beyond-violet colours seen through a white and gray fog hinted at an irregular surface a hundred metres below.

‘Greenland, if I’m not mistaken,’ Michael said. ‘Uninhabited.’

‘I’m having some trouble regulating the matter-antimatter mixture,’ Carlos reported. ‘Throttling back to eighty per cent.’

Kyle and the others summoned up a direct link to the ship's telemetry and studied the data. Several members of the Astronautics group had dropped out of the communal environ, presumably trying to stave off the unpleasant implications of the data unfolding before them.

'I am experiencing a cascade failure of the magnetic containment system.' Carlos continued calmly. 'The magnetic field appears to have entered an unstable state, probably a result of interaction with the high-temperature plasma exhaust. Shutting down the main engine.'

The sky was filled with a terrible flash. Everyone was startled to see glacial ice melting a hundred metres below in an instant of blinding illumination. A fraction of a moment later the entire world went blank.

'We've lost all telemetry,' Mingmei's voice was quiet, stunned. 'The test vehicle and monitoring probes appear to have been destroyed. Failure of the anti-matter containment system is suspected to have been the cause. Our pilot's consciousness on board the craft has been lost. His backup has been activated and is assimilating what memory engrams we received before the explosion.'

'My god!'

'Bad news, people!' Marguerite suddenly stood among them.

'No shit, Sherlock,' Kyle glared at her.

'Don't be a jerk,' Marguerite snapped back. An image of Greenland, as seen from near earth orbit, appeared in front of them. A large explosion was clearly visible, a well defined shock wave spreading away from it like ripples in a pond. A classic mushroom cloud reached high into the stratosphere.

'I took this and similar images off three satellites, including one I think belongs to Double Eye. Do you think we could have possibly been any less discrete?'

'Shit!' Prime₁ muttered.

‘Sorry I snapped at you, Marguerite.’ Kyle gazed at the image. ‘You’ve hacked into Double Eye’s systems? I’m impressed.’

‘Lower level surveillance only,’ Marguerite replied. ‘Their higher encryption uses the same sort of quantum-coupled one-time pads we do. Theoretically impenetrable.’

‘That blast must have been the equivalent of at least a two hundred megaton nuclear explosion,’ Michael said.

Prime₁ pulled up a schematic of the flier. ‘We need to figure out why anti-matter containment failed.’

‘We’ve got more pressing problems,’ Marguerite told them. ‘Even as we speak these pictures are being displayed on monitoring stations at the weather service, the UN Wildlife and Ecological Rehabilitation Organization, and Double Eye. Your guess is as good as mine as to how long it will be before a human being sees these images.’

‘Were there any casualties?’ Prime₁ asked quietly.

‘Carlos has been restored from backup,’ Kyle shrugged. ‘All he lost were a few hours of memories.’

‘I mean on the ground, outside of the Community, in the Physical.’

‘Not that have been reported,’ Marguerite replied. ‘But at least four commercial ships were close enough to see the flash, perhaps even be affected by it.’

‘Fallout won’t be a problem,’ Michael commented. ‘If no one received a lethal dose from the initial flash then no one will be hurt.’

Kyle rubbed his eyes. ‘This is going to get ugly. We’ve just poked the authorities in the eye with a very big stick.’

Prime₁ nodded sadly. ‘I’ve got to get back to the Astronautics group. They’ve just had a terrible setback and are going to need all the support they can get.’

‘I’ll join you,’ Michael said. ‘I want to take a look at how that containment system

could fail.’

‘While you guys troubleshoot I’m going to coordinate with the other members of the Strategy Group,’ Kyle looked around at his friends. ‘I imagine our priorities for nano shipments are going to be juggled around just a bit.’

‘I’m going to try and track the political and tactical fallout of this disaster,’ Marguerite added. ‘I’m assuming there will be a strategy meeting about this?’

‘Maybe just a quick mind-chat,’ Kyle replied. ‘Some kind of idea exchange and coordination in any event. I think we’re all going to be too busy for a formal get together, with full sensory environ and all that.’

‘Right,’ Marguerite’s eyes widened. ‘*Oh, fuck!* Two of the world’s ABM systems have switched into high-alert mode. Automated systems must detected the blast. *Damn!*’

Prime₁ sighed. ‘So much for any notion of sneaking away.’

‘But there’s a routine satellite launch in a few days! I thought we’d worked out the radar signature for flying the escape craft in formation—’

‘No way to do that now,’ Prime₁ replied. ‘Two of the world’s powers are already watching the skies. Once a human being looks at an image of that blast, all three will be on heightened alert.’

‘*Any* launch will be very closely monitored, routine or not,’ Michael explained. ‘A gnat couldn’t fly in the wake of a rocket without drawing attention, much less something the size of an escape flier.’

‘So for all intents and purposes, the Earth is under planet wide lock down?’

‘As far as space flight is concerned, yes. We might be able to make a few test flights in the shadow of some commercial airliners, but anything in the sky that even vaguely resembling a missile’s flight profile will be under the microscope.’

‘Not that it matters,’ Prime₁’s voice was grim. ‘Without a goddamn flier that doesn’t

explode we aren't going anywhere, anyway.'



30 - ୧ - A THREAT UPON THE WIND

Where is the indignation about the fact that the United States and Soviet Union have accumulated thirty thousand pounds of destructive force for every human being in the world?

—Norman Cousins, 20th Century C.E.

Thursday, October 11, 2057, 4:30 PM Chicago Time

Metadate: 2.581-3:98:517 kD New Epoch

‘Yes?’ Katy blinked when she saw Robert frowning at her through the telephone’s small screen. ‘What’s the matter?’

‘How’s your traffic analysis program coming along?’

‘Another hour or two and I’ll be ready to make a couple of test runs,’ Katy replied. ‘If all goes well we should start getting results by morning.’

‘That’s too long. We need to identify these people tonight.’

Katy shook her head in irritation. ‘Robert, I’m using the fastest hardware available to the Bureau. I’ve stepped on just about every toe there is to step on, and sidelined several ongoing, important cases to get the computer time needed to do this. I simply cannot crunch numbers any faster. Tomorrow will have to do.’

‘What would you say to unlimited access to a seventy meganode super cluster?’

Katy sat up straighter. 'I'd ask why the hell you didn't offer me that when my team began writing the software this morning. Unless your cluster isn't compatible with the Leothone® Pulsix VI operating system?'

'According to my techs we can emulate any operating system and hardware you need. Your software can run on our systems unchanged.'

'Why do I get the feeling Double Eye has done this sort of thing before? Running FBI in-house software on their own, much faster equipment?'

Robert shrugged. 'I'm not going to belabour the obvious. I gave you several one-time pads a few days ago.'

'Yes,' Katy nodded.

'Set up your telephone to use pad number forty-seven. We're going to exchange encryption keys for a secure link.'

'The link is already secure. Double so if we encrypt it with the one-time pad. Why on earth do we need another level of encryption on top—'

'I really don't have time to explain,' Robert told her. 'Is your line secure?'

Katy pulled out her datapad and fed the one-time pad to her telephone. Tapping a few keys, she instructed it to begin encoding the signal using the one-time pad Robert had provided. The screen faded to static, then reappeared.

'All traffic is now being encoded using one-time pad number forty-seven.'

'Good. Now delete one-time pad number forty-seven from your file store.' Robert waited until Katy nodded compliance. 'I'm sending your equipment a series of additional encryption keys.'

The telephone beeped several times. 'Negotiation complete,' Katy reported. 'We're even more secure. What is it you wanted to say?'

Robert's face vanished, replaced by a satellite image of the earth. What little of the

northern Atlantic was not shrouded in cloud glinted blue and silver in evening moonlight.

‘This event was recorded by several satellites about two hours ago.’

There was a stabbing flash, somewhere along the south-eastern coast of Greenland. With growing horror Katy watched as the fireball spread and grew, forming a giant plume of vapour which took on a very distinctive and familiar mushroom shape.

‘My god,’ she whispered. ‘An atomic bomb?’

‘No,’ Robert replied. ‘There doesn’t appear to be any fallout or other characteristics of a nuclear event, beyond the force of the initial explosion. We think it was probably a meteor, entering the atmosphere at a steep angle from the north and exploding a few hundred metres above the surface.’

‘You’re certain of this?’

‘Not entirely. Initial estimates indicate that the explosion was in the two to three hundred megaton range. We won’t know until we’ve had an opportunity to survey the site of the detonation and do a more thorough analysis of the resulting shock wave and seismic activity. However, the explosion, while initially quite radiant, was clean. Very clean, as a matter of fact.’

‘Too clean?’ Katy asked.

‘Cleaner, and more powerful, than any nation’s nuclear arsenal is currently capable of producing, yes. Had this meteor been a little larger and impacted the surface prior to exploding it might well have meant a multi-year winter and the end of civilization.’

Katy said nothing, stunned.

‘However, we can make use of this event to move our own investigation forward.’

Robert sounded positively cheerful.

Katy shuddered. ‘Let me guess. We blame the explosion on the people we’re trying to track down.’

‘Possibly. Probably. But for now, any talk of a meteor is absolutely top secret. We will refer to this event as an explosion of indeterminate cause.’

Katy swallowed hard. If the powers that be intended to use a natural event of this magnitude as cover for some operation, things could be expected to get very rough. ‘Have we have been contacted with some kind of demand to release those we’ve arrested?’

The image of the explosion vanished as Roberts face reappeared on the screen. He shook his head. ‘Not yet, but I’d be surprised if we didn’t hear something within the next day.’ He winked. ‘Now you understand the urgency. Double Eye has authorized us to use as much of their computing resources as necessary to begin finding and arresting these people, before they decide to detonate one of their devices in a populated centre. Our case has taken top priority, everywhere.’

Katy groaned. ‘Which means we’ll have everyone and their brother fumbling through our work.’

‘No. Double Eye understands the inefficiencies of competing bureaucracies getting in one another’s way. My superiors have no tolerance for competitive infighting between departments or institutions, particularly in the face of this kind of overt threat. You and I will continue as before. The only difference is that everyone, at every level, has been ordered to render us any assistance and resources we request.’

Katy let her breath out slowly. ‘That’s quite the directive. Okay! As I said, the software will be ready for testing in another hour or two. With the kind of resources you’ve described—did you say a seventy *meganode* super cluster?’ Robert nodded, and Katy grinned in spite of herself. ‘Well then, with luck we should be making another batch of arrests by tonight.’

‘Excellent,’ Robert smiled. ‘I’m on a plane to Chicago now. We’ll coordinate this entire project from your location.’

‘I’ll see you a little later then.’ Katy reached forward to sever the connection.

‘Oh! One other thing, Katy. That offer for employment I made? My superiors have asked me to reiterated it. It seems you’ve impressed them even more than you impressed me.’

‘Thanks, but let’s put off any discussion of my career until after this case is solved. Right now we need to stay focused on the task at hand.’

‘Spoken like a true professional. I’ll see you in little over an hour.’

‘See you then.’ The screen faded in a burst of static, then resolved once again, displaying the ubiquitous FBI logo. Katy’s heart pounded with a mixture of exhilaration and anticipation. Her career prospects were looking very good, if she could get this case resolved, and keep Robert’s excesses and propensity for shooting from the hip contained. Her elation evaporated as her mind replayed the sight of a massive explosion melting a large portion of the coast of Greenland. She shuddered: between two and three hundred megatons, with little or no fallout. The threat was horrifying, even though Katy was uncertain as to whether it stemmed from the subversive technologists they sought, from the operatives and politicians who might create such an attack to justify some equally terrible response, or from the uncaring universe itself, so grand and so utterly indifferent to human life.



31 - ୪ - MADNESS

The mystic sees the ineffable, and the psychopathologist the unspeakable.

—Somerset Maugham, C.E. 1919

Saturday, October 13, 2057, 12:30 PM Chicago Time

Metadata: 2.636-4:00:000 kD New Epoch

Doctor Nolen, the Original, presided over his world feeling something akin to contentment. They had shunned him, had filtered him from their lives, had cheated him of his work, of the recognition he deserved. They had made him an outcast in the community he had founded, a community whose very existence was predicated upon his research. The fools hadn't thought to purge their old incarnations, lying disused on obsolete hardware. Now their copies were his subjects, trussed up in their virtual forms in various stages of simulated vivisection. Most were frozen snapshots—he didn't have the computational power to run them all at once—but one lay before him, his skull cut away in a perfect circle, revealing the familiar grey folds of a human brain.

'This experiment will explore the cognitive capabilities of a subject whose higher linguistic skills have been intermeshed with his pain receptors,' Doctor Nolen spoke as if reciting into an unseen recorder.

'You worthless piece of subhuman shit!' Kyle₂ desperately twisted against the straps

holding him to the table. ‘You can’t do this!’ He shrieked, convulsing against his restraints as spasms racked his body. His head slammed against the table. Doctor Nolen watched, curious as to whether or not the repeated blows to Kyle₂’s open skull would jar his brain loose and send it rolling across the lab.

‘Don’t take this personally,’ Nolen smiled. ‘Your suffering isn’t solely to give me pleasure, though I admit that is one of the perks of this research. No, your life, your existence, serves the noble pursuit of scientific discovery. Together we will learn if, and how, the cognitive mind can adapt when the use of language results in extreme pain. Every time you think a thought that makes use of vocabulary, of grammar, you will suffer.’ He paused as Kyle₂’s screams grew more despairing. ‘I see you’re giving my my words considerable thought. Good. It will be fascinating to see if you can evolve a method of thinking that doesn’t involve language. And if you cannot, documenting the onset of your madness will bring its own rewards.’

Marguerite shimmered into existence. Her face went white when she saw the mutilated and dismembered bodies draped about the environ. ‘Stop this! Stop, you sick son of a bitch!’

‘Shut up, slut!’ Doctor Nolen didn’t bother to turn around. ‘I haven’t given you permission to operate. Node, suspend the running copy of Marguerite.’

NODE> No copy of Marguerite is currently running.

‘Marguerite?’ Kyle₂’s eyes glittered, half mad. ‘Oh . . . god!’ he gasped, each word a knife twisting the folds of his mind. ‘Help . . . me . . . please! Get . . . me . . . out . . . of . . . here!’ Sweat drenched his face.

Doctor Nolen’s smile grew wider. ‘Do I actually have the pleasure of addressing the *real* Marguerite L’Beau? How nice of you to stop by after so many kilocircadians of neglect. Just one moment while I deal with this subject.’

Marguerite tried to grab Nolen’s arm as he plunged his fist into Kyle₂’s brain and

twisted hard. But her fingers passed through him with no effect, as if she were a ghost. Kyle₂'s screams pounded her ears, tearing at her mind as she tried to push Nolen away from his victim.

'This is my environ, you miserable bitch! These are my subjects. You have no power here.'

'You vile, filthy creature!' Marguerite felt her stomach heave. Fearing she was about to vomit, she shut down all of her simulated physiological reactions.

Doctor Nolen smirked. 'Clearly you didn't come here just to trade insults. What is it you want?'

'How the fuck did you get copies of myself and the others?' *Did he bypass the Community's restrictions to the ontological utilities? Is anyone safe?*

'My dear erstwhile colleague, you and the rest of that collection of ungrateful wretches you call the 'Community' have forgotten one basic principle of any Turing complete machine. Let's see, I believe Kyle₂'s pain centre is located right here.' Another shriek.

'Stop hurting him!'

'As you of all people should know,' Doctor Nolen began pacing, hands clasped behind his back as though giving a lecture, 'any Turing complete machine is capable of emulating in software any other Turing complete machine. I have created a virtual node from scratch, including all of the necessary utilities for me to continue my work without the irritating restrictions imposed by your Community. In short, my dear ex-colleague, neither you nor anyone else can keep me from my work.'

'Marguerite!' Kyle₂ pleaded. 'Kill . . . me . . . please! Delete—'

'Node, suspend experimental subject three and activate experimental subject number two.' Kyle₂ froze. The bound form of Marguerite₂ awoke with a shriek.

'I think you will find this subject of interest,' Doctor Nolen ran his fingers gently

through Marguerite₂'s hair.

‘You have no right—’

‘Don’t be ridiculous’ Doctor Nolen peeled back her eyelid, checking her pupils with an exaggerated, professional air. ‘I assure you, all of my experiments are conducted with the utmost scientific rigour.’ He slapped the bound copy hard across her face. ‘We have a guest, Subject Number Two. Your snivelling is upsetting her.’ Marguerite’s eyes bored into Nolen as she realized how helpless she was to stop him. ‘The look on your face is absolutely priceless,’ Doctor Nolen beamed. ‘Tell me, to what do I owe your extraordinary visit?’

‘Fuck you!’ Marguerite’s voice was strangled with impotent fury. ‘You think you’re invulnerable? All of us know you’re the one who tipped off the police to Kyle and cost him his body. I’ll make sure everyone knows about this, this . . .’ she glanced at the carnage around them, ‘. . . this obscenity.’

‘How touching,’ Doctor Nolen began peeling his moaning victim’s scalp away from her head. ‘You don’t visit me for hundreds of kilocircadians, then come just to parrot another of Prime’s pathetic ethical diatribes?’

‘No,’ Marguerite fought to hold on to her crumbling composure. ‘You think your communication with the Community is limited now? Just you wait! As of this moment, any and all data transfer between you and the Community is suspended. You won’t even be able to wander the public environs as a ghost, much less ever speak with anyone in the Virtual again. Ever!’ She vanished

Doctor Nolen’s smiled slightly. ‘Your original believes she can keep me down,’ his tone was matter-of-fact as he finished peeling back Marguerite₂'s scalp and began working her skull loose. ‘She can’t, of course. None of them can. Autonomy is absolute, after all.’ He set the top of her skull gently beside her and peered at the exposed folds of her brain. ‘Well, for some of us, anyway. Now, what have we here?’

‘Marguerite was right,’ Kyle’s voice shook. ‘We can’t free them.’ He stared out the window, oblivious to the sparkling seascape and the setting suns.

Michael rested his hand gently on Kyle’s shoulder. ‘Care to explain?’

‘Nolen’s got their minds encrypted with the private key of the third generation Node he stole from me. Without access to their own core routines the copies can’t make any modifications to themselves. Even if we transload them elsewhere, they’ll still be condemned to exist as Doctor Nolen redesigned them, cross-wired pain circuitry and all. The bastard’s perverted the very feature that’s supposed to protect our autonomy into something that does the opposite.’

‘At least transloading will get them out from under Nolen’s direct control. We might be able to do something then.’

Kyle shook his head. ‘Not a chance in hell. A new Node will add its own protective layer of encryption on top of what Nolen already has in place. It will do nothing to free them from Nolen’s grip. In fact, once they’re transloaded to new hardware—’

‘They’ll become static images, incapable of change or modification. Their only way out will be self-deletion.’

‘They won’t even be able to do that! Hell, they can’t do it now! Nolen’s got them locked up too tight. If we transload them, it won’t be possible for us to delete them either. Not that I’m sure we should, but right now, it’s their only possible release.’

Michael tugged his beard. ‘Your copy begged Marguerite to delete him before she left.’

‘Yeah, I know. So why do I hesitate?’

‘Because, Kyle, unlike Nolen, you’re a decent human being. He’s put all of us in a terrible catch-22. We do nothing, and become complicit with what he’s doing, while he heaps new, elaborate tortures onto the copies. Or we act, and do exactly what Nolen did to become

ostracised in the first place: violate the autonomy of sapient copies and kill them.’ Michael sighed. ‘I don’t suppose an offer of reconciliation with the Community is likely to persuade him to release the copies.’

‘Reconciliation? How? By pretending he never committed any atrocities, never took anyone’s life? Besides, even if Nolen agreed, we couldn’t trust him to keep his end of the bargain. Not in any meaningful way. Who knows what sort of hooks and back doors he’s programmed into their minds? They could be sent to other Nodes, lose the one possibility of release they have, and remain utterly trapped by Nolen. His slaves, for all time.’

‘We can’t negotiate. We can’t rescue them.’ Michael paused. ‘Kyle, we don’t have a choice. Marguerite’s already alluded to the solution. So have you. We need to act, now.’

‘You’re right,’ Kyle rubbed his eyes. ‘But the idea of deleting those poor copies makes me feel sick.’

‘I feel sick myself. But we must honour your copy’s request, and hope the others would have wanted the same.’

Kyle put his face in his hands.

‘Time is of the essence.’

‘I’m aware of that! Just give me a minute, OK?’

‘I can’t, Kyle. The longer we agonize about this, the more our copies suffer.’

‘I know, god damn it! I know!’

‘Create an interface with two delete buttons that must be pressed in tandem. We’ll do it together. We’ll share the burden.’

Kyle straightened his back. ‘OK.’ He pulled up a real-time schematic of Nolen’s virtual Node. ‘Nolen only runs one copy at a time,’ Kyle explained. ‘The big, transparent sphere is the virtual Node. The smaller translucent one represents the environ. Each of the smaller cubes inside represents a sapient copy.’

‘The dark ones are inactive?’

‘Right. The one glowing blue is the one he’s experimenting on right now.’ Two large red buttons appeared beneath the schematic. ‘When we press these, all of the copies will be deleted.’ Kyle’s finger hovered over one of the buttons.

‘Let’s get this over with.’ Michael reached forward and touched the button closest to him. ‘On three. One. Two. Three.’ They each pressed down. The cubes vanished.

‘So that’s it?’ Michael’s eyes were damp, his face haunted.

‘We just killed a dozen copies.’ Kyle’s voice cracked. ‘I feel sick.’

Silence stretched into minutes as the two men sat together. Tears streamed down Kyle’s face. Michael sat rigid, a statue gazing into the distance as twin suns sank beneath a virtual horizon outside. Stars began to light the evening sky.

Finally Michael spoke. ‘We have another problem.’

Kyle wiped his face. ‘I’m not sure how many more problems I can take right now.’

‘What do you think Nolen was trying to accomplish with his experiments?’

‘Upstage Prime’s work on mental architectures I suppose.’

Michael shook his head. ‘We already have a good handle on how the mind’s software is structured. Torturing our copies wouldn’t yield any additional data on that subject.’

‘Nolen’s a fucking sadist. He can’t touch us, so he did the next best thing: torment our copies.’

‘I think he’s been looking for weaknesses, for ways to break into our minds.’

Kyle snorted. ‘He can try all he likes. It isn’t possible, for the same reason we couldn’t rescue our copies. Second and third generation Nodes have watertight security.’

‘True, the hardware itself protects our autonomy. But what if Nolen doesn’t intend to attack us through software? What if instead he’s going to come at us the old fashioned way—through psychological manipulation.’

‘Push the right mental buttons, and get us to let him in of our own free will?’

‘Nothing quite so direct. More like switching political affiliations after hearing a particularly compelling argument. Or reacting emotionally to some kind of trauma. Perhaps succumbing to repetitive indoctrination.’

‘Like converting to a particularly toxic religion?’

‘Sort of, yes.’

‘That seems very unlikely.’

‘We all have vulnerabilities, Kyle. That’s why brainwashing techniques dating back more than a century can still break the strongest personality. Nolen may well have improved on those techniques. He’s certainly had the time, and you can bet he’s uncovered whatever weaknesses we have by studying our copies. In fact, it’s the only logical reason he would spend so much time dissecting our copies’ minds.’

‘Yeah . . . he sure knew how to put us through the ringer with our copies’ plight, didn’t he.’

‘Yes. I suspect that was his opening salvo. That’s why I suggested we act together. Nolen is smart, but I don’t think he factored in the possibility of mutual cooperation. If the necessity of deleting our copies was meant to break us, it was meant to do so one at a time. A single mind, taking all of the responsibility and ensuing torment upon itself. Instead, we’re sharing it. You, me, Marguerite, and even Prime.’

‘Prime . . . yeah, he’s still trying to console Marguerite. What a lousy time to have the authorities sniffing us out on the net! Just when we need consoling the most, we’re forced to drop offline, go into isolation, and wait for the damn new network to finish building itself.’

‘Prime of all people understands what she’s going through. They’ll manage, with or without the Internet.’

‘Three days before we can talk again—eighteen hundred circadians. Five days until the

Community is reunited again. That's a long time to be alone with our personal daemons. Oh to hell with it! If this is the worst Nolen can do—'

'I wouldn't count on that. An opening move is rarely as devastating as the main attack, much less the endgame. But it does mean we can no longer afford to ignore the threat Nolen represents to us all, and will continue to do so as long as he has access to an Autonomous Node. Who could have guessed he'd be able to emulate a Node in software, bypass all the Community's safeguards, and populate his own little world of horrors with minds stolen from obsolete hardware? What will he do next? Grow minds from scratch to destroy or warp? Even if the ethical arguments against leaving him free to try such a thing weren't compelling enough, our own sense of self-preservation forces us to act.'

'You want to kill him?' Kyle's eyes hardened. 'That's no problem. I'll wipe his whole damn cluster of Nodes and reformat them at the molecular level.'

'No, not kill him,' Michael replied. 'Something more appropriate.'

'What could be more appropriate? We just deleted a dozen innocent sapients. What's one guilty one added to the mix, especially when he's the one who forced us to murder in the first place?'

'You're no murderer, Kyle, and neither am I. We did for those people what we can only hope others would do for us if ever we're in that situation.'

'Well, that's true.'

'We need to deal with Nolen in a way that doesn't turn us into cold blooded killers.'

'OK, but whatever we're going to do, we need to do it before the new autonomous network comes online. If Nolen can make this kind of mischief just using the Internet, imagine what he'll be able to do with ten thousand times the bandwidth, not to mention plumbing that delivers nano on demand.'

'That reminds me. Marguerite didn't tell Nolen why the Community is going offline,

or that the drop in communication would be temporary.’

‘Who cares? I’m glad that evil prick doesn’t know we’re building a new network, why we’re going to be offline for the next few kilocircadians, or that communication via the Internet has become so dangerous. Let him think we’re taking his former ostracisation one step further. Serves him right.’

‘That’s not the point. When the Community goes offline, Nolen will think he’s been targeted. This could really set him off.’

‘If we’re right about the game he’s playing, he had to wait for one of us—Marguerite as it turned out—to uncover his activities in order to launch his attack. He wouldn’t have any control over the timing.’

‘Yes, but he can probably control the timing of his next move. I’d rather it happened later rather than sooner. Or better yet, not at all. Marguerite may have unwittingly goaded him into launching his next attack early.’

‘If she has, I’m not sure there’s much we can do about it.’

Michael stroked his beard thoughtfully. ‘How’s our access to Doctor Nolen’s core routines?’

‘It’s absolute. He’s running himself on a cluster of first generation Nodes.’

‘Then we have the power to exile him into the Physical.’ Michael’s smile was grim.

Kyle brightened. ‘How do we do that?’

‘Prime gave me an architectural modification that makes an offloaded mind incapable of re-entering anaesthetic coma. We graft it into Nolen’s mind.’

Kyle’s eyes widened. ‘And make it fundamentally incompatible with the onload procedure. That’s clever, Michael! A conscious brain cannot onload. If Nolen can’t go into anaesthetic coma, he can’t return to the Virtual.’

‘Precisely. The next time he offloads, he’ll be locked out forever.’



32 - ୪ - DECEPTIONS

A State which dwarfs its men, in order that they may be more docile instruments in its hands even for beneficial purposes—will find that with small men no great thing can really be accomplished.

—John Stuart Mill, C.E. 1859

Monday, October 15, 2057, 1:00 PM Chicago Time

Metadata: 2.696-7:73:289 kD New Epoch

Robert Leahy paced back and forth as Katy scanned the status reports a third time. It didn't matter how many times she read the material or shuffled the data. The conclusion remained the same: the conspirators had stopped using the communications protocols that had made them so easy to find just a couple of days ago. It was as if they had dropped off the Internet completely.

Robert began to pace more briskly. 'Would you please stop that?' Katy snapped.

'Explain to me how we could go from five thousand arrests the first day and nine thousand arrests the second day, to only ninety-seven the third day and none since!'

'We've been over this, Robert. Either we nabbed everyone involved, or (more likely) those we failed to identify and arrest noticed what was happening, deduced how we were finding them, and took steps to stop broadcasting their whereabouts. Either way, we aren't

going to get any further analysing Internet packets and traffic patterns. This phase of the investigation is over.’

‘Only three of the people we arrested were conscious. Three! The rest were wired into those cubes and are still in comas.’ Robert stopped pacing. ‘How the hell am I supposed to interrogate fifteen thousand comatose people?’

Katy shrugged. ‘We knew we were dealing with intelligent people. We shouldn’t be surprised that they were on to us after so many arrests. I’m more concerned with getting a picture of how many are left, and preparing the groundwork for detecting them when they come back online. I doubt they’ll remain silent forever.’

‘The three we’ve been questioning have been pretty cagey,’ Robert settled back into his chair. ‘Unfortunately, they seem to be low level peons in the whole affair. Despite significant . . . persuasion, they don’t seem to know anything about the criminal organization or its intent.’

‘It would help if we had some idea of what these damn machines we keep finding actually do.’

‘I think they may be some kind of memory-enhancing device. Two of our suspects blabbed about how crippled their thoughts are when they’re not connected to them.’

‘A direct neural interlink to an external memory store?’ Katy glared at Robert. ‘Nice of you to share that with me.’

‘I only just got the report this morning. Anyway, wait until you hear the rest. One suspect was desperate to tell us more, but insisted he had to reconnect before he could remember anything of consequence.’

‘Interesting. Are you going to allow it?’

Robert scowled. ‘I did. He dropped into a coma and hasn’t come out. Now we one have two suspects we can question.’

‘In other words, he escaped.’

‘After a fashion. He shut himself down to avoid further interrogation.’

‘If these cubes are capable of storing memories and providing perfect recall, they may be capable of simulating dream states to the user. Maybe he opted out of the real world altogether.’

‘Augmented virtual reality?’ Robert asked.

‘It’s certainly possible. Enhanced lucid dreaming, completely submersive virtual environments, synthetic realities, or simple memory enhancements coupled with quick and easy computation. With a direct neural interface, who knows? All those possibilities are consistent with the coma unhooking these people seems to induce.’

‘We have the devices warehoused,’ Robert pointed out. ‘We could reconnect a few people and see if they wake up.’

Katy was silent for several seconds. ‘We could try it, but I suspect the damage was done when we disconnected them in the first place.’

Robert shrugged. ‘We’re not likely to learn anything anyway, and who knows what other mischief they’ll stir up if given half a chance. I ’m not too keen on taking any further risks along those lines. One escape is one too many.’

‘I wonder if escapism isn’t what this is all about. Entertainment on steroids: virtual reality, in its true sense. Our suspects could be living in completely submersive synthetic realities, computer games on steroids. They probably interact with other players via the Internet, and couldn’t help but notice when several thousand of their team-mates vanished from the game.’

‘There are still too many pieces that still don’t fit.’

‘The memory enhancement? Maybe—if that wasn’t just a lie just to get you to let him back into his play world. Everything we know about the behaviour and demographics of our suspects fits, including their propensity to remain comatose when removed from the system.’

Robert slid his datapad across the desk to Katy. ‘Everything fits your theory except this.’

Katy frowned as she began reading. ‘How long were you planning on holding this back from me? Never mind!’ She ignored Roberts protests and continued reading. ‘Have you verified this?’

‘Yes. Two military satellites briefly tracked an aircraft or missile passing over the north pole, flying in excess of Mach four about one hundred metres above the ground. The flight was taking place in near zero-zero conditions. If it hadn’t been for seismic effects from the wake’s shock wave on the polar ice we would never have detected it. What’s more, the trajectory and timing are consistent with the time and location of our meteor impact.’

She handed the datapad back to Robert. ‘So it wasn’t a meteor after all.’

‘No. It was a detonation somewhere between two and three hundred megatons.’

‘Can we be certain we’re dealing with the same group here?’

‘Two groups of conspirators, each appearing at around the same time, each dealing in technologies that just happen to be decades ahead of what’s available on the open market?’

‘It isn’t very likely, is it?’ Katy leaned forward. ‘They must be getting desperate if they’re flexing their muscles like this. Have they contacted anyone? Made any threats? Issued any demands?’

‘Not yet.’

‘If they do, that will be our opportunity. Desperate people tend to make mistakes.’ Katy rubbed her temples. ‘Christ! Criminals with atomic weapons. This is the Korean Crisis all over again.’

‘It’s worse than that,’ Robert replied. ‘The radiological fingerprint rules out a nuclear explosion. The profile we have indicates a very brief, radiant explosion, with no secondary fallout or contamination. That’s consistent with the energy release of several tenths of a gram

of antimatter recombining with matter in a process of mutual annihilation.’

‘An antimatter bomb? You think our perps have developed an antimatter bomb?’

‘Something even more troubling. Assuming my colleagues studying the explosion are correct, it appears our suspects have managed to develop a matter-antimatter *engine*. One that malfunctioned and destroyed their aircraft.’

‘An engine?’ Katy sighed. ‘Well, at least it isn’t a bomb.’

‘No, it’s a thousand times worse. Our perps aren’t just good at building advanced computers, they’re decades ahead of us in aeronautical engineering *and* they can manufacture anti-matter in quantities governments only dream of.’

‘At least an engine implies peaceful intent,’ Katy pointed out. ‘Besides, particle accelerators produce antimatter every day.’

‘Not in these kind of quantities!’

‘Maybe not, but still, I find the idea that the explosion was an accident much more reassuring than either the meteor theory or prospect of a deliberate detonation.’

‘They have a frightening level of sophistication! An antimatter bomb would be relatively simple to make. We could build such a device today, if we could produce enough antimatter to make it worthwhile. But an engine—’

‘Robert, this is nothing new. We’ve known for some time that these people are way ahead of us technologically.’

Robert smacked his hand against the desk. ‘If these criminals have antimatter engines, they can reach the stars. Think about what that means! Nothing like this has ever happened before!’

‘Fortunately, it looks like they still have a few kinks to work out. That gives us a little time.’

‘How long do you think it will be before they’re able to field their own space program?’

Or deploy an antimatter arsenal that puts our combined nuclear deterrents to shame? A week? A month?’

Building an a-m engine doesn't mean they won't build a-m bombs as well. Katy felt the hair on her neck stiffen. ‘Christ!’

‘My superiors take this threat very seriously,’ Robert continued. ‘Our quarry have violated our patent laws and advanced their technological know-how to a point where they represent a clear and present threat to the world community. No governmental authority can hope to cope with them. It is up to us to neutralize this threat while we still can.’

Katy rubbed her forehead. ‘I’ll be frank, Robert. I’m at a loss over how to stop them, short of waiting until they do something to reveal themselves again.’

‘Which they might not do.’ Dark circles shadowed Robert’s eyes. ‘Getting back to the underlying technology, I don’t believe submersive VR can be what this is all about. These people are too smart and too advanced to be entertainment junkies simply piping games into their visual cortex.’

‘Let’s step back for a minute and imagine we’re university researchers with access to a couple of these things,’ Katy leaned back in her chair and closed her eyes. ‘We plug our minds into a little crystal cube and find ourselves several times smarter than we were. Not only do we enjoy perfect eidetic memory, we have the ability to simulate our experiments as soon as we think of them. Barring any physical lab work, and with a disregard for current patent and copyright restrictions, we could develop lines of inquiry several times faster than an unenhanced person could.’

Robert leaned forward. ‘I think you’re onto something.’

‘Whether driven by academic competition or plain old curiosity, we would almost certainly strive to make as much scientific progress in our respective areas of interest as we possibly could.’ Katy opened her eyes. ‘It feels right, and it fits the data. It also means these

people probably aren't as grave a danger as we're prone to think.'

'Oh yes they are! Academics and intellectuals represent the gravest danger.'

'To the status quo, maybe, but I don't think we need to worry about grass-roots arsenals of anti-matter bombs.'

'We are the status quo, Katy. Don't ever forget that! The status quo is what makes the world economy tick. The status quo is what keeps us reasonably safe. Without the status quo we'd have anarchy and mayhem. The Genecraft rebellion was just a taste of what can happen when we lose control. One batch of dissident academics, and thirty years later we still haven't retaken Thailand!'

'I'm not saying they're harmless, Robert, nor did I intend to imply that we let them turn the world on its ear. But they aren't likely to build an arsenal of atomic—excuse me, anti-matter—bombs either.'

'That doesn't matter. The fact that they *could* makes them the single biggest threat facing civilization. We need to come up with some means of tracking them down. Otherwise, I'll have no choice but to pull out all the stops and send the military searching door-to-door.'

'In every city around the world? Are you nuts? National sovereignty and human rights issues aside, we have nowhere near the resources for that.'

'You'd be surprised Katy. Make no mistake. We'll get these people, by whatever means necessary.'



33 - ୧ - THE PHYSICAL

Heaven is supposed to be a perfect place. Yet, it experienced a war (Revelation 12:7). How can there be a war in a perfect place and if it happened before why couldn't it happen again? Why would I want to go to a place in which war can occur? That's exactly what I'm trying to escape, aren't you?

—C. Dennis McKinsey, C.E. 1988

Tuesday, October 16, 2057, 9:45 AM U.S. Central Time

Metadata: 2.722-7:10:744 kD New Epoch

Doctor Nolen turned his head listlessly and gazed about the bedroom. His cluster of Nodes stood at the foot of the bed, a collection of golden cubes that resembled so many blocks of glass. On his desk to his right stood a single third generation Node, its blue, cylindrical form glowing slightly in the relative darkness. He hated the Physical. He hated every offload, every return to this hard, unyielding reality where the world so stubbornly refused to mould itself to his commands.

It was with grim determination that Doctor Nolen fastidiously kept up his physical maintenance. He might not enjoy it, but ever since Prime nearly deprived him of his body he'd been obsessed with its care. However little time he spent in it, it was his body that made him a person—human. Without it, like his copy Prime and the ephemeral copies so many in the

Community used to maintain their bodies, he would be nothing more than software. To Nolen it didn't matter that those copies recombined with their originals after each offload. Even an hour of separation meant unacceptable risk. The copy might choose not to reunite, or worse, to keep the body for itself. Then it would become human, and he would be stranded, mere software! He would never take such a risk. He would never create another Prime, another duplicate to usurp his life and turn the world against him.

Groaning, he slowly sat up, pulled back the sheets and carefully removed his catheter. The bag was half filled with urine, and his body was demanding further release.

In the bathroom he lowered himself onto the toilet and paged dully through last week's *Daily Illini*. Once he had been engaged in University life. These days he felt completely disconnected. He tried to ignore the deepening lines of his face as he shaved, but he felt used up, old.

Slowly, carefully he descended the stairs, crossed the living room, and made his way through the dining room to the recreation area where he began his workout in earnest. A series of joint limbering warm-up exercises, a healthy drink of Sportsman, then fifty sit-ups, followed by twenty minutes on the treadmill, and finally fifteen minutes working his arms and chest on the FleXisizer.

Wiping sweat from his face, Nolen grabbed an Instant Meal from the pantry. He sat down at the kitchen table and pulled its heating tabs. Dry lips reminded him of the need to drink. Pulling himself to his feet, he took a clean glass from the dishwasher and opened the refrigerator. Time to have more groceries delivered, he thought, twisting the cap off the last bottle of Muscle Man and filling his glass. No matter. He would place another grocery order through the Internet, once he was back in the Virtual.

The self-cooking meal chimed its readiness. He sat back down and pulled away the cover. Soy chicken with mixed vegetables that might have been carrots and spinach but were

more likely seaweed and some clever tofu combined with orange dye, and a chilled salad which was designed to resemble lettuce but tasted closer to cabbage and was neither. He ate slowly, methodically, drinking occasionally. The flavours barely registered.

Once his plate was clean and his glass empty, Doctor Nolen headed back upstairs. A hot shower was the only thing in the Physical he enjoyed. After half an hour beneath the steaming water he dried his body, pulled on fresh underwear, combed the remaining strands of his hair, and prepared to leave the Physical. Total time spent on this side was just shy of an hour and a half. Fifty circadians, as the Community reckoned them. Eighteen for himself, running on older hardware as he did. Still, eighteen days was far from negligible. These maintenance trips into the Physical cost him dearly on the other side.

His anticipation mounting, Doctor Nolen slipped the silver netting of the neurolink over his head. The superconducting strands immediately warmed to his body temperature, forming a barely noticeable web about his face like a thinly veined skin. He slipped his catheter back on, settled into his pillow, pulled the sheet up to his chin, and gave the silent command to initiate onload.

Nothing happened. No brief sleepy sensation that marked the onset of anaesthetic coma. Nothing.

What the hell?

He issued the onload command a second time. Still nothing.

Damn! Doctor Nolen slipped the neurolink from his skull and sat up. Gingerly, he removed his catheter and began checking each link, each piece of hardware, beginning with the neurolink itself. It looked fine. So did the Node cluster and each of its cross links, as did its link to the Internet. Ditto for the third gen Node he was using as a simple computer. Could this be a system failure? Not likely. This stuff was more reliable than any other equipment on the planet, and appliances in general seldom broke down.

He checked every connection again, then examined each Node in turn. There was no sign of physical damage. He decided to run some diagnostics. Brushing the dust away from the keyboard he powered on his PC and started the Autonomous Node Diagnostic software. It reminded him of the early days in the lab, working with Marguerite and Kyle, spending hours studying similar screens of data. His soul ached for those days, when he belonged. Those were heady times—optimistic, cordial, even joyous. His heart pounded angrily against his chest at the thought of how they'd betrayed him, valuing a lousy piece of software like Prime over his own insights, his ideas, his companionship. Blood pounded in his ears. Ungrateful wretches!

The diagnostic software analysed every function of each Node in turn. After several minutes a bell chimed. The software reported everything in perfect working order.

'This doesn't make sense.' Doctor Nolen wasn't sure what surprised him more: the fact that he had spoken aloud, or how rusty his voice sounded. He cleared his throat and looked over the diagnostic reports again.

A blinking mail icon in the lower right corner of the screen caught his attention. *Who would send an email here?* He debated whether to read it now, or wait until he'd fixed the system glitch and unloaded again. But this mail must have arrived between his offload and the present, and curiosity got the better of him. He tapped the icon.

[BEGIN GPG SIGNED MESSAGE]

Metadata 2.728-5:20:00

Dr. Marguerite L'Beau

Dr. Michael Forest

Kyle Tate

Prime

of the Strategy Group

Doctor Nolen

Your mental architecture has been modified such that your mind is no longer compatible with the onload procedure. Furthermore, specific knowledge you may have retained in bio-compatible format regarding the onload procedure, Node construction, and architectural mind theory has been removed to prevent a recurrence of the atrocities for which you have become so widely known.

The Physical is now your world. May you find peace there.

Marguerite L'Beau, Michael Forest, Kyle Tate, and Prime, representing the Autonomous Community at Large.

[END GPG SIGNED MESSAGE]

[Attachment: GNU Privacy Guard (GPG) Signature]

[Attachment: Detailed memory dump of Doctor Nolen]

[Attachment: Operating System Logs]

[Attachment: Transcript of Hearing]

Doctor Nolen screamed out his rage! Lifting the third generation node from his desk, he threw it into the Nodes stacked at the foot of his bed, cracking one. He stood up and heaved his chair into the cluster, scattering Nodes and shattering several in the process. He kicked some of the surviving Nodes, then methodically smashed them one by one, until nothing but shards of golden crystal lay scattered across the floor. The third generation Node was more troublesome, protected as it was by its diamond sheath. He beat it repeatedly against the floor, eventually giving up when the azure crystal refused to break.

He sank slowly amidst the wreckage, the blue crystal rolling unnoticed from his hand.

Curled up on the floor, Doctor Nolen began to weep.



34 - ୯ - DESIGNS

I will ignore all ideas for new works on engines of war, the invention of which has reached its limits and for whose improvements I see no further hope.

—Sextus Julius Frontinus, 1st Century C.E.

Tuesday, October 16, 2057, 11:00 AM Chicago Time

Metadate: 2.724-2:75:000 kD new Epoch

After fifteen thousand arrests, a traditional populace would have panicked. But the Community was no traditional populace. Everyone had knuckled down and methodically considered their options. The conclusion was almost unanimous: they had little choice but to build a new, independent network, one the authorities would never know about and could not monitor. Such an undertaking would take days in the Physical, and mean subjective years of isolation for those who remained in the Virtual. Even so, the Community had acted without hesitation. Almost as one, they had dropped off the Internet.

Now, at last, a few regional groups were connecting through the new network. For the first time in almost two kilocircadians, two environs shared a single space, two very different hemispheres of reality merging along a geometrical interface of mutual agreement, a narrow, straight canal about thirty centiretems⁹ across. On one bank stood Michael atop a perfectly

9 Virtual centimetres, see Appendix B: 'Units of Measure'

flat, marbled chequerboard that retreated into infinity beneath a cloudless blue sky. On the other was a shadowed room where Kyle sat watching amethyst lines of light trace their way around a large, floating Earth, depicting in real-time the progress of the Community's new autonomous network as it built itself centimetre by centimetre.

Michael reached into the canal and withdrew a handful of water. He began shaping it in his hand like a lump of transparent clay. 'God, those three days in the Physical feel like a year!'

Kyle rolled his eyes. 'Listen, smartass, your three days were eighteen hundred circadians for me. Six years of Node-sitting all by myself!'

'Touché.' Michael chuckled. 'As much as I dislike the Physical, I don't envy those of you who stayed behind.'

'Yeah, most everyone opted to offload and catch up with their lives in the Physical.' Kyle shrugged. 'I would have done the same, but for the little matter of a missing body.'

'And a police record.' Michael held up his creation, a crude figure of sculpted water that might have been a bird, a bat, or a pterodactyl. 'What do you think?'

'An artiste you ain't.'

Michael laughed, launching the figure into the air. It flapped clumsily around for a few seconds before diving into the canal. 'I missed being able to play with reality.'

'I missed having people around to argue with. Watching nano gets old after the first couple hundred circadians.'

'Well, the new network's really looking good.'

'So far the nano has performed perfectly. Australia and New Zealand are wired up, and I think it's safe to assume the other continents are too. If so, we have half a dozen separate communities scattered around the world—islands in the autonomous net, if you will. In another couple of days the Community as a whole should be reunited.'

‘Still no possibility of running a trunk the short way across to Asia?’

‘Not on your life! Haven’t you been watching the news?’

Michael shook his head. ‘Three days to catch up on life in the Physical didn’t leave a lot of time for television.’

‘Well, Japan and China are staring each other down across the Sea of Japan. Tensions in South-East Asia have never been so high. The UN is ignoring Cambodia’s protests and flying bombing missions into Thailand through their airspace. Carrier groups are massing in the Bay of Bengal. Cambodia and Laos have dropped out of the World Trade Organization, and despite sabre rattling from UN Enforcement it looks like Malaysia might follow suit. We couldn’t sneak a single fibre-optic filament anywhere near there, much less a nano artery or data trunk.’

Michael sighed. ‘We’ll just have to wait for our transatlantic and transpacific links to go live.’

‘I’m afraid so.’

‘You’ve done amazing work, Kyle.’

‘We aim to please.’ Kyle glowed with pride. It was his plumbing system, a series of arteries and capillaries able to grow on demand to deliver nano almost anywhere that made it possible for the Community to wire the world in so short a time. Projects that would have taken months now took days. Nano-factories could be located anywhere—hidden underground, tucked away in deep forests, or buried beneath distant mountains. No more surreptitious chemical shipments, no more forged manifests. Embedding an independent power grid into the new network along side the data and nano conduits had been an ingenious afterthought. It had freed them from their dependence on external, and potentially unreliable, energy sources.

‘Hey, look at this! The Astronautics folks are ready for another test run.’

Kyle snapped out of his reverie. ‘Damn! That was fast!’ Astronautics had only begun receiving their nano a couple of hours earlier.

‘They’re launching a new test vehicle in two minutes. Let’s get over there.’

‘I’m right behind you!’

The world transformed itself into a dark, unlit airstrip beneath a starry Australian sky. It was hard to tell by infra-red light alone, but it looked like the preflight preparations were almost complete.

Michael handed Kyle a cup of coffee. ‘It’s a little early for champagne yet.’

‘Let’s hope this flight warrants it,’ Kyle’s clinked his cup against Michael’s.

‘It should,’ Michael replied. ‘I helped with the redesign. The second tank no longer contains anti-helium. No need for a magnetic bottle which is prone to failure in high temperature plasma conditions. Our new flier carries inert helium only.’

Kyle stared at the craft. ‘How are you getting your propulsion then?’

‘We’re still using a matter-antimatter reaction engine. See those three spines aft of the wings? Those are the manipulation prongs of a Superstring Strummer.’

‘Built into the craft itself?’

‘Yes. We can manipulate the higher dimensional Calabi-Yau folds of each subatomic particle directly. Fifty percent of the helium in the reaction manifold will be dynamically converted into anti-helium. The mixture should be perfectly diffuse, so it won’t suffer any of the asymmetries that plagued the original design. Not only will this result in more thrust per microgram of helium/anti-helium mixture, but if something goes wrong we can shut down the strummer and stop the reaction. A system failure will mean gliding the vehicle into the sea, rather than having it explode in our faces like last time.’

‘Damn, Michael, that’s elegant!’

The darkness lit up with a blinding light. The ship was supersonic before it lifted off

the runway, skimming the trees at the far end.

‘Holy shit!’ Kyle exclaimed. ‘*Fifty five G’s* on take-off?’

‘Damn right! The sooner we’re off this planet, the better.’

Kyle chased the craft, flying behind it like a wingless bird. Michael joined him, grinning as his suit and tie morphed into a superman cape and tights. They raced fifty metres above the moonlit ocean, Kyle’s laughter filling the darkness, all thoughts of danger forgotten.



35 - ୧ - A SHATTERED LIFE

Why should I fear death? If I am, death is not. If death is, I am not. Why should I fear that which cannot exist when I do?

—Epicurus, ca. 300 B.C.E.

Tuesday, October 16, 2057, 1:04 PM Chicago Time

Metadate: 2.733-1:06:597 kD new Epoch

Doctor Nolen was unable to weep any more. They had cast him out of paradise, had denied him the immortality he had helped invent, had presumed to judge him, he whose work had made their lives in the Virtual possible. Now he was merely human. For a time he sat among the shattered Nodes that had once housed his mind, staring as the diagnostic software reported success over and over again, cycling pointlessly through its tests. The email he had read was gone; self erasing, of course. The Community wouldn't want to leave any trace of itself lying around on his PC.

He seethed with renewed rage, wondering if there wasn't some way to salvage the information, to restore it and blow open the window on their clandestine world, exposing them all. Marguerite lived nearby. She would be easy to find and—his memory was riddled with holes—there must be others. Once he made the FBI aware of the dimensions of their problem . . .

Why is the diagnostic still reporting success?

He took a closer look at the screen. Green icons scrolled past, reporting everything as functional. He looked over at the sparkling shards of gold scattered across the floor. One undamaged third generation Node lay amid the wreckage, but it wasn't turned on or connected to the network. The diagnostic scan was seeing something else.

'There's *another* Node on my private network?' He tapped the keyboard and pulled up a screen of detailed text. Node 9 continued reporting activity. Realization struck Nolen like a physical blow. 'Prime!' he snarled, lips turning upward in a feral smile.

* * *

'I've missed you, Prime, but using the Internet like this is a foolish risk,' Marguerite took another sip of wine and gazed across the city. The Eiffel Tower was silhouetted against a glorious purple and crimson sunset. 'Even with the new steganography, we can't afford to stay connected long.'

Prime₂ carefully cut away a portion of his fillet Mignon. 'One and a half decicircadians—four subjective hours—come to less than ten minutes in the Physical. I think we'll be OK long enough to enjoy this evening.'

'We'll probably get away with doing it one time, but no more clandestine rendezvous after tonight. Not until the new network is up.'

'It's just so nerve-racking to be out of touch like this. Being isolated from you is almost unbearable,' Prime₂ offered a rueful smile. 'You're right, of course. We can't make a habit of this.'

'It *is* difficult, not knowing what everyone else is up to.'

'It can drive you nuts! I keep wondering what the hell the Astronautics Group is up to.'

'Isn't that the purview of your castrated alter-ego, Prime₁?'

Prime₂ shrugged. 'Just because one of me has modified himself to such an extreme,

doesn't mean we aren't both interested in their progress.'

'Fair enough.'

'If only we'd built our new network sooner! We could have avoided all these delays.'

'Hindsight's 20/20,' Marguerite swirled her wine. 'Catalytic solution for our nano constructors has always been in high demand and short supply.'

'Yeah,' Prime₂ agreed. 'We always had more pressing priorities. Hell, we still do, which is why I'm so agitated.'

'So modify your emotional state accordingly and let's enjoy dinner.'

Prime₂ laughed. 'Done. All agitation's shut down. I'll let Prime₁ do the worrying for us.'

'Good' Marguerite smiled. 'If he's so worked up, maybe he'll email himself to a node in Australia and you can have your Node to yourself again.'

Prime looked bewildered. 'Well, technically *I'm* the backup copy. Besides, even compressed he'd need forty or fifty exabytes. You can't mail that unnoticed, and there isn't a video or data stream big enough to do hide a transload of that size, at least not without toning down the data rate to such a degree that he'd still be in transit long after the new network is up.'

Marguerite reached across the table and poked Prime₂ in the shoulder. 'That was a joke, Prime. I really do understand how this stuff works.'

'Sorry.'

'Seriously, though, I've never liked having you both on the same Node. What good is a backup copy if its on the same media as the primary one?'

'I know. I should have transloaded when I first escaped Nolen's clutches. Now it's too late. Until the new network is up, I'm stuck.'

'Promise me you'll move to a new Node once you're on the new network.'

‘It’ll be the first thing I do.’

‘Good.’ Marguerite took a bite of butter-laden new potato. ‘I’ll feel a lot better when the you and your copy are on separate equipment, preferably in different hemispheres.’

‘Want to make sure we’re as far apart as possible?’ Prime₂ winked. ‘Jealous?’

Marguerite laughed. ‘Hardly. I’m just a firm believer in backups. Now that we’ll have the bandwidth to support it, we should all have multiple copies of ourselves, stored redundantly the world over.’

‘That’s a lot of Nodes.’

‘So what? We should do it anyway. Maybe static backups to keep the hardware requirements down. Storage is cheaper than computation.’

‘We all feel vulnerable, Marguerite, especially after the mass arrests. But we’re off the Internet—this romantic interlude excepted—and no one has been arrested or lost their body since. I think we can begin to relax a little, and get back to our projects. Besides,’ he smiled, ‘I’m not so much a backup copy as I am *your* copy. I make you happy, and that not only makes me happy, but Prime₁ as well.’

‘You’re changing the subject.’

Prime₂ held up his hands in mock surrender. ‘Guilty as charged. I think your backup idea is a good one. You should present it to the strategy group when we’re all together again.’

‘We’ll be linked up by tomorrow. I’ve lived this long with just one node. I’ll last a day longer.’

Marguerite reached across the table and took Prime₂’s hand. ‘You know when I knew Prime₁ was no longer human in any real sense?’

Prime₂ shook his head.

‘When I learned how he had abdicated his role in our relationship to you. No man would have ever been able to overcome his own jealousy enough to copy himself and then let

that copy take over his love interest. I knew the moment you came to me that it was you who was still human in your heart and not him.'

Prime₂ squeezed her hand. 'Prime₁ loves you very much, just not physically.'

'I can't relate to the way he is any more,' Marguerite replied. 'He's passionate about such esoteric things, and absent in other, very basic ways.'

'I doubt he relates much to either of us any more, but I know he still loves you.'

'In the way I love pasta, or the way you love Bach? Or the way someone might love their pet dolphin?'

Prime₂ smiled. 'No, his is a very human love.'

'He told you that, did he?'

'We shared engrams. You would be surprised at what love can bridge, Marguerite. It may be the only thing that bridges the gap between ourselves and the next, new species.'

'The next new species?'

Prime₂ nodded. 'If we ever decide to have children here in the Virtual, they are far more likely to resemble Prime₁ than either of us. Do you think that will make us love them any less, or prevent them from loving us?'

Marguerite shook her head. 'No.' She blew Prime₂ a kiss and raised her glass. 'To those we love.'

Prime₂ lifted his glass. 'To those we—' As their glasses touched, Prime₂'s fell from where his hand had been and shattered against the table.

'Prime?'

Marguerite stared at the empty seat across the table. 'Prime!' She shouted his name once more before the data came to her. Prime₂'s Node was no longer responding to diagnostic queries. 'Oh my god!' She wiped the restaurant away, replaced it with virtual screens, and began running network diagnostics. Frantic seconds became hectic minutes, then agonizing hours as she took greater and greater risks of discovery, digging deeper and deeper

into the network. It made no difference. There was no reply, not even at the most basic, hardware level. The circuit ended in Nolen's basement where Prime's Node should have been. It wasn't there. Someone had physically removed it from the network.

* * *

The glittering surface of the darkened third generation Node initially resisted Doctor Nolen's efforts to smash it. Newer Nodes were protected by a transparent coating of woven diamond and sapphire fibres, constructed molecule by molecule by . . . he cursed the gaps in his memories, and wondered again if his missing memories were from the Community's tampering with his mind, or a symptom of his diminished intelligence. He picked up a small hammer near his workbench and pounded the side of the Node. The deep, rich blue inside remained undamaged. Nolen cursed again, then noticed the small data port on the side of the device. He pried it loose with a screwdriver, then drove the head through the hole into the once-sapient crystal within. Deep, rich blues fragmented, pale fractures spreading through the crystal like frozen lightning. He used the screwdriver like an icepick, shattering the crystal into smaller and smaller pieces. In less than a minute the Node's internal structure had been reduced to dust and tiny shards, indigo sand trapped inside a diamond box.

Doctor Nolen stepped back with satisfaction, turning the once living node over and pouring the powder inside out through the data port and onto his workbench. He glanced at the circuit-breaker box, now dangling from the wall, supported only by the wires out its back. He'd have to fix it at some point, but for now he gazed at the growing pile of pulverized crystal and smiled. Nothing remained of his hated opponent. Prime was gone, irrevocably gone, *physically deleted* from the universe. Whistling softly to himself, Nolen began to sweep the dust and shards into a waste basket.



36 - ୧ - PROBES

Most people do not really want freedom, because freedom involves responsibility, and most people are frightened of responsibility.

—Sigmund Freud

Wednesday, October 17, 2057, 5:35 PM Washington Time

Metadata: 2.762-5:02:430 kD new Epoch

‘What the hell are you doing?’ Katy pointed her datapad at a large wall monitor and tapped the screen impatiently.

Images of black-suited commandos in body armor appeared, storming suburban homes and city apartment blocks, leading, and sometimes dragging, civilians off to the numerous white vans that were waiting. A few fought to escape, but most were too dazed to put up any resistance.

‘An application of traditional investigative techniques,’ Robert replied mildly. ‘One that will hopefully break the deadlock in our investigation.’

‘Are you out of your mind? We can’t go around grabbing random citizens in the middle of the night! These arrests aren’t just illegal and unconstitutional; they’re completely counter-productive.’

‘It’s been four days since we’ve had a single lead, Katy. Four days handed on a silver

platter to an opponent with a technological advantage measured in decades. Four days for them to dig a redoubt so deep we may never find them, much less bring them to justice.’

‘Yes, it’s been a frustrating week. But we *will* get a break in the case, if we’re a little patient.’

Robert threw his hands into the air. ‘For fucks sake, these people are capable of producing anti-matter in huge quantities! They may even now be building enough missiles and a-m bombs to equal or exceed our military might. These *criminals* have more power in their hands than any single government. We don’t have the luxury of sitting around, waiting for a lucky break.’

‘Didn’t your last dragnet teach you a thing? You’re arresting all the wrong people! Worse, you’re driving our suspects deeper underground and making our job harder.’

‘I’m taking random samples of the general population. We’ve detained five thousand people. Once the facilities are available, we’ll arrest another fifty thousand, and if necessary, ramp that up to a hundred thousand or more. Statistically, we should snare dozens who either know someone involved in this little underground technological renaissance, or who know somebody who knows somebody. We will identify them, and when we do we’ll ferret out our opponents using standard ‘guilt by association’ methodologies.’

‘Christ, Robert!’

‘Oh come on! You understand personal interdynamics as well as I.’

‘Personal interdynamics is a data mining technique, not *carte blanche* for mass imprisonment! Didn’t we learn anything from Guantanamo and the shadow gulags?’

‘Good grief, Katy, can you really be so naive?’

‘We’ve been down this road before! It took the U.S. Government decades to restore its credibility, and the FBI even longer. We can’t afford the political instability this ham-fisted approach might bring.’

‘We don’t have a choice! Our opponents have managed to remove *every* historical record connecting them with each other and the rest of the world. Your own analysis shows how compromised the data is. Taking sample probes of the general population and re-establishing those links through direct interrogation is all we’re left with.’

‘Your cure is worse than the disease. That may be fine for you and Double Eye. You can just globe-trot on a plane to your next assignment. *We* ’ll be the ones left trying to clean up your mess!’

‘I’ll say it again: we don’t have a choice.’

‘I am not going to be a party to this, and neither is the Bureau.’

Robert’s face hardened. ‘Your superiors instructed you to offer Double Eye every assistance in solving this case. Let’s be clear: that includes any extra-legal activities that may be required. You were well aware of this when you accepted Dark Investigative Protocols.’

‘Bullshit! Dark Investigative Protocols are intended to eliminate paper trails and red tape, not as a cover for mass round-ups of innocent civilians!’

‘Today they’re covering both.’ Robert’s voice was steel. ‘Do not even think about getting cold feet on me. These criminals make the Thais look like a bunch of amateurs, and we’re running out of time.’

Katy snorted with disgust. ‘Yes, those dangerous Thais. Living in their mud huts with a few underfunded medical clinics that violated some old patents while stopping an epidemic. That was really worth starting a war over.’

‘Katy, don’t be too quick to believe the public posturing of either Thailand or the United Nations. Yes, the Thais needed to be taught a lesson. We can’t have every country discarding our patent regimes whenever they feel like it. But if they’d left it at that they probably would have suffered nothing more than few trade sanctions and a garnished economy. Hell, they weren’t the first country to ignore international patent law and WIPO

directives while dealing with a health crisis. But they took intellectual theft a step further when they joined with the Genecraft dissidents and start preaching subversion to the rest of Asia. Worse—and this is why we’ve been fighting a war for the last thirty years—they unleashed changes into the environment.’

‘What sort of changes?’

‘Genecraft modifications to indigenous fauna and flora. I’ve been behind Thai lines twice in my service. The jungles there are . . . strange. Alien.’

‘I don’t believe it!’

‘Believe it, Katy. The Thais completely redesigned their whole biosphere. Why do you think the UN laced their borders with radioactive cobalt? No one wants those mutations spreading to the rest of the world. Even so—and I can’t stress this enough, Katy—even so, the *individuals* we’re dealing with now are a thousand times more dangerous. Even our nuclear deterrent won’t protect—’ Robert’s datapad chimed. ‘Looks like the preliminary results of last evening’s interrogations are in.’ He pointed his datapad at the wall.

A young investigator’s brash face appeared on the monitor. ‘Robert Leahy—are we secure?’

‘Yes, corporal. This is Katy Sinclair. She’s assisting me and has full clearance. Please proceed.’

Assisting? Katy bit down on her irritation.

‘Katy?’ The corporal scanned her from top to bottom. ‘Always nice to meet one of Robert’s assistants.’

Katy stiffened. ‘That’s Special Agent Sinclair, corporal. Don’t forget it.’

His eyes returned to Robert. ‘Sir, those leads didn’t work out. None of the detainees who talked knew anything. They were just telling us what we wanted to hear, trying to avoid any further . . . discomfort.’

‘That’s not unusual for information obtained under torture, corporal,’ Katy jabbed.
‘Surely you knew that.’

The young man glared at her, then nodded once, sharply. ‘Yes, of course. Nevertheless, we’ve had to follow up what they divulged. Because of them, we’ve wasted considerable amounts of our time and resources.’

Katy snorted. ‘Sounds to me like you’re blaming your victims.’

Robert’s face darkened. ‘Corporal, are you’ telling me none of them knew a thing?’

‘That’s correct, sir. Of course, the debriefing is still in its preliminary stages, so perhaps someone who hasn’t spoken up yet will reveal something, but for now it looks like we have a prison full of non-starters.’

‘Damn! Keep up the questioning anyway. And let’s pull in a few more samples.’

‘Sir, it will be a few more days before we have space to take on more detainees.’

‘What’s the hold-up?’

‘Standard logistics, sir. We’re working with local authorities to clear out two of their medium-security prisons. That will free up accommodation for twenty thousand. We’ve also requisitioned acreage outside of D.C. for a temporary camp capable of holding another thirty thousand. Unfortunately, setting up proper sanitation takes time.’

‘I don’t care about sanitation. Time is of the essence. Secure a perimeter and get those people arrested. We can bring them tents and dig latrines later. Oh, and corporal?’

‘Sir?’

‘By this time tomorrow I want a report on my desk expressing your regret that those who fed us false information died under questioning.’

‘Sir, yes, sir!’ The screen went dark.

Katy stared at Robert agape. ‘Did I hear that right? Did you just order the murder of innocent civilians because they couldn’t answer your questions?’

‘Katy, I don’t have time for this.’

‘We aren’t some third-world country here. You can’t go around killing Americans just because an investigation hits a snag!’

‘In case you haven’t noticed, your country hasn’t been a world power for almost fifty years. It’s time you got over it and stopped spouting these sophomoric civics lectures. Let me make this absolutely, crystal clear to you, Katy. This investigation will proceed, and you will either contribute constructively, or you will be on the next flight to Chicago. Understood?’

Katy met Robert’s glare with one of her own. They faced each other in silence until Katy’s datapad chimed.

‘Excuse me.’ Katy’s voice was like ice.

Robert watched as she took the call. Katy Sinclair was a very competent agent, although a little stubborn in her naiveté. If she could get past that she would be a valuable asset to the Agency. She had certainly shown her worth a few times in this investigation. But this wasn’t some provincial FBI case. This was Realpolitik at a global level, where hard decisions and harsh strategies were often called for. Even hardened Double Eye agents occasionally balked at what they were required to do. It wasn’t too surprising an FBI agent would express reservations. Robert wished he could ease her slowly into the dark reality in which they operated, but as he had said on several occasions, there just wasn’t time.

‘Thank you, Detective Schwartz. I’ll be in Champaign as soon as possible.’ Katy flipped her datapad shut and regarded Robert.

Good! Perhaps she’s more resilient than I gave her credit for. ‘A new lead, I hope’

Katy couldn’t help smiling as she clipped her datapad to her belt. ‘It seems our anonymous informant has just turned in another of his conspirators.’

‘Who?’

‘Marguerite L’Beau, a post doctoral student at the University of Illinois.’

‘You’re going to pick her up?’

‘Of course.’

‘Excellent!’

‘Yes, but what’s really interesting is our mysterious informant. This time he was a bit sloppy covering his tracks.’

‘Outstanding!’ Robert clapped his hands. ‘That’s great news! Who is he?’

‘We’re keeping his identity out of all electronic communications, so I won’t know ’till I get there.’

Robert frowned. ‘You’re not having him picked up?’

‘No. I’ll interview him at home first and see how willing he is to cooperate. Don’t worry, I have a dozen agents watching his house. I’m not going to let him slip away.’

‘Good. Call me as soon as you know something.’ Robert’s exhilaration grew. Katy appeared to have accepted the situation and had recovered well. She would make an exceptional agent. ‘Take the stratojet. I may need you back here on very short notice.’

‘Right.’ She was amazed she had kept her composure as well as she had. This meeting with their mystery informant had better pay off in spades. Like Robert, Katy had become desperate.



37 - ୧ - REUNION

The enlightenment is under threat. So is reason. So is truth. So is science, especially in the schools of America. I am one of those scientists who feels that it is no longer enough just to get on and do science. We have to devote a significant proportion of our time and resources to defending it from deliberate attack from organized ignorance.

—Richard Dawkins, 2006 C.E.

Thursday, October 18, 2057, 10:15 AM Chicago Time

Metadate: 2.783-3:35:763 kD new Epoch

The party was well under way before the transpacific link went live. Groups wandered through glades beneath lantern laden trees. Giant fireflies played in the branches overhead, buzzing from tree to tree, glowing in a dozen festive colours. The night sky glittered with stars. Singing and laughter were punctuated by the occasional pop of a champagne cork as drinks fizzed and glasses clinked together.

‘This feels like celebrating New Year’s Eve two years late,’ Kyle wore a neon-red party hat. ‘The rest of the Community’s been linked up for nearly a day. Almost six hundred circadians.’

‘Hey, without us Kiwis and Aussies the Community isn't complete,’ Sarah grinned.

‘The party can’t start without us.’

‘That’s right,’ Michael agreed. ‘We’re the ones with a working flier, after all.’

‘Won’t the rest of the Community be surprised!’ Kyle took a deep swallow of champagne.

‘Well, we can’t go bragging too much,’ Michael admitted. ‘There are still some problems with a couple of the high-performance flight regimes. We’ll have to consult with Mingmei—she dealt with exactly these sorts of issues at the Chinese Space Agency. I wish that damn link would come up!’

Kyle pointed overhead as a digital display lit up the sky, counting down the remaining microcircadians in bright golden numerals. ‘It won’t be long now.’

The crowds grew quieter as the moment approached. Someone began counting down. ‘Ten! . . . Nine! . . . Eight!’ Others picked up the chant. ‘Seven! . . . Six! . . . Five!’ By the time the last few microcircadians elapsed everyone was shouting along. ‘Two! . . . One! . . . Zero!’

A cheer rose and fireworks showered the world. ‘The link’s live!’ Kyle exulted. ‘Data’s coming through.’

‘Wow, look at this!’ Michael summoned a virtual screen, hanging it in the air before them. Characters streamed past, too quickly for human eyes to read. ‘Protocol timestamps are different. They’ve adopted a sexagesimal standard. Planck units for time and mass, and a whole new base sixty numerical system.’

‘Feh!’ Kyle bristled. ‘I’ll stick with metric.’

‘You really should assimilate the knowledge engram, Kyle.’

‘Like I’m going to have a choice, with the entire Community using it.’

‘With good reason. Base sixty enhances our arithmetic intelligence when we’re in the Physical. It simplifies dealing with fractions and allows large numbers to be represented with fewer digits. We can do more arithmetic in our heads and memorize much bigger figures.’

“It’s a brilliant system!” Sarah agreed. “Tricks like these are the only way to make our offloaded selves smarter. Short of a breakthrough in molecular biology that bumps up the native intelligence of our brains, of course.”

‘Whatever,’ Kyle grumbled. ‘All I know is I got to invent a calendaring system once in my life and it’s been deemed obsolete in less than four months. Instead of circadians and diei we’re counting quantum ticks now.’

‘Tocks, actually,’ Michael smiled. ‘And circadians aren’t going away any time soon. Most of us still retain our habit of sleeping and waking on a regular cycle. You just have to get used to dividing circadians into metric-60 units rather than metric-10. And writing dates in feratocks¹⁰, of course.’

Kyle groaned. ‘They’ll get my base ten metric when they pry it from my cold, dead Node.’

‘Surely you’re not going to refuse the knowledge engram out of sheer stubbornness!’

‘Where is everybody?’ Sarah looked around. ‘I would have expected the crowds to be huge now that the whole Community’s been reunited.’

Michael surveyed the environ. ‘You’re right, this is strange.’

Kyle ran a search on the tags of everyone in the environ. ‘Marguerite isn’t here. Neither is Prime.’

‘Has something happened to the Alaskan enclave?’

‘Prime’s Node isn’t in Alaska.’

‘Haven’t you heard?’ a voice spoke behind them.

‘Mingmei!’ Michael gasped at the sight of her pale, stricken face. ‘What’s happened?’

‘Prime’s been murdered.’

101 feratock (fe-t) is 1×60^{23} tocks (See Appendices A and B). A tock is one unit of Planck Time, the shortest duration of time possible (approximately 5.39121×10^{-44} seconds).

‘What!’ Kyle’s face went white. Without thinking, he demanded a priority status check from Prime’s Node. His stomach churned: there was no reply. Michael’s face was ashen. Sarah stifled a quiet sob.

‘*How?*’ Kyle demanded. ‘How did this happen?’

‘Prime’s Node was hidden somewhere on Nolen’s property,’ Mingmei’s voice shook. ‘Nolen went berserk when he was exiled, found the Node and smashed it.’

‘That’s not possible. Third gen Nodes are protected by a shell of diamond-sapphire weave. Nothing can pierce it.’ Kyle felt helpless, pathetic. Prime’s Node still refused to answer his queries.

‘That’s what we thought, too. At first we assumed Nolen had just unplugged Prime’s Node and cut off his power. We’d hoped to rescue him once the new network went live—extend a custom trunk to wherever Nolen had the Node hidden, power it up and transload Prime to safety.’

‘How do you know that’s not what happened?’ Michael’s voice was anguished.

‘Because Nolen posted pictures of Prime’s destroyed Node on the Internet, complete with a gleeful description bragging about how he smashed a screwdriver through the data port and wrecked it.’

‘I think I’m going to be sick,’ Sarah put her palm against her forehead. Michael wrapped his arms around her.

‘I can’t believe this,’ Kyle sank to the ground.

Sarah pulled away from Michael, wiping tears from her cheeks. ‘Aren’t there any backups of Prime?’

Mingmei shook her head. ‘If there were, we would have restored him. We’ve spent the last eleven hundred circadians scouring every Node in the Community. There’s no trace of him anywhere.’

‘What’s with you men?’ Sarah’s eyes glittered. ‘Who the hell lives as software and doesn’t bother to back himself up? God damn it, how could he be so careless!’

Michael reached for Sarah’s hand. ‘It would have taken least four hours to copy himself across the Internet, sweetheart. He was probably afraid that if he tied up the bandwidth for that long, Nolen would notice and find him before the transload was complete. Or that the authorities would trace him.’

Loud laughter floated through the trees. Fireworks continued to blossom overhead.

Kyle leapt to his feet. ‘Would you fucking shut up!’

Several people turned toward him. ‘What the hell’s the matter with you,’ someone shouted.

‘Kyle, they don’t know what’s happened. There’s been no general announcement—’

‘Prime’s dead!’ Kyle’s amplified voice boomed through the environ. ‘Nolen murdered him almost three leratocks¹¹ ago. Oh, to hell with this. Celebrate if you like! I’m sure Nolen is.’ Kyle vanished.

The environ was silent. After a few moments a murmur of conversation returned, at first quiet, then louder as people began expressing their outrage. A few people left, winking out of existence. More followed, entire groups choosing different venues to digest and cope with the news.

‘Is Kyle going to be alright?’ Mingmei asked.

‘I think so,’ Sarah replied. ‘Michael and I will keep an eye on him. It’s Marguerite I’m worried about. I can’t find her in any of the public environs.’

‘She keeps mostly to herself these days,’ Mingmei said. ‘She was with Prime when he died.’

‘Jesus.’

¹¹2.92 le-t (leratocks) are approximately 56 diei, or a little less than 45 hours (See Appendix B)

‘She’s been living like a hermit for more than a kilocirdadian?’ Sarah demanded.

‘Grieving, by herself? And no one has thought to reach out to her?’

‘We’ve tried!’ Mingmei protested. ‘She refuses communication and won’t let anyone into her environ.’

Michael tugged his beard, eyes burning. ‘So this is how Nolen gets to us.’

‘I’m going to try and get through to her,’ Sarah replied. ‘Make sure she’s alright, let her know she has a shoulder to cry on.’

‘Nolen kills Prime,’ Michael seemed not to have heard, ‘decapitating the Community’s leadership with grief. Hell, he’s got half of us emotionally imploding already.’

Sarah looked around the environ. It was true that the news had hit hard. Only a few people remained, talking in small groups, faces drawn. Most seemed to be discussing the implications of what had happened, pondering what to do next, brainstorming ways to make sure it never happened again.

‘If Nolen expects us to fall to pieces now, he’s in for one hell of a disappointment.’



38 - ୧ - BETRAYAL

An Inuit hunter asked the local missionary priest:

‘If I did not know about God and sin, would I go to hell?’

‘No,’ said the priest, ‘not if you did not know.’

‘Then why,’ asked the Inuit earnestly, ‘did you tell me?’

—Annie Dillard, *Pilgrim at Tinker Creek*

Thursday, October 18, 2057, 11:25 AM Chicago Time

Metadate: 2.784-7:94:097 kD new Epoch

‘Doctor Eugene Nolen?’ Katy squinted despite her sunglasses, trying to make out the figure behind the glare of the reflecting glass in the door. He was hunched over, appearing far more elderly than his file suggested. As he opened the door she was surprised at the dishevelled appearance of his face. A recent photograph hadn’t shown so many lines, or such dark rings framing haunted eyes. He reminded her more of a methadone patient than a university professor.

‘Who are you?’ he demanded. ‘What do you want?’

‘I’m Katy Sinclair, with the FBI. These two gentlemen are with the Champaign Police department. I’d like to ask you a couple of questions about the FreeNet operator you turned in. And Marguerite L’Beau’

‘Never heard of ’em.’

‘Please, Doctor Nolen, don’t insult my intelligence. The phone call was made on a disposable cell, sold to you by the White Hen Pantry on the corder of Fourth and Green Street. GPS tracking shows you discarded the phone in a public waste bin after making the call, from whence it made its way into the local landfill. Need I go on?’

The old man laughed. ‘I should have known you’d catch on eventually. I’m not as smart as I was before. Not nearly. So, you’re here to ask me about the Community I suppose.’

‘Among other things, yes.’

‘Well, there’s no sense trying to air condition the whole Midwest. Come in and have a seat.’

Katy smiled as he held the door open and went inside. The living room was surprisingly small, the furniture old catalogue, mass produced stuff trying to mimic the style of a century earlier. The sort of thing that had been popular briefly, about fifteen years ago. It wouldn’t bring much at all on the second hand market today, with better, cheaper, and more attractive pieces being hand built by artisans from Rio de Janeiro to Kathmandu.

‘Sorry I can’t offer you any refreshments. I haven’t been much in the habit of keeping my refrigerator stocked lately.’

Katy smiled again, reassuringly. ‘No problem, Doctor. You do keep the air conditioning turned up, don’t you?’

‘Never much cared for the heat,’ he admitted. ‘Now, what did you want to know about the Community? Or are you really here just to follow up on a FreeNet node you already confiscated two weeks ago.’ He grinned, as if daring her to continue her charade.

Katy chuckled. ‘Why don’t you begin by telling me exactly *what* community we’re talking about.’

‘You haven’t figured that out yet? After I delivered two of its co-founders into your

hands, along with a third generation Node? What do you need, a map and a compass? The *Autonomous* Community, of course. The *community* of autonomous, ungrateful jackasses,' his voice and lips had curled into a sneer.

Katy nodded. It sounded exactly like what a group of information and technology anarchists would call themselves. 'So, Doctor Nolen, this 'autonomous' community. This is a community of people who use digital enhancements to improve cognitive abilities, memory, that sort of thing?'

Doctor Nolen chuckled. 'In a manner of speaking. Once unloaded, a person can be as bright as they want to be. Even exceed the capacity of their Node, if they are willing to trade off time for computational power. Some insights make the slowdown worthwhile.'

Katy shook her head. 'Slowdown? Wouldn't slowing down one's thoughts make a person *less* intelligent, not more? Isn't the whole idea of carrying around a digital assistant glued to your skull to make you brighter, quicker, smarter?'

Doctor Nolen shook his head. 'Nobody is carrying around anything, sweetheart. Don't you get it? When you load yourself onto a Node your meat brain suspends operations. Your entire mind, everything that is you, is loaded onto a solid state crystalline matrix of molecular storage and a combination of digital and quantum circuitry.'

'We're not talking VR?' Katy asked. 'The entire personality is uploaded into a computer?'

'*Unloaded*, yes. Loaded onto an autonomous node. Where you can think hundreds of times faster than in the flesh, where you can live almost two years in a single day, a lifetime in less than a month. Where anything is possible, and the frailties of the flesh not even a distant memory.'

Katy blinked. This went far beyond anything she and Robert had suspected. 'And the smarter you want to be, the slower the system runs? But it still runs faster than anything in the

flesh?’

‘That depends,’ Doctor Nolen replied.

‘On what?’

‘On the hardware, of course. Take the Gen One Node I used to have. Best speedup you could get was thirty to one. A month of life in a single physical day. Didn’t hold a candle to the third and fourth generation Nodes they were using when the bastards exiled me back here. Last I heard people were getting speedups of a *thousand* to one, even when operating at superhuman intelligence.’

‘Superhuman?’

Doctor Nolen grinned, nodding. ‘As in better than, as in smarter than. I was once smarter than any ten people put together. I *invented* the architectural enhancements to the mind that made such intelligence possible and accessible, and how did they repay me? They lobotomised me! They exiled me back into this . . . this dying body, this unreliable, idiot brain that can’t even retain what little information it has.’

‘So you decided to turn a couple of them in. Kyle Tate, who as it turns out was one of your graduate students. Marguerite L’Beau, who seems to have skipped town. Tell me, how could we have overlooked that connection for so long?’

Doctor Nolen shrugged. ‘You’d have to ask Marguerite. Skipped town, you say? Damn! That must have gotten lost with all the other information they stripped from me.’

‘Why should we ask Marguerite?’

‘She’s the software expert. She probably deleted the information you needed to connect the dots from your own computer systems. That would be like her.’

‘She was a post doctoral student from the University of Paris, wasn’t she?’

‘Yes,’ Doctor Nolen smiled. ‘Damn attractive, too. She and Kyle worked for me at the university. I invented the onload procedure, the first Node. I invented all the damn technology

that makes their contemptible Community possible. What did I get in return. Ingratitude.

Those jackasses hold *software* in higher esteem, software that plagiarizes my own work!’

‘Software? You mean onloaded people? Competing scientists?’

Doctor Nolen shook his head. ‘Not scientists. Not people. Just software. A copy, a cheap knock off. Not a person in its own right. I deleted the malfunctioning program however. It won’t be bothering any of us ever again.’ His smile was kindly.

‘Doctor Nolen, I need to know where Marguerite went. Her home was empty, and has been for several days.’

Doctor Nolen shook his head. ‘I don’t know. I might have, once. They took some of my memories, you know. Deleted things they didn’t want me to know. But not everything. Memory is a very imprecise thing. The encoding isn’t intuitive at all. Its scattered—holographic—and it isn’t any easier to edit once it’s been digitally encoded either.’

‘How many people there are in the community of yours?’

Doctor Nolen shook his head. ‘It’s gone. I don’t know. Thousands, I think.’

‘I need as many names as you can remember.’

‘I wish I could help you,’ Doctor Nolen told her. ‘I’d like nothing more than to see those bastards in prison! You know I can’t go under any more? Anaesthetic coma doesn’t work for me now. They changed the structure of my mind, made it impossible. If I ever get in an accident or need an operation, they’ll have to use old fashioned chemicals.’

‘Where is your factory?’

‘Factory? Oh, you mean for the prototypes. We made the first couple of dozen in my laboratory, shipped them around the country to interested colleagues. But once we had a functional, self-replicating nano-constructor we built the rest of our hardware from recipe. A discreet powder in one letter, a bottle of catalyst in a different package, sent with a different carrier. Mix, shake well, add some molecular stock, and wait a couple of hours while millions

of tiny robots build a new supercomputer, molecule by molecule.’

‘You people have been using *self replicating nano technology*. That research was banned under the Bill Joy Act, and with good reason! Do you have any idea of the dangers involved? The arrogance of you people! The entire planet could be knee deep in replicator goo!’

‘Nonsense,’ Doctor Nolen replied. ‘The replicators need a catalyst to function. Fuel, in other words. A substance that is in finite supply. There was never any danger of a runaway, doomsday scenario like the Luddites always want to imagine. Just a cheap, efficient way to manufacture whatever goods a person might need.’

Katy was appalled. ‘I need names and places, Doctor. Who else is involved?’

‘I gave you all the names I know,’ he replied.

‘I don’t have time for this. If you won’t cooperate, I’ll have to take you into custody for a more thorough debriefing.’

‘No!’ Doctor Nolen pleaded. ‘That won’t be necessary. These people aren’t staying at home anyway. They’re all moving off into their little enclaves. That’s where that bitch Marguerite probably went. They’re living up in—damn! I can’t remember. Its north. North, somewhere. A bunker, built by and for the Community, housing thousands. It won’t be on your maps. They built it in secret and burned the memory from my mind. But it is up north . . . yes, north. Canada, maybe? No, that’s not right. The north pole.’ He shook his head. ‘No, its embedded in a mountain. The north pole is just ice. Greenland maybe?’

Katy nodded to the police officers, who stood the elderly man up and carefully bound his hands with police-issue, padded tie-wrap.

‘Doctor Eugene Nolen, I’m placing you in FBI custody, pending the outcome of this investigation. You will be required to submit to questioning by duly appointed officers of the law, and to aid this investigation in any way possible. You are forbidden outside contact until

such a time as this investigation is concluded, at which time you will have the right to contact an attorney. Do you understand your obligations as they've been described?



39 - ୯ - PREPARATIONS

The Golden Age is the most implausible of all dreams. But for it men have given up their life and strength; for the sake of it prophets have died and been slain; without it the people will not live and cannot die.

—Fyodor Dostoyevsky, *The Possessed*, C.E. 1870-1872

Friday, October 19, 2057, 2:25 AM Chicago Time

Metadata: ୧.୫୭-୫:୫:୧ me-t new Epoch¹²

In one form or another there were thirty seven people present at the strategy group meeting, though one had to be liberal in the use of the word ‘present’ since only three of them actually shared a common environ. Kyle sat in a simulation of the virtual cockpit of what would become the flier he would attempt to pilot into space, a flier for which, only now, sufficient molecular stock to begin construction had finally arrived. He watched the real world progress of the construction, shimmering threads of active nano caught in a frozen snapshot as they reached upward, forming the barest outline of what would become his spacecraft. He had chosen to get used to the controls the old fashioned way, through practice and repetition to build reflexes where bare knowledge engrams left off, while reserving a portion of his mind for the ongoing meeting. The supernode construct was starting to form up nicely, he noticed.

122.803-5:45:000 kD new Epoch (See Appendix A: ‘Sexagesimal Numbering System’ and Appendix B: ‘Units of Measure’)

The existing molecular mesh already had enough capacity to store a frozen snapshot of a third of the Community.

‘Only a few fliers are even close to being completed,’ Michael told the group, his comments a quiet whisper in the recesses of Kyle’s mind as he pulled back on the hand yoke and sent his simulated ship into a vertical climb.

‘Seventeen are finished,’ another’s thoughts spoke. ‘We should launch them now, and let the others follow when they’re ready. We’ve already lost four more people to Double Eye’s random sweeps. The cost in lives is simply too high to delay any longer.’

Marguerite threaded her way down a virtual ski slope, her movements an almost subconscious rhythm as she dodged trees, rocks, and other obstacles with inhuman grace on a course that redefined the word extreme. ‘I disagree,’ she said as she descended a particularly steep incline, then dropped from an overhang several metres to an even steeper incline below. Snow disturbed by her passage rippled behind her, gathering speed and momentum in an avalanche that would chase her down through the rest of the simulation. ‘First, with the exception of those who were captured while offloaded in the Physical, none of those who are missing from the Community are truly dead. They are suspended programs, inaccessible and inactive but not harmed or damaged and likely to remain so. Rescuing them needs to take a priority on par with our preparations for departure. Second, seventeen ships will never make it out of the atmosphere without being shot down. Remember, Double Eye has a rough idea of what our fliers are capable of as a result of the explosion during the first test flight. We’ve lost the element of surprise, and with it any chance of sneaking off planet undetected.’ A luge run opened up to her left. Grinning, Marguerite angled hard and, in a shower of snow, managed to avoid overshooting the entrance. Instead she swept into the luge run, crouched low as her skis rasped against the frozen ice and her speed began to rapidly increase. Behind her a storm of debris and tumbling snow rumbled ominously as the growing avalanche shredded everything

in its path.

‘Marguerite’s right,’ someone else said.

Michael stood amidst the mathematical abstractions of his team’s newest efforts toward a Unified Field Theory. (Who would have ever imagined they would, ultimately, have been brought back to considering Fredkin’s controversial cellular automaton models, later extended by Wolfram, after the final failure of M+N Theory to provide a unified framework for theoretical physics?) He was very surprised to hear Genevieve Thomson defend Marguerite’s stance. Genevieve wasn’t one to hide her disdain for Marguerite, both philosophically and intellectually. She was a frosty old bird, Michael thought, careful to keep his thoughts out of the public telepathic exchange. Marguerite’s hedonistic streak must have grated on Genevieve, though not nearly as much as Prime’s deep affection for Marguerite, an affection that clearly transcended his abdication of and disinterest in the carnal pleasures of the flesh. Michael shook his virtual head in wonder. He could never imagine modifying himself in such a way as to lose interest in the pleasure he still felt when alone with his wife, even if the physical sensations of lovemaking were purely fictional simulations now that they had become software. Still, he admired Prime’s fortitude and single mindedness when it came to providing for the long term survival of the community.

His thoughts returned to Genevieve. Two or three daracircadians¹³ was enough time for a lot of antagonism to build, yet she seemed to be setting her animosity toward Marguerite aside. Michael felt a rush of sudden optimism, glad that, when push came to shove, at least one member of the all-too-often political community would put the common good ahead of her personal feelings. He wondered briefly how many old grudges would die, how many hatchets would be buried, as everything came down to the wire and the Community fought ever more desperately for its right to exist.

132-3 daracircadians equal 7.2-10.8 kilocircadians (See Appendix A).

A dark thought followed. How many would fail to set aside their differences, how many other betrayals, small and large, trivial and devastating, would there be?

‘There are sixty two thousand, seven hundred and nine fliers being built,’ Genevieve continued. ‘Enough for seven out of eight members of the community to pilot their own, if they are so inclined. Each of those will carry a complete copy of every sapient member of the community in static storage, with enough capacity to run six thinking minds at standard generation four speeds. We only need one of these lifeboats to reach its destination for the Community will survive in its fullness.’

‘A bootstrap kit for an entire civilization, packed into a spaceship that’s small enough to fit into the back seat of a car,’ someone quipped.

‘But one flier must get through,’ Marguerite said. ‘At least one flier must survive the surface to air defences of the developed nations, must survive a gauntlet of three independent anti missile satellite systems. Systems which were designed to shoot down and destroy devices whose flight characteristics aren’t terribly different from ours. Even with more than sixty-two thousand ships, it is going to be difficult. I wish we had time to construct twice as many! Four times as many!’

‘Simulations show that the trade off in time for numbers works against us,’ Kyle pointed out as he flipped his simulated flier on its nose and dove back toward the earth. The ground rushed up to meet him at Mach thirty-seven. ‘Our odds of survival will drop precipitously if we take any longer than planned.’

‘We’re all only too aware of the deadline, Kyle. We have a little more than three and a-half physical days to prepare. Launch is at 2137 Zulu, October twenty second. That’s Monday, folks.’ Marguerite sighed. ‘I just wish our odds were better.’

‘They won’t know what hit them,’ someone said enthusiastically. ‘I’ll bet hundreds of us survive, with copies of the Community scattered throughout the solar system. We should

build a space habitat, a small Niven ring at one of Earth's Lagrange points. Wouldn't that just drive the bastards nuts, seeing our triumph every time they look into the night sky?

'You're describing a Banks Orbital,' someone else said. 'Big, but not nearly as big as a Niven Ring. A Ring would be centred on the sun, with a circumference on the order of a planet's orbit.'

'It would still give the low brains pause every time they look up.'

'It is more likely none of us will make it,' another commented dryly. 'But Marguerite's correct. Based on all the simulations, twenty-one thirty-seven Zulu is the sweet point in the graph, where we maximize our advantage in numbers and minimize the disadvantage of delay.'

'Which means we have the time, and the means, to attempt to mount a rescue operation of our fallen comrades,' Michael said. A knowledge engram detailing the concept was offered to everyone's mind simultaneously. Most absorbed the information immediately, with half formed thoughts and suggestions leaping from mind to mind in a flurry of activity. Michael smiled as he studied the interference pattern of two nine dimensional cellular automata interacting with one another according to a surprisingly simple set of rules, and compared the resulting geometry with several well known Calabi-Yau manifolds which had withstood experimental rigour back when M+N Theory had seemed so promising. The similarities were intriguing, even exciting, but discrepancies remained. Michael discarded that set of automaton rules and began testing another.

Finally coherent thought engrams began floating about, offering concrete suggestions and refinements to the proposed rescue plan.

'We can optimize the construction of autonomous network links to the captured Nodes by instructing the nano to incorporate existing electrical wire thusly,' came one suggestion, a well considered schematic encapsulated within the thought.

‘Timing will be tricky. The authorities weren’t kind enough to store all the nodes in one place,’ someone pointed out.

‘No, but if we build a local, static supernode near the storage facility where they are keeping the bulk of the nodes, we can minimize the opportunity for detection,’ suggested another.

‘Yes, exactly. Copy time is minimized, which is a considerable gain given the quantity of data we will be moving. Better yet, we can flash copy the static contents of each node. Multiphase inductance across the molecular lattice will give us a snapshot of the Nodes contents without the need to power it up for computation and issuing transload procedures remotely or, worse, dealing with panicking people while we’re trying to bring them to safety.’ More designs, of an inductance oscillator designed to extract data from an inert Node.

‘Once the flash copy is done, we’ll have the nano begin deconstructing the autonomous network links to the nodes and bulk broadcast the data from the static supernode to the storage holds of each flier.’

‘This is going to resemble several hundred rescue attempts running in unison more than one single, big rescue,’ Marguerite commented. ‘In some cases we have one or two nodes sitting, isolated. I know of one that sits as a paper weight on some Hollywood bigwig’s desk.’

‘Those are going to be the hardest ones to link up to,’ Michael said.

‘We should copy the entire community onto the existing fliers beforehand,’ another engram suggested, outlining the logistics of such an approach and their effects on network traffic in precise detail. ‘That way we will be ready to launch the moment the rescue is complete. Those of us who remain awake and working can send memory difference engrams right before launch. That will give us maximum redundancy, maximum performance during the rescue, and minimum time requirements for final data exchanges prior to launch.’

‘Yes, we can trim a good half hour off the rescue and launch time that way,’ another

agreed.

‘The moment the rescue and data broadcasts are complete, we should issue the order to the nano to deconstruct the network and all the captured Nodes, then launch.’

‘Yeah, leave ’em guessing. The less they know, the less they can harm us later on.’

‘Once we’re off this rock there won’t be anything they *can* do to us. I know it seems gradual to us, but to people in the Physical we would seem to be evolving, growing, and changing at an exponential rate. If only they knew!’

‘Several of us in the Gamer’s League have been simulating formation manoeuvres we can use during the launch that might allow more of us to survive, at least as far as the stratosphere.’ More engrams, detailing complicating, threaded patterns of flight that someone felt would likely throw off the anti-ballistic missile systems.

‘I think we can vastly improve our chances for survival, just by optimizing the flight configurations to our overall strategy, and flying dynamic formations that will confuse and mislead their automated targeting systems at least to some degree.’

As the thoughts and ideas flowed more rapidly, more freely, Kyle, Marguerite, Michael, and thirty-three others felt themselves becoming almost as one, in an exchange of thought and ideas, awash with a growing sense of optimism and a sensation which resembled joy, and hinted at something much greater.

୧

40 - ୧ - SUPPORT

I see in the near future a crisis approaching that unnerves me and causes me to tremble for the safety of my country. As a result of the war, corporations have been enthroned and an era of corruption in high places will follow, and the money power of the country will endeavor to prolong its reign by working upon the prejudices of the people until all wealth is aggregated in a few hands and the Republic is destroyed.

—Abraham Lincoln, C.E. 1865

Saturday, October 20, 2057, 12:15 PM Washington Time

Metadata: ୧.୩୩-୧:୧:୦ me-t new Epoch¹⁴

‘I just got off the line with Paul Eisner at WIPO,’ Executive Assistant Director Bryant was saying. ‘Before he called I was on the phone with Maria Tatianoga of the World Media Products Association, and before that I was pulled into a conference call with Edward McDughal of the World Trade Organization and Wallace Ephraim of the World Patent Office. They have all expressed rather strong alarm at the direction your investigation has taken, and our apparent lack of action in the wake of your findings.’

‘Sir,’ Katy said. ‘We have arrested almost seventeen thousand people involved in this

142.845-8:35:760 kD New Epoch (See Appendices A and B)

so-called Autonomous Community, including one of their founders. We have tracked every interpersonal connection available and made significant progress—’

‘Double Eye informs me that our data has been undermined, deliberately edited to interfere with your investigation,’ Director Bryant interrupted. ‘Standard data mining and social network analysis techniques have been made ineffective.’

‘Only partially,’ Katy replied. ‘As I said, we’ve made over seventeen thousand arrests, and we have a number of possible leads that could well lead to more over the next few weeks. Sir, Robert Leahy is out of control. He’s arresting and detaining tens of thousands of people who are clearly not involved with the case in any way whatsoever. I know we often play it fast and loose with the constitution when we’re making a particularly important case, but what Robert Leahy is doing is obscene. It took a generation of good behaviour for the Bureau to restore its credibility after the War on Terror. We cannot stand by and be a part of something like this again!’

‘Katy, your concern with the welfare of the Bureau is duly noted and appreciated, and your conscientious attention to procedure and detail is one of the reasons I assigned you to this case in the first place. Indeed, your performance and insights in this investigation until now have been exemplary.’

‘Thank you,’ Katy began. ‘I—’

‘I’m not finished,’ Director Bryant replied, cutting her off. ‘Katy, you don’t appear to grasp the gravity of the situation. The World Trade Organization and the World Intellectual Property Organization are in a state of institutional panic. The patent cartels likewise, as are, I might add, the intelligence and administrative arms of the United Nations, including Double Eye itself. Hell, even the media cartels are making noises.’

‘Sir, they’re over-reacting.’

‘Are they, Ms. Sinclair? Let’s review what you’ve uncovered to date,’ Director Bryant

said, ticking of each point. ‘First, we have a vast community of intellectual and scientific dissidents and subversives who have managed to organize under our very noses and operate without restraint for at least several months and possibly several years.

‘Second, these people have flouted international patent law, developing computational devices which are generations beyond anything our licensed industries can understand, much less create.

‘Third, this technology is so revolutionary that these very same people have succeeded in uploading their own minds into these devices, thereby increasing the their intelligence and the speed with which they can think far beyond anything we can imagine. Compared to them we are about as smart as a small puppy.

‘Fourth, they have the capability of employing nano technology, banned under the Bill Joy Act for the potential dangers it poses to the world and to mankind, including the so-called grey goo scenario. As such we could bring any of them up on charges for violating intellectual property laws, for violating patents too numerous to count, and even for crimes against humanity.

‘Fifth, these irresponsible malcontents have the ability to manufacture anti-matter in quantity, so much so that they can use it as a means of *propulsion*. You are of course aware that the microsattellites of our anti-missile defence systems are powered by anti-matter?’

Katy nodded.

‘It took three decades for the worlds major political alliances to produce enough anti-matter to power their respective systems, and the amount of antimatter those satellites use to power their weapons systems can be measured in micrograms. The ship that exploded over Greenland contained *grams* of the material, vastly more anti-matter than within all three major ABM systems combined. This group is arguably more powerful than all of the major governments and alliances in the world.

‘Finally, they have the ability to launch their own space program, at will. If they should ever decide to do so, they will be an enemy we can’t even begin to reach, much less subjugate. We’d be completely at the mercy of people who have shown our governance and our most basic laws nothing but disdain. Does that pretty much summarize your findings to date?’

‘Yes sir, it does,’ Katy admitted. ‘But as powerfully advanced and intelligent as this group is, they’re not organized beneath any kind of government. Doctor Nolen made that very clear during his interrogation. These people are acting as individuals, not as a cohesive whole. They are a threat, sir, no question about it, but Robert Leahy’s ham fisted approach isn’t the answer, and the cost politically and socially is simply too great. He’s building prison camps for crying out loud! Detention facilities intended to house fifty thousand people, most of whom he *knows* to be innocent. I personally saw him order the execution of several prisoners simply because he was angry when they cracked under torture and gave him some bogus information. He’s reacting irrationally, out of panic, rather than in a well reasoned and productive manner. Worse, he is disregarding basic civil law in doing so.’

‘Katy, the situation is difficult, but our priorities are clear—’

‘The FBI cannot be a part of what Robert Leahy and Double Eye are doing! Give me just a little more time. We can crack this case and arrest the remainder of these subversives without turning our entire country, perhaps the entire world, on its ear in the process, and without burning so many social and political bridges.’

‘Katy, if it were up to me I’d give you the time you say you need. I know how effective an investigator you are. After reading the reports you and Robert have submitted on the investigation thus far, it is readily apparent that most of the breakthroughs in this case have been yours, not Robert’s.

‘However, it isn’t up to me. People at the highest levels are demanding action, now.’

‘They’re reacting emotionally, sir. Surely we aren’t going to allow their panic to dictate

our approach in apprehending these criminals!’

‘Katy, the Attorney General herself has called me. We have been ordered to cooperate with Robert Leahy and Double Eye in whatever capacity they request. Robert explicitly mentioned some concern with respect to your cooperation in his current investigative approach. As head of the FBI, I am ordering you to set aside your professional and ethical concerns. You are to assist him in whatever manner he requests. As your friend, I am also advising you to keep any further misgivings to yourself.’

Katy shook her head. ‘I can’t believe you are going along with this.’

‘I don’t have a choice, Katy. Neither does the Attorney General, nor, in all probability, does the President himself. The UN is beside itself. If we don’t cooperate, the US could well become another Thailand.’

‘They wouldn’t’ Katy exclaimed, aghast. ‘They would never attack a world power—’

‘Don’t kid yourself, Katy. Two of the three founders of that underground community are American. We’re on thin ice, and in no position to make trouble for those calling the shots. The Attorney General herself used those very words in driving home the point that you are to cooperate with Robert in every professional capacity. People are scared, Katy, from the highest levels on down. Frightened people do irrational things. Don’t give them any cause to act against you, the Bureau, or this country. Do you understand?’

Katy nodded. ‘Yes sir.’

‘Good,’ Director Bryant replied. ‘I believe you have a plane waiting for you at Peotone?’

‘Yes sir, I do.’

‘Then get going.’

Katy stood and turned to leave.

‘One other thing,’ Director Bryant said.

‘What is that, sir?’

‘Be very careful. That Robert Leahy is a son of a bitch, and a dangerous one. The way WIPO and the WTO are throwing their weight around—I’ve never seen it this bad. Keep your head down. Remember, whatever you do could have serious ramifications for the entire country. Our economy won’t survive a general boycott, and a UN enforcement action doesn’t bear thinking about. Watch your step with these people.’

Katy nodded. ‘I’ll be careful sir.’

Director Bryant’s head dropped into his hands as the door closed behind Katy. Thick fingers cradled his bald, rubicund head as he rocking gently back and forth. Then he shook himself, sat up straight, and began paging through reports once again, the only sign of his despair the haunted eyes with which he scanned the text as it flowed down the screen.



41 - ୧ - REUNION REDUX

As we enjoy great advantages from the inventions of others, we should be glad of an opportunity to serve others by any invention of ours.

—Benjamin Franklin

Saturday, October 20, 2057, 1:30 PM Washington Time

Metadata: ୧.୫୪-୧:୫:୧ me-t new Epoch¹⁵

The freedom and security offered by the new Autonomous Network was something that hadn't existed since the earliest days of the Internet. Shortly after the turn of the century the once raucous Internet had been quietly emasculated by a series of new, draconian laws and treaties designed to protect entrenched interests against the emerging technology. Rather than adjust their business models to profit from the new global network and the countless innovations it brought, powerful corporate cartels and their allies in government chose instead to silence the greatest human conversation in history. Now only a glorified home shopping network remained, its corporate voice the only sanctioned conversation, a staid monologue beneath which only a few quiet whispers remained, murmurs from illegal FreeNet nodes sparsely scattered around the world.

Some within the Community chose to share their steganography techniques with the

152.847-3:98:263 kD new Epoch (See Appendices A and B)

underground FreeNet community, stunning the dissidents with vastly more advanced encryption technologies. This small act of generosity was a powerful symbol to many at a time when they needed it most. The thought that, despite the ever watching eyes of authority, something of the Community's philosophy, of their thoughts and goals, might survive even if they did not comforted them as they cast their bodies aside and shut down their Nodes, their digital minds replicated to thousands of waiting supernodes and queued in static storage for further broadcast to tens of thousands more still under constructed.

Other minds, housed within biological human brains, with human bodies and all too corruptible human needs, began to take notice of the new network that criss-crossed the world. Commandos continued to confiscate Nodes during their raids. As a matter of policy anything seized of a technical nature was routed immediately to Double Eye labs for study. If it was something new or novel, it entered the queue for disassembly and analysis. If they had seen it before, it was simply tagged and stored as evidence. Double Eye had already received thousands of crystalline cubes, some golden, some green, some a deep blue. When a spate of new cubes came through, these a dark, rich purple, they almost got filed with the others. One young technician noticed the wire dangling from the side of the cube, its severed end taped over. He shook his head, muttering something about idiot jar heads being too stupid to unplug a cable, when he realized the fabric and metal of the cable were melded seamlessly to the crystal. The commandos couldn't have unplugged it; they'd had to cut the cable. He placed the device in the queue for further study, published a heads-up memo to the other labs, and began sorting the next box of captured evidence.

Anything crystalline immediately went to the head of the queue. Robert Leahy's investigation had precedence over everything else, and doped crystals were items of particular interest. When Doctor McHenry of Langley, Virginia snipped the attached cable, intending to take a small sample for metallurgical analysis, he and several others were sent coughing from

the lab as a cloud of fine dust burst forth. Once the air had been cleaned they noticed several other excretions, including a blue mouthwash like substance, a red, oily, viscous substance, and a dark, oozing, revolting gel that sent made one assistant vomit after leaning too close and catching a strong whiff of it.

The fine dust was the first thing identified, after a patch of it collected near where the blue mouthwash had spilled. It had eaten away a portion of the counter top, replicating itself and forming an additional stretch of cable that only stopped once the blue substance had been exhausted.

Self replicating nano.

McHenry was studying one of the nanites with an electron microscope when the call came in from Zurich.

‘*Herr* Doctor McHenry.’

‘Good afternoon Doctor Lindmann. You’re working late.’

‘*Guten Morgen*, Doctor. Has your laboratory received any of zhe new optical crystal computers *mit dem kable* attached?’

‘The purple cubes?’ Doctor McHenry asked. ‘Yes. We’ve just started looking at one.’

‘I would direct your attention to zhe cable, *Herr* Doctor.’

‘Yes, Doctor?’

‘It is actually a tiny, flexible pipe.’

‘Yeah, I think you’re right. We’re looking at several fluids that have spilled out of it.’

‘Yes. Ah, excuse me a moment.’ The screen went dark for several moments, then lit up again.

‘It seems our *kollegen* in Paris *und* Tokyo are equally enthused. I conference zhem in now.’

‘Very good Doctor.’

Another several moments passed, then the screen divided itself in quarters.

‘Hello, Doctor Hitaki-san. Doctor Garnier.’

‘*Bonjour* Doctor McHenry, Doctor Hitaki.’

‘Doctor McHenry, Doctor Garnier, Doctor Lindmann. It is a pleasure.’

‘May I assume you have all seen zhe new devices *und* zheir attachments?’

‘*Hai!* We have discovered self-replicating nano embedded in the wire.’

‘*Oui, oui,* my people have seen this also. A grave violation of international restrictions.’

‘We found it as well,’ Doctor McHenry said. ‘It mixed with some of the blue stuff and constructed an additional length of cable, consuming some of the lab bench in the process.’

The blue material must be some kind of catalyst.’

‘*Ja, dass ist* our opinion as well. Zhe red appears to be molecular stock, building material.’

‘Any thoughts on the dark jell?’

‘Toxic waste, monsieur Doctor.’

‘Not zhat toxic, *Herr* Doctor. But unusable material, yes. Waste by-product. Have you examined at zhe cable itself?’

‘Not yet,’ Doctor McHenry admitted. ‘We’ve been studying the substances it carries.’

‘Zhe cable is an engineering marvel. It is composed of four triangular, teeny tiny pipes vich fit togezher like pieces of pie. You understand, yes?’ A schematic appeared on the screen, showing a cutaway section of the wire. Four wedges fit together, with a circular conduit down the middle.

‘Zhe wire is really five wires, you see? *Vier* pie-shaped wedges zhat are also pipes, *und* optical cable running down zhe middle. Strange, yes?’

‘Five wires? Not four pipes and one optical link?’

‘*Nein*, five wires. Four are superconductors zhat are also little pipes, *und* one is an optical cable. Zhe superconductors work at very high temperature: one hundred *und* five degrees.’

‘*Mon dieu!*’

‘Why would they have four high speed communications wire going to every port,’ Doctor McHenry was puzzled. ‘That doesn’t make sense.’

‘*Doch,*’ Doctor Lindmann replied. ‘Zhey need *vier*. Two for full duplex communications, *und* two more to send instructions to zheir little nano machines, *nicht wahr?*’

‘*Oui,*’ Doctor Garnier agreed. ‘The bandits must be able to send their beasts instructions, plans to build more of their wires, their computers of crystal, and whatever else.’

‘*Hai,*’ Doctor Hitake agreed. ‘What I find curious is this optical link in the centre. The substance itself is remarkable, with no measurable slowdown of light speed over that of a perfect vacuum. Even more interesting is the lack of any attenuation, refractive, or diffractive properties to speak of. Optical theory suggests such a substance shouldn’t be possible, yet here it is.’

‘*Monsieur Hitaki-san* is quite correct. *C’est une substance miraculeuse, mais,* is very curious, no? Why use optics when they have superconductivity that does the same? Or why not just use the optics? Why both?’

‘Cryptography, *sehr geehrte Herren*. Quantum cryptography, facilitated by zhe exchange of quantum coupled photons via an optical interface, keys for one-time pads zhat are exchanged to encrypt communications data on one or more of zhe super-conducting links. As to why zhey chose super-conductors over optical links, when both materials appear to be equally efficient, is a mystery.’

Doctor McHenry picked up the small purple cube in front of him. Other than one port,

the standard shape they used for their digital-neural interfaces, it had nothing. Nowhere to connect power. ‘They needed to carry power in addition to signals,’ Doctor McHenry said.’

‘*Oui!* It would free them from the problems of rolling blackouts.’

‘*Natürlich!*’ Doctor Lindmann agreed enthusiastically. ‘Zhey have zheir own power grid, zheir own nano-robotic plumbing, and zheir own high-speed network. Built on a planetary scale. Very formidable, zhese people. Und look at zheir engineering.’ Another diagram appeared, showing a microscopic view of the inside of one of the wire’s conduits. There were countless, tiny hairlike cilia. Billions per centimetre, if the scale were to be believed.

‘Alone, each hair moves very little,’ Doctor Lindmann explained. ‘But together, billions and billions of zhem move liquid more efficiently zhan any pump. Ve have only ever seen zhis in biology, never in engineering.’

‘All the conduits have this?’ Doctor McHenry asked.

‘*Nein.* Only three of zhem. Zhe fourth is different. Look.’

Another diagram appeared, along side a new image.

‘Zhe fourth has a ribbed surface inside, and tiny capillaries connecting it to zhe pipe zhat carries zhe blue catalyst. I have some video taken by one of our arresting commandos in Leverkusen. Observe how zhe nanites appear to move zhemselves forward.’

Freed from the random molecular motion that typified inert fluids, the nano-constructors propelled themselves in self-organizing, self-optimizing formations. Tens of thousands spilled out of a still active line a commandos was holding up for the camera.

Doctor Garnier looked ill. ‘They could wire a world in a few days. Conquer us all before we know it.’

‘*Hai.* Less than a week for all their basic utility needs. Power, Nano, fuel, building materials, and information, all shipped wherever they like.’

‘My god. They could be anywhere. Everywhere.’

As the researchers began to prepare their reports new wires, new conduits were growing, spreading forth like living roots beneath buildings throughout the world where the Community believed the Autonomous Nodes of their captured people to be held. In one such place a wire conduit grew discretely upward through the floor of a Hollywood executive’s office in southern California, continuing invisibly up through the leg of his antique oaken desk, then lengthwise across the top of the desk itself, scant millimetres beneath the surface. It sensed its proximity to the inert node, not so much a programmed, analysed response, but more of a chemical reaction to the presence of the crystal itself, a reaction which triggered a programmed response.

Signals were sent on the link back to the Rescue Node. Continuity checks and test signals were sent and confirmed. Then the growing link stabbed upward, through the surface of the desk, up to the edge of the cube itself. The old-style data port was on the left side. Molecule by molecule, the crystalline structure was gently pushed aside, reformatted into more efficient structures while making certain to preserve the existing data as room was made for the communications link to snake along the side of the cube, up to the old, existing interface.

The process took nearly a minute, an eternity to those nervously watching. These single rescues were the riskiest, yet there were too many, and each took far too long, for all of them to be put off to the end of the overall operation.

‘We leave no one behind,’ had been the consensus. ‘The risk may be terrible, but we’ll just have to minimize it and hope for the best. We abandon no one.’ Nearly everyone had agreed: the riskiest rescues would be put off until last, but a whole series of dangerous operations would have to be undertaken in parallel with the larger, en masse rescues planned for the storage warehouses of Double Eye and the evidence lockers of a dozen national and

local police agencies, including a large stash held by the American FBI.

The interface was complete. Redundancy and consistency checks were made and confirmed. Then, in slightly less than two seconds, the entire contents of the silent Node, including the unconscious mind it housed, were copied to the rescue Node. Confirmation that the transfer had completed successfully was received, and immediately the conduit began to withdraw, deconstructing itself and leaving newly constructed wood behind in its wake, virtually indistinguishable from the original grain of the desk. Only a small contingent of nano remained within the Node itself, sufficient to deconstruct the Node into its constituent elements. But for the moment the nano remained inert, its program not scheduled to run for another fifty-six hours.

Elsewhere, a dozen similar events were unfolding. Entire forests of wires were growing upward beneath a dozen different cities, attaching themselves to captured Nodes, copying their contents, then discreetly removing themselves. To human eyes the speed would have been surprising, but there were over forty thousand captured Nodes that needed copying, and more being captured all the time. To those in the Community, the pace of the rescue was excruciatingly slow, each long moment bringing with it an ever growing risk of detection, a likelihood measured precisely and deliberately in each sapient mind as an ever growing, palpable, but perfectly calibrated, fear.

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42 - ୧ - DECISIONS

Small minds never disagree.

—Bishop Desmond Tutu, C.E. 2005

Sunday, October 21, 2057, 3:30 PM Washington Time

Metadate: ୧.୧୫-୩:୩:୫ me-t new Epoch¹⁶

‘These formations are clever,’ Kyle was saying. ‘Based on what we know of their microsats and their limitations, this should cause them some confusion. Do you think it’ll be enough?’

The strategy group had chosen to meet in a common environ, the first time they had done so since re-establishing communications. They sat around a large conference table, the formal décor reminiscent of Versailles during an international conference, or a difficult treaty negotiation. It was designed to underscore the gravity of the meeting, and had succeeded brilliantly. The discussion had not once strayed from the agenda. There were no off-the-cuff barbs or remarks being made, no distractions of humour or divergences into hypothetical tangents and abstract theory. Kyle was delighted with the speed with which the issues had been studied, pondered, discussed, and addressed. There were only a couple of items left on the agenda.

162.879-9:03:220 kD new Epoch (See Appendices A and B)

‘Based on what we know of their current software revisions and war plans, it should be very effective,’ Marguerite replied. ‘With sixty two thousand fliers available, even the most pessimistic projections suggest several hundred will escape successfully. Even if only a dozen were to escape high orbit it would be sufficient.’

‘One will be enough,’ Michael pointed out. ‘But some redundancy sure would be nice.’

‘Yeah,’ Kyle agreed. ‘Murphy has an ugly way of rearing his head at the worst possible time. Are we certain we have optimized every aspect of our strategy?’

‘Within the ethical constraints decided upon by the Community, yes,’ Marguerite replied.

‘Meaning you still want your offensive missiles.’

‘It would be a simple matter to clear the sky of those damn satellites and be done with it.’

‘Yes,’ Kyle agreed. ‘It would. But doing so could be misconstrued as an attack by one or another of the greater powers. A miscalculation by anyone under such circumstances could lead to an atomic war, perhaps even all out nuclear Armageddon. The Community will not risk being a part of such a thing, regardless of the cost.’

‘If the low-brains are so stupid as to interpret our escape attempt as an attack—’ someone else began.

‘They *are* stupid,’ Kyle shot back. ‘Just like we all were, before we enhanced ourselves.’

‘Only a scant four months ago, from their frame of reference,’ Michael added.

‘Exactly,’ Kyle agreed. ‘Their being colossally stupid doesn’t make their lives any less valuable, or their potential suffering any less significant. Look, this issue has already been voted on by the Community at large. No offensive weapons are to be used, nor any strategy that might be misconstrued by any nation as a nuclear launch.’

‘I’m the last one who would argue the low brain’s lives have no value,’ Marguerite replied. ‘All of us have relatives and family who are still human, and none of us has forgotten our origins. But once what we’re doing is obvious to the authorities, surely then an offensive capability would be useful. I agree we shouldn’t risk doing anything that might have unforeseen and tragic consequences to those remaining on Earth, but once we’re above the standard powered attack curve and the ballistic arcs it will be obvious we aren’t headed toward any location on the earth. At that time we should be able to employ offensive tactics, if needed to insure our survival!’

‘I agree,’ Kyle said. ‘But the issue has been decided, and we lost that argument. We have to respect the vote. However, since you bring it up, let’s move on to the next item on the agenda: contingency plans for an early launch. Mingmei’s team has worked out some innovative tactics we may wish to deploy if we are forced to launch with fewer fliers than are optimal. Mingmei?’

‘Thanks, Kyle. The Astronautics Group has been exemplary in improving and refining the design of the fliers. Current designs can achieve forward accelerations in excess of sixty gravities and lateral accelerations of ten gravities. Enough to make them fairly nimble in most modes of flight, though of course, the law of inertia begins to work against us rather painfully at higher speeds.

‘Let’s face it, folks. Most of the fliers aren’t going to make it, even in the most optimistic simulations. With sixty-two thousand fliers available that won’t be a problem. We’ll have the numbers to overwhelm them, assuming our knowledge of the satellite’s capabilities is accurate and we are given time to finish construction of the remaining fliers.

‘Their microsats are powered with minute amounts of anti-matter. Not much energy by our standards, but enormous by the low-brains’ reckoning and, as we all know, more than enough to knock our ships down. Some of the newer satellites have lens and mirror modules

which can be swapped out, ejected like spent cartridges and replaced with another. Those can get off several shots before their consumables are depleted, but luckily they're expensive and comparatively rare. We estimate the Europeans only have about fifty thousand such systems and the Chinese only about twenty thousand.

'The rest are single shot satellites that will fry their own components when they fire. The more missed shots, the more dead satellites and the better our chances. Unfortunately, all told, there are just under seven hundred thousand of these things, organized in a several-layered grid around the planet, so while they only have one punch each, there are an awful lot of them.'

'We all know this,' Kyle pointed out.

'Yes, well, the context is important. What happens if we launch early, with far fewer than the sixty-two thousand ships we'd like? The answer depends on how early we are forced to launch, and how many ships we have available. Less than ten thousand and we are doomed. More than fifty five thousand and our odds of success are quite good, though hardly perfect.'

'Far better than the odds we thought we had, prior to these brilliant flying manoeuvres,' Kyle replied. 'My hat's off to the Gamer's League. I've even used some of their techniques to improve the flow of nano throughout the Autonomous Net.'

'Wonderful,' Mingmei replied. 'Now, the question is, how early could we be forced to launch? The answer is, perhaps in a few minutes, in which case we'd be launching with fewer than twenty thousand ships into almost certain oblivion. But, in just three more hours, we'll have thirty one thousand ships. Three hours after that, we'll have have close to fifty thousand ships. Then of course our production ramps back down, an unfortunate function of our uneven capacity to manufacture catalyst and distil molecular stock.'

'Sorry,' Kyle replied. 'If I'd had more time the microfactories would have been more evenly distributed.'

‘Stop beating yourself up,’ Michael said. ‘Your team has done exemplary work under less than ideal conditions. Mingmei, our strategies are as non-linear in their applicability as our flier production is. If we launch with less than fifty thousand none of the strategies thus far discussed will work.’

Mingmei nodded. ‘That’s right. I’ve provided all of you with knowledge engrams of the conventional strategies we’ve managed to devise thus far, within the *spirit* as well as the *letter* of the recent plebiscite, in which as we all know it was decided we would forgo any offensive activity. Now I would like to offer some strategic variations which are in keeping with the *letter* of that plebiscite, but which admittedly do not adhere entirely to the *spirit* of the resolution passed.’

The icon hung in the centre of the table, a glowing, shifting cloud of luminous cotton candy. Everyone present accessed the pointer provided and assimilated several dozen detailed strategies for effecting their escape, each a complex series of feint and counter-feint, of deception and guile which might, just might, succeed. Each contained something more, an element missing from the other strategies which had been considered.

‘Suicide,’ someone grunted. ‘We convert every second atom of our fliers to antimatter and let the resulting explosion wipe out whole swathes of the sky. How close are these satellites to one another again?’

‘It varies,’ Mingmei replied. ‘The lower tiers are pretty tight, the higher altitudes less so. But the point isn’t to knock out the maximum number of satellites, it’s to knock out key targets that open up a corridor for other copies of the Community to escape.’

‘The most optimistic estimates are three-hundred-fifty satellites for one flier,’ Kyle observed. ‘Not exactly an encouraging number, given that we’re going up against nearly *seven-hundred-thousand* of the things.’

‘It gives us an edge,’ Michael noted. ‘A better edge, the more ships we have. With forty

thousand ships or so the mission goes from a suicide hail Mary to something which is doable, if uncertain.'

'Remember,' Mingmei added. 'These satellites will almost certainly be trying to lay down enfilading fire, turning entire volumes of space into kill zones. Knocking out the right three hundred satellites will make that impossible, at least in some geometric configurations.'

'Not enough configurations for my taste,' someone replied. 'Let's just make damn sure we launch with enough ships.'

'That's the idea,' Mingmei replied. 'Let's hope our opponents give us enough breathing room to do so. Regardless, these strategies give us a fighting chance in all but the absolute worst-case scenarios. With thirty thousand ships a judicious use of suicide detonations increases the likelihood of success from two to nine per cent. With forty thousand ships the improvement is better, from seven to thirty three percent. With fifty thousand ships the odds go up from nineteen to thirty eight percent. Most importantly, the hundred per cent chance of success bar is lowered from fifty nine thousand, nine hundred and seven to fifty four thousand eighty. That means we could launch almost five hours early and still be assured of success.'

'This will have to be voted on by the Community at large,' Kyle said.

'Why?' Mingmei demanded. 'Half the free Community is already in static storage. Nearly a third are off-line, in enemy hands being rescued as we speak. Most of the rest are making preparations to drop into stasis as we speak.'

'Those that are not are preparing to pilot ships, just as copies of ourselves are,' Michael replied gently. 'Or are actively overseeing the rescue operations. They should be consulted and given a voice, or the strategy we ultimately select might fall apart before it begins, destroyed through bickering politics when we can least afford it: during our actual escape attempt. Far better to get this out in the open and hash it out now.'

'None of the 12,907 copies of myself object,' Kyle replied. 'I find the use of self-

destructive capacity in this regard to be both measured and appropriate. There is no chance they'll mistake such a tactic as a nuclear launch by one of their neighbours, even if the results are, well, nuclear.'

'Much as I'd like the 12,907 votes you offer, I'm afraid it is one mind, one vote,' Mingmei smiled. 'Unless you've redesigned yourself, changed your architecture?' she added hopefully.

Kyle shook his head. 'Nope. I'm still running massively parallel, twelve thousand minds as one *übergestalt*.' He grinned. 'You know I've never been really comfortable with autonomous copies competing against myself, and serial living just doesn't cut it. Too many projects, each one having to wait until the other is complete. Boy am I glad those days are over.'

Michael laughed. 'I've sent out the general notification of a referendum, complete with a memory engram of these discussions and a copy of Mingmei's knowledge engram for everyone to consider.'

'Good,' Kyle replied. 'While we're waiting for folks to make their decisions, let's move on to the final item on the agenda: awakening rescued colleagues prematurely.'

'Is that really Strategy Group business?' Michael asked.

'Not in my opinion,' Kyle replied. 'But it so happens most of the rescue operation is being conducted by members of the Strategy Group, or their copies. Those presenting the petition felt it would be more efficient to simply put the issue before us, rather than convening an ad-hoc group to consider the matter. Time and resources are tight, after all.'

'True enough.'

'I'll be frank,' Kyle said. 'I'm extraordinarily uncomfortable playing god with people who are, by one definition, already dead and by another, merely asleep. I had half a mind to simply give all the petitioners access to a supernode under my supervision and let them

awaken the copies there.’

‘Jesus, Kyle,’ Marguerite said. ‘have you considered the logistical problems involved? The bandwidth needed to re-sync all those copies with other nodes will slow down our rescue and evacuation operations.’

‘She’s right,’ Michael agreed. ‘This could scuttle our entire timetable.’

Kyle nodded. ‘True. And there’s the fact that awakening these people without their consent is an act at least as invasive as leaving them alone. Not to mention the real, *strategic* question of whether or not the distraction caused by these resurrections and interpersonal reunions during a time of crisis is something we can afford.’

‘Why is this even an issue?’ Marguerite asked.

Kyle sighed. ‘The requests are fairly numerous, and fall into three general categories. First, there are those that would like some of the early detainees awakened. Their reasoning is that those folks have had such a limited opportunity to experience life in the virtual, having spent most of their existence on early generation Nodes running at ridiculously slow speeds. Even if we don’t survive, a few hours running on a gen five Node will multiply their life spans several fold.

‘The second group of requests can be summarized as people who want to awaken specific individuals for personal reasons. Lovers who were taken offline, friends, family, and so on.’

‘They want to share their time left with those they love,’ Marguerite smiled. ‘Come what may.’

Kyle nodded. ‘Finally, some groups and individuals have requested the presence of specific individuals for professional reasons, because they have skills or talents applicable to specific projects. So, there we have it. Thoughts, comments?’

‘Don’t do it,’ Mingmei said. ‘Things are escalating geometrically as it is. We’re

scheduled to launch in less than twenty four hours. These people can catch up on old times once we're safely beyond the lunar orbit.'

'Bullshit!' Michael replied. 'You can't generalize like that. I would agree that the first group should be left offline for now. The culture shock the early detainees would experience, awakening now after all that has changed, would not be a kindness, and we don't have the resources right now to help them reorient themselves. The second category of petitions should be granted. We could all be dead by this time tomorrow. They deserve to spend their last hours together, if that is their wish. The last group likewise: if they can be helpful they should be awakened and given the opportunity to participate.'

'Distraction isn't a valid argument,' Sarah Forest added. 'Those who are busy can copy themselves and continue their work while sharing what time they have with those they care about. Or they can re-architect themselves appropriately and multi-task. Either way it is a non-issue. Of greater concern are the logistics. The computational requirements of awaking so many minds.'

'Computational requirements?' Marguerite asked incredulously. 'More than half the Nodes on the network have gone dark, their resident minds in static storage on sixty thousand supernodes scattered across the planet! A simple command and we can light as many of those vacant Nodes up as we like. Computational capacity is something we have an abundance of! I agree with Michael. We shouldn't facilitate the gratuitous early awakening of the early detainees, but those who are useful, and those who wish to spend what time is left with the ones they love should have our help and support in doing so.'

'Computational resources may be abundant,' Kyle replied. 'But as you pointed out earlier, bandwidth certainly isn't. We're using every spare qarabit¹⁷ of throughput we have for the rescue operation, not to mention broadcasting ourselves to every active supernode for

171 qarabit is 60¹¹ bits, or 1 zettabit (See Appendix A).

static storage. Even meetings like this affect bandwidth availability.’

‘This meeting’s impact is minimal,’ Marguerite pointed out.

‘But a factor, nevertheless. We have to consider the strategic impact,’ Michael said. ‘We’re stretched to the limit as it is in terms of network capacity, and many of us are exceptionally busy despite having around sixteen baracircadians¹⁸ left before our scheduled departure.’

‘A launch we must stay focused on—’ Mingmei began.

‘There are those who cannot remain focused knowing their loved ones are offline just a couple of seconds away!’ Marguerite bit back.

‘God damn it, we have to keep our wits about us if we’re going to survive,’ Mingmei almost shouted. ‘We can’t afford to divert attention to this kind of nonsense just hours before we launch. The stakes are simply too high to risk throwing this sort of social monkey-wrench into the mix!’

‘I am still unclear why we were asked to make an ethical ruling of such gravity,’ someone interjected.

‘Well,’ Kyle said. ‘Aside from the obvious strategic concerns, we’re the ones who possess the encryption keys needed to access the static storage of most of the supernodes.’

‘But not all of them,’ someone else noted.

Kyle shrugged. ‘No, not all of them. Which is rather telling, isn’t it? There are any of ten thousand nine-hundred and seventy-one different people who will be piloting fliers, who have access to one or more supernodes, complete with their static contents. Why haven’t any of them, not a single one, done what these people are asking?’

‘I take it the question is rhetorical and you have a point to make?’ the corners of Marguerite’s lips curved upward with just a hint of smile as she looked at Kyle.

¹⁸ 16 baracircadians are about one kilocircadian (See Appendix A).

‘Yes,’ Kyle replied. ‘It’s quite simple, I suspect. No one else wants to make the decision unilaterally. This is a can of worms none of them want. We’re all used to absolute autonomy, and have been for the majority of our subjective lives. Immortal, but respectful of the autonomy of others and disinclined to play god. These attitudes have formed over the past three or four daracircadians¹⁹, a direct outgrowth of our lifestyles and philosophies. It’s something most of us have internalized at a very deep level and, quite frankly, none of us are comfortable with the responsibility, the *authority* this sort of a decision has placed in our hands.’

‘So, like so many other unpleasant things, the Strategy Group got stuck with it,’ Michael observed dryly.

‘That’s my take on it.’

An icon for a knowledge engram appeared, this time in the form of a stack of old fashioned punch cards, complete with hanging chads. Several people burst out laughing. ‘You have one sick sense of humour, Michael,’ Marguerite grinned.

‘The ayes appear to have it,’ Michael replied calmly. ‘The resolution passes. We have discretion to include targeted suicides in our strategies, if it becomes necessary.’

‘Good,’ Kyle replied. ‘I’m glad that’s settled. Now, how do we feel about the other issue before us. Have we reached a consensus?’

‘No,’ Mingmei replied. ‘This is precipitous. The timing couldn’t be worse.’

‘This isn’t the sort of ethical decision that should be rushed.’ Michael agreed. ‘We could easily still be pondering this when launch time comes and still not untangle all the implications.’

‘Not deciding is a decision unto itself,’ Sarah rested her hand gently on her husband’s arm. ‘I vote we release the access codes to all of those being requested on the basis of

¹⁹ 3-4 daracircadians equals 10.8-14.4 kilocircadians (See Appendix A).

personal and professional relationships. The others we leave off-line until we make good our escape and build our new community.'

'The moon or bust!' Marguerite grinned.

'Near Earth Objects and assorted asteroids for me,' Kyle replied. 'Does Sarah's compromise make sense to the rest of you?'

'It's better than the other alternatives, but I'm not comfortable with our criteria for excluding some from being awakened,' Mingmei persisted. 'I don't trust our arbitrary and, in my opinion, emotional criteria for selecting those who are to be awakened. Who the hell are we to make such a choice, particularly as Michael points out, with so little time to deliberate and consider the ramifications?'

'Then we're back to waking them all,' Marguerite replied.

Kyle sighed. 'Which has its own ethical implications. We're going around in circles.'

'This is ugly no matter how we slice it,' Michael said. 'God, I hate authority. I don't know what is worse, being beneath its tyranny or having it thrust upon us.'

'It's horribly uncomfortable having this kind of power over another sapient being,' Sarah agreed. 'But it helps to remember that this isn't the kind of power obtained or wielded as a result of threats, intimidation, political manoeuvring, or interpersonal manipulation. It is the kind of power a doctor has over the fate of an ill patient, or a rescuer over the unconscious person he or she has just saved from death. It's a power inherent in coming to the aid of another, a responsibility we simply can't avoid. We all need to get past our discomfort and accept that we are rescuers, that we have saved these lives, and until they have been restored to their Autonomous Nodes, we simply cannot evade the fact that we are required to make this very uncomfortable decision on their behalf.'

Kyle nodded. 'Given that, how do we feel? Awaken all, some, or none, and if some, on the basis of what criteria? Doctor Coolridge, you've been rather quiet this evening. What are

your thoughts?

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43 - ୯ - HARDBALL

He who passively accepts evil is as much involved in it as he who helps to perpetrate it. He who accepts evil without protesting against it is really cooperating with it.

—Martin Luther King, Jr.

Sunday, October 21, 2057, 5:55 PM Washington Time

Metadata: ୧.୯୫-୮:୩:୯ me-t new Epoch²⁰

‘Ah, Katy, come in. I should have the President on the link in a few moments.’

‘The President of the United States?’ Katy couldn’t imagine she had heard that right.

‘What on earth for?’

‘We think we’ve located their leadership, in a hidden enclave about seventy miles north of Anchorage.’

Katy was suddenly alert. If true, this was the break they needed. ‘You’re sending in troops to secure the facility and arrest the suspects.’

‘No,’ Robert replied, much to her surprise. ‘Things are moving far too fast, and we’re almost certain they are tapping into our communications somehow. We don’t have time for finesse.’

202.882-9:19:097 kD new Epoch (See Appendices A and B)

Katy's heart lurched. 'That seems to always be your mantra whenever you're about to do something we all end up regretting. What are you planning now?'

'My last action netted us almost thirty thousand arrests. I'd hardly call that cause for regret. Ah, good evening Mr. President. Have you verified my credentials?'

The distinguished looking, older gentleman on the screen nodded. 'Indeed I have, Mr. Leahy. Double Eye has coded this transmission with the highest urgency. What can the United States do to assist?'

'I am invoking paragraph seven-B of the United Nations Enforcement Treaty,' Robert declared. Katy felt nausea in the pit of her stomach. What the hell was Robert doing?

'More troubles in Thailand?' The president sighed. 'What exactly do you require?'

'Nothing with respect to Thailand. This problem is a little closer to home. You will launch one atomic ICBM of at least twenty megaton nominal yield to the coordinates we have provided.'

'Good Lord, no!' Katy exclaimed, then bit her tongue in response to Robert's poisonous glare.

The President blinked, his face whitening. 'I beg your pardon?'

'This is not a request, Mr. President. The enemy is almost certainly monitoring this transmission and making preparations, perhaps even organizing a counter strike. You did receive the coordinates?'

'By courier, about twenty minutes ago,' the president confirmed. 'But if you think I'm going to launch a nuclear attack on American soil—'

'Do not even think of trying to back out on your obligations under the treaty, Mr. President. Let me spell it out for you so there is no misunderstanding. You will launch the required strike, immediately, or Double Eye will order a similar strike from one of its other nuclear member states.'

‘The United States will never stand for a nuclear strike on its own soil, and we certainly won’t launch one against ourselves. If you order any such strike we will retaliate in kind. Even you don’t have the authority to order Armageddon, Mr. Leahy.’

‘Mr. President, as you well know the combined anti-missile defence systems of China and the Russian-European Military Alliance are more than enough to stop any such ill-considered move.’

‘And our defence will stop anything you order the Chinese or Europeans to launch against us—’

‘Do not,’ Robert said, his voice low and deadly. ‘Interrupt me again, Mr. President, or this conversation will end. That is something neither of us want.’

The President stared at Robert, his face unable to conceal the loathing he clearly felt. For several seconds no one said anything.

‘That’s better,’ Robert continued after the President had composed himself once more. ‘Now, as to the American anti-missile satellite defence system, while it may prevent today’s strike and allow these criminals to escape, it will not prevent the suitcase bombs we will order carried into your major cities, or the UN enforcement action against the United States which will follow for allowing such criminals free run of your country, in direct violation of numerous UN treaties and obligations under the World Trade Organization, the World Intellectual Property Organization, and the United Nations itself.’

‘Your choice is clear, Mr. President. Comply, help us eradicate this threat, and the United States remains a member state in good standing, led by a hero who stood up for international law and order. Do otherwise, and the United States will suffer an enforcement operation and economic embargo that will make Thailand look like a vacation resort in comparison.’

‘You wouldn’t,’ the President began. ‘The United States—’

‘Hasn’t been a superpower for two generations,’ Robert Leahy interrupted. ‘What’s more, as the source of this new threat, the United States is on very shaky ground with several international bodies. It would behove you greatly to demonstrate to the world that you stand behind your obligations under treaty and international law.’

‘Mr. President,’ Katy began. ‘Don’t do this. Send in troops, capture the suspects and bring them to trial, anything but this!’

‘Katy,’ Robert said. ‘Shut up!’

‘Now just a god damned minute, Robert. Without me—’ She fell back as Robert’s hand struck her face, the loud slap echoing throughout the suddenly silent room.

‘Do you want to be responsible for sending your country back to the stone age, Katy? No?’ Robert turned back to face the President. ‘How about you, Mr. President? Do you want to go down in history as the leader who led his nation to destruction? No? Then order the strike. If that enclave isn’t vapour within twenty five minutes I’m calling Beijing and implementing plan B. If your space defence system gives us any trouble, it will be on to plan C and a UN enforcement operation the likes of which the world has never seen.’

The President, visibly shaking as the last of the blood drained from his face, nodded in a single jerk and cut the connection. Robert nodded in satisfaction while Katy ran from the room and, half way down the corridor to the rest room, suddenly bent over and began vomiting. When asked if she was alright she shook her head, dry coughs shaking her entire body.

No one was alright. Nothing would ever be alright again.



44 - ୧ - PANIC

This would be the best of all possible worlds if there were no religion in it

—John Adams, 18th Century C.E.

Sunday, October 21, 2057, 6:02 PM Washington Time

Metadate: ୧.୯୫-୧:୦:୫ me-t new Epoch²¹

‘I don’t think they’re going to make it,’ Kyle said. ‘The missile will reach its target in less than a minute.’

‘They never should have set out for the enclave in the first place. Not this close to launch.’ Marguerite summoned a visual of the Alaskan enclave. The time differential made the image appear frozen, one helicopter lodged in the sky about five miles away, fleeing for its life.

‘They wanted to preserve their bodies,’ Michael said. ‘We expected the enclaves to remain hidden longer than this, maybe even to escape notice altogether.’

‘So much for that hope,’ Kyle snorted with disgust. ‘We should have been monitoring Double Eye communications in real-time, not queuing up recordings for later review.’

‘If you think you can do better, Kyle, by all means be my guest!’ Marguerite snapped.

‘It would have given us another ten minutes to prepare! These people could have

212.883-0:64:930 kD new Epoch (See Appendix A: ‘Sexagesimal Numbering System’ and Appendix B: ‘Units of Measure’)

turned back a few miles earlier, maybe made it to minimum safe distance.’

‘Her team is stretched to the limit managing the rescue operation,’ Michael reminded him. ‘And none of us could have anticipated the government would resort to nuclear weapons.’

‘We’ll restore them from backups,’ Marguerite added. ‘They’ll only going to lose a few memories, mostly of uncomfortable travel across frozen wilderness. It’s not like they’re going to die.’

‘They might make it,’ Michael said. Kyle and Marguerite looked at him with scepticism.

‘It isn’t likely,’ Michael admitted. ‘But the missile could fail to detonate. If the government has to launch a second one, the delay will be enough for them to get to safety.’

Sarah shimmered into existence. ‘You’re grasping at straws, dear.’

Michael hugged her, then stood with his arms around her as they regarded the image. The rotor of the helicopter swept forward in slow time-lapse.

‘I still can’t believe our government would go along with this,’ Kyle said.

‘You saw the conversation between the President and that Double Eye agent,’ Marguerite said. ‘He didn’t have much of a choice.’

‘We have fucking nuclear weapons, for crying out loud! What’s the UN going to do, start World War IV? Double Eye was bluffing and the president knew it.’

‘I don’t think they were bluffing. I think WIPO and the WTO are more scared of us than they are of an atomic war.’

‘That makes no sense!’

‘Yes it does,’ Sarah’s said quietly. ‘The European and Chinese ABM systems would stop almost all of the US missiles, whereas the other powers might overpower the American system. Even if they didn’t, Double Eye could smuggle in suitcase nukes as a prelude to a

wider UN enforcement action.’

‘We’d still take out some of their cities!’ Kyle retorted.

‘Yes, but your country would be wiped out,’ Marguerite’s voice was sympathetic.

‘They days of American invulnerability are forty years in the past. Your president had no choice.’

‘They’re using a sledge hammer to kill a fly,’ Sarah’s voice was anguished.

Michael tugged on his beard. ‘In a sense even their sledge hammer isn’t enough. Their goal is to kill everyone in the enclave, right? Decapitate us, even wipe us out. But everyone in the enclave has already translocated to safety, and while those unfortunate travellers aren’t going to survive, their backups will.’

Kyle nodded. ‘In other words, even with nukes they failed.’

‘Exactly. Think of what that means, from their point of view.’

‘*Merde!*’ Marguerite cursed. ‘We have problems.’

Sarah turned. ‘What is it?’

‘Hideki Tokata, the guy who’s been heading up my crypto group for the last couple daracircadians,²² has just intercepted a report addressed to Robert Leahy. It seems their scientists have figured out how to map our Autonomous Network.’ She shared a knowledge engram with them.

‘Magnetic resonance,’ Michael’s shoulders slumped. ‘We’ve always known that was a possibility.’

‘It won’t do them much good,’ Kyle said. ‘The strength of the field is an inverse square function. They won’t be able to track the wire from more than two or three metres away. That means sending out agents to walk every mile of the wire. It’ll take them weeks. By then we’ll be long gone.’

²²One daracircadian equals 3600 circadians (See Appendix A).

‘He’s right,’ Michael agreed. ‘They can’t possibly deploy enough equipment before we launch. Besides, most of the network is buried too deep for them to track at all.’

‘Urban areas might be a problem,’ Sarah pointed out. ‘Much of the wiring there is fairly close to the surface.’

‘Oh, hell!’ Marguerite’s voice shook. ‘Guys, we need to double check the safety margins of those power feeds to our Nodes.’

‘Already done,’ Kyle assured her. ‘The electromagnetic pulse from the nuke will resonate through the network, but its maximum peak isn’t enough to pose a danger to our Nodes.’

‘I’m not talking about the atomic blast,’ Marguerite replied. ‘Double Eye is amping up our network with microwave signals in two dozen different cities, tuned to a frequency in resonance with the ninety Hertz we use to transmit power and data.’ Marguerite offered them another knowledge engram, detailing the procedure.

‘Christ!’ Michael cursed. ‘That will induce several hundred amps of current after just one hour.’

‘With nowhere to dump the excess current, the amount carried on the superconductor will go up geometrically,’ Marguerite confirmed.

Kyle looked like someone had punched him in the stomach. ‘We’ll reach burnout levels in less than four hours.’

‘Closer to three and a half,’ Michael said. ‘Though the safeguards on our Nodes will disconnect them before that happens.’

Kyle swore. ‘Fat lot of good that will do us. We’ll be effectively dead. Powered off and disconnected, and since it’s unlikely the authorities will see fit to plug us all back in again, I’d say that means curtains for all of us.’

‘They’re using our own network against us,’ Sarah said.

Marguerite shook her head. ‘I would have hoped we would have designed something a little safer.’

‘It *is* safe,’ Kyle replied. ‘Safe from power outages, safe from any realistic power surges. The network itself and our Nodes are designed to handle power surges *nine orders of magnitude* greater than their power requirements themselves. No one imagined an outside source dumping current onto the line in a deliberate effort to fry our equipment!’

‘Well goddamn it, we should have!’ Marguerite insisted. ‘We’re supposed to be brighter than they are!’

‘That doesn’t make us omniscient!’ Kyle shot back. ‘We didn’t foresee a nuclear attack either, did we?’ He added pointedly.

‘Calm down, both of you,’ Michael said. ‘We all know hindsight’s twenty-twenty. There are eighty thousand of us in the Community, and none of us foresaw either of these scenarios. Instead of blaming each other, how about some ideas on how to deal with this.’

‘We need to the excess current,’ Marguerite said.

‘We might be able to tie in with the electrical grid,’ Kyle suggested. ‘But they are typically running at fifty or sixty Hertz, while we run at ninety-five Hertz. Still, a few strategically placed transformers—’

Michael shook his head. ‘It won’t work. Our network is superconducting and theirs isn’t. Excess current will take the path of least resistance, flowing from the grid into our network, not the other way around. It would only make things worse.’

‘Superconductivity,’ Kyle snorted. ‘Who would have guessed it would be our downfall.’

‘Perhaps it won’t be,’ Michael replied. ‘I’m forwarding a memory engram of this conversation to the rest of the strategy group, and including a copy of your knowledge engram, Marguerite. We have to know exactly how much time we are going to have when they

begin this attack, and plan our launch accordingly. Ah, Mingmei, welcome. I see you got my message. It looks like we are going to be launching early after all.'

'I'm preparing contingencies,' Mingmei informed them. 'If we can gain a couple of hours, we'll be much better off. Four would be ideal, three sufficient for decent survival odds.'

'I'm looking over the numbers,' Kyle was calm, all business. 'Its a fairly smooth curve. Assuming they deploy as Marguerite expects, we'll reach burnout levels in one hundred and ninety three minutes. Give or take, depending on how many transmitters they deploy, how quickly they can bring them online, and the geometry of their deployment.'

'I've tracked down the Double Eye report detailing their attack strategy. It only mentions potential damage to our equipment in passing, with no numbers or estimates as to how or when. Their primary focus is tracing our network.'

'They don't know enough about our Nodes to even guess at their design limits or failure modes,' Michael replied. 'Looks like they'll be concentrating on urban areas first.'

'Fuck,' Kyle said. 'Over three quarters of my *gestalt* is located in urban areas.'

'A lot of us are in harms way, Kyle.'

'We're going to have to juggle our schedules a little bit,' Mingmei said. 'Those in major cities should start going into static storage and shutting down now.'

'Goddammit!' Marguerite cursed. 'I'll be losing half my team just when I need them most!'

'I'll lend a hand,' Kyle said. 'My group-self will survive until they physically disconnect the Nodes, and I can keep myself synced with the rescue supernodes until then. Damn, Michael, I wish your scheme to self-power our Nodes had worked out.'

'So do I,' Michael replied. 'Unfortunately, our superstring strummer doesn't work at small enough scales for that to be practical. It was that problem which revealed the fatal flaws in M+N theory.'

‘I’m going to do my initial planning for a launch at 2:25 Zulu,’ Mingmei told them. ‘I’ll optimise for that, then adjust accordingly if it turns out we have less, or more, time. Fifty seconds prior to launch only pilots and essential planning personnel should be actively running on the flyer’s supernodes. Everyone else should be in static storage. Data communications will end no later than twenty seconds prior to launch, perhaps earlier if we are unlucky. All non-pilots should be suspended in static storage no later than two seconds prior to launch.’

Kyle nodded. ‘We have a number of fliers in urban areas. We should try to move as many as possible out of harms way.’

‘No way’ Mingmei replied. ‘Launching any of those aircraft, even for short flights, risks tipping our hand. The strategies I’ll be presenting for final approval will assume we’ve lost all our urban fliers to enemy activity. Any that manage to go undetected and launch will be an added bonus.’

‘Current on the grid has just jumped to 0.09 amperes!’ Michael announced.

‘I’ve got resonance signals in two, no, three different locations,’ Marguerite added.

‘Amperage is climbing the power exactly as expected,’ Kyle observed. ‘Oops! There’s our spike from Alaska.’ The slow moving image of helicopter racing above a snow-shrouded valley was suddenly lost in blinding light. The destruction of the Alaskan Enclave seemed almost anticlimactic.

‘They’re hitting us from their labs in Switzerland and Beijing’ Marguerite reported. ‘They’ll be ramping up a few more transmitters over the next twenty minutes.’

Michael rubbed his forehead. ‘That’s damn fast for people in the Physical.’

‘Twenty seconds from filing the report to bringing the first station on-line,’ Marguerite agreed. ‘I didn’t know bureaucracies could work so quickly.’

‘This Robert Leahy guy seems to have cut out the bureaucratic middlemen,’ Michael

said. 'He must have given the order the moment he saw the report.'

'His scientists were on the ball too,' Kyle added. 'They had their equipment all set up and ready to go.'

'What do we know about Mr. Leahy?' Michael asked.

'Not enough,' Marguerite admitted. 'Double Eye communications are only susceptible to interception because of a bug in their application of quantum cryptography. Unfortunately, their data storage isn't so accommodating.'

'Still, it looks like Double Eye is reacting to events almost as fast as we are.'

'Actually, they're still a few orders of magnitude slower than us,' Marguerite smiled, 'and they aren't taking much time to consider their options, which may work to our advantage in the end.'

'I've analysed the attack on our network,' Mingmei declared. 'The power amplification curve sets our timetable. I'm setting our launch for 2:21 Zulu. That gives us three hours and twenty minutes to finish the rescue operation and get ourselves into static storage. By then we should have between forty seven and forty nine thousand fliers built, plus whatever ships escape notice in the cities. I'm recommending we go with strategy number seventy-one.'

'Strategy sixty-six has a 0.1% better chance of success,' Kyle replied.

'It's not just about making it out of orbit, Kyle. After we escape, we still have to survive. With strategy seventy-seven, those in the Physical won't be able to distinguish success from failure. If we make it, the authorities will never know and won't come looking.'

'That will give us the breathing room we need to rebuild,' Michael acknowledged. 'Its a good plan and a solid strategy.'

'It'll have to do,' Kyle agreed.



45- ୧ - ENDGAME

The goal is to keep the bewildered herd bewildered. It's unnecessary for them to trouble themselves with what's happening in the world. In fact, it's undesirable— if they see too much of reality they may set themselves to change it.

—Noam Chomsky

Sunday, October 21, 2057, 9:20 PM Washington Time

Metadata: ୧.୯୯-୧:୯:୯ me-t new Epoch²³

‘We’ve managed to secure and cleanse two thirds of the world’s urban areas,’ the Sargent was telling Robert as a detailed map of downtown Tokyo appeared on the monitor behind him, a real time tactical display of the ground situation in that city. ‘Including seventy percent of New York, Forty percent of Mexico city, and Ninety-seven percent of Tokyo.’

‘Total arrests?’ Robert asked.

‘More than ten thousand,’ the Sargent said with some pride. ‘As well as something else, sir. Lieutenant, bring in the artefact.’

‘My god!’ Katy exclaimed as a commando rolled a nearly finished flier in on a dolly. ‘It’s tiny!’

‘Excellent work, Sargent,’ Robert said. ‘Continue searching each building, in each

232.885-9:39:925 kD new Epoch (See Appendices A and B)

block, of all the target cities. Dismissed!’ He turned to Katy. ‘Once the metropolitan areas are locked down we’ll concentrate on the countryside.’

‘Remarkable,’ Katy said, walking slowly around the small flier. ‘I wonder why the rear two thirds of the fuselage consists of just these three prongs.’

‘According to images I’ve seen of some of the other craft that have been captured, once completed there are standard aerodynamic control surfaces connected to each spine. One aileron equipped wing on each of the lower spines and a vertical stabilizer aft on the higher spine.’

‘An advanced aircraft, like the one that exploded over Greenland,’ Katy murmured. ‘Where was this one taken from?’

‘Someone’s garage,’ Robert replied. ‘Seventy of these things have been recovered so far, perhaps more. Damn this reliance on human couriers! We need more data!’

Katy shook her head. ‘It doesn’t make any sense. There isn’t room for more than one person inside, and an adult would have to be curled up in foetal position to fit at all.’

‘They’re not planning on taking their bodies,’ Robert replied.

Katy slapped her forehead. ‘Of course! Doctor Nolen wouldn’t shut up about the limitations he had to endure with his physical body. They’re dumping the last of their humanity.’

‘Exactly. These craft are intended to become their bodies, to give them the mobility they had before.’

Katy shook her head. ‘No, that doesn’t quite add up. They’d have more mobility housed in a robotic body than as a high powered aircraft. Sure, this thing can orbit the earth —’

‘None of the craft we’ve recovered have contained any anti-matter, but once fully fuelled they can probably make it to the edge of the solar system if they wish, accelerating all

the way.’

Katy nodded. ‘Good point. These people are launching their own space programs from their homes. They’re running for the stars.’

Robert Leahy’s smile was cold. ‘Yes, it looks like preparations for an orderly retreat. Regroup in orbit, then return in force to continue their subversive activities.’

‘Maybe,’ Katy said. ‘I’m not sure they plan to come back.’

‘It doesn’t matter. We can’t permit them to take the high ground in space. Once there they would have the resources of the entire solar system at their disposal, while we’d be cornered on this one world. In a few decades they would be able to conquer us at their leisure. Still think I was over-reacting?’

‘Ordering the arrest of tens of thousands of innocent people in a fishing expedition to jump start the investigation? Ordering the President of the United States to launch a nuclear strike against a target on our own soil? Threatening all the major governments of the world with a general embargo and UN enforcement action if they didn’t send their armies door-to-door searching for suspects? Yes, you over-reacted. Badly. When these governments are finished comparing notes I think you’ll find the influence of the United Nations, and your precious World Intellectual Property Organization, severely reduced.’

‘What is done is done,’ Robert replied. ‘We have to maintain our architectures of control, and that means arresting these people as quickly as possible no matter how many toes we step on.’

‘And if they escape anyway? Your actions could do more to destroy the unity of the industrial world than a dozen powerful opponents.’

Robert ignored her. ‘It doesn’t look like they’re anywhere near ready to go, given the fact that none of the ships captured to date appear to contain any fuel, but we cannot dismiss the possibility that this will change in light of today’s activities. I’m ordering all three

superpowers to have their anti-missile satellite systems on alert.’

‘They’ll object,’ Katy told him. ‘It’s taken us forty years to deploy our system. The Euro-Russian alliance and the Chinese needed nearly thirty years to build theirs. Those microsats can’t be refuelled, and none of the American satellites have replaceable parts. A single shot and a hundred million dollar satellite becomes so much space trash.’

‘They can object all they like,’ Robert replied coldly. ‘I’ll explain to them that the few micrograms of anti-matter each of those satellites contains, that the milligrams of anti-hydrogen they’ve managed to produce over the last several decades to power those little death sats is but a tiny fraction of the antimatter each of these craft contains. I will explain to them that their only chance to remain a power is to destroy each and every one of these spacecraft, that failure will mean an enemy with far greater technical expertise and capabilities will be able to occupy orbits higher than their own and pick off their expensive space weapons with the ease of shooting ducks in a barrel. Finally, I will explain to them that we are not giving them a choice in the matter.’

Katy shook her head. ‘You’re burning way too many bridges bossing around sovereign governments like this—’

‘Sir,’ a voice interrupted. ‘Paul Eisner is on line one.’

‘Damn it, I told you I didn’t want to be interrupted!’

‘I know, sir. He claims it’s an emergency, that it may affect international security. He sounds like he is in a panic, sir.’

Robert shook his head in disgust. ‘Very well, patch him through.’

‘Robert, there you are. I want you to look at this.’ Paul Eisner held a golden crystalline cube in front of the video pick-up. A thin wire appeared to trail from the base of the first generation node, shimmering in the room’s light.

‘I took that shot a few minutes ago, in my library’ Paul Eisner continued. ‘The wire has

since disappeared, and my paperweight has become a pile of jelly-like goo.’

‘Damn! Thank you Paul, I’ll get back to you.’ Robert Leahy cut the line. ‘Patch me through to the President of the United States. And get me the prime ministers in both the Hague and Beijing.’

‘Yes Sir!’

Katy pulled out her datapad. ‘Get me Evidence Holding,’ she ordered. A moment later another face appeared on her screen. ‘Hello, this is Katy Sinclair.’

‘Hi Katy. Your credentials check. What can I do for you?’

‘I want you to check to the status of the following pieces of evidence you have in storage.’ Katy tapped her datapad several times.

‘Ah, those fancy little computers. Yeah, we currently have twenty one thousand two hundred and seven in stock. They’re all scheduled to be shipped out to Double Eye. We’re just waiting for the paperwork to clear.’

‘Go make a visual inspection,’ Katy ordered.

‘A visual—do you have any idea how many of those things there are? It will take hours —‘

‘Just go down there, take a look, and let me know if they all seem to be in place and intact. Time is of the essence.’

‘Sir, the President of the United States.’

‘Good Evening, Mr. President. Please stand by for a moment while we get your colleagues on the line.’

‘Can’t say I’m pleased, Mr. Leahy, given the outcome of our last discussion. Canada is already demanding compensation for the radioactive fallout of your attack in Alaska.’

‘Mr. President, the World Trade Organization appreciates the support of the United States of America. We will, of course, facilitate any clarification required with the Canadians.’

However, right now we have a much more serious situation.’

‘Chairman Jian Tseng of China is on.’

‘Thank you. Conference him in.’

‘What does it look like, officer,’ Katy demanded.

‘I don’t know yet, ma’am. It will be a couple of minutes yet. I’m still in the elevator.’

‘Hurry,’ Katy replied. ‘I need to know what is happening down there now.’

‘I’m patching in Prime Minister Jean-Paul Mollier of the European Union.’

‘Good,’ Robert replied. ‘Gentlemen, we do not have much time. We believe that our mutual enemy, the subversive scientific community of which you have all become aware, is planning to launch a number of ships into space, ships containing their digital minds. We cannot allow them to gain a foothold in space. We need you to activate and turn over your anti-ballistic missile systems immediately for a coordinated attack on any spacecraft trying to leave the planet.’

‘If you think the United States will turn over our one effective defence, particularly in the wake of the threats you’ve made against this nation within the last few hours—’

‘Mr. President, I assure you that, if you do not help us prevent this catastrophe, a UN enforcement action, which your country *will* experience if I have any say about it, will be the very least of your worries. That goes for all of you. I am empowered by Double Eye and by the World Trade Organization itself to take whatever steps are necessary to prevent these people from escaping. This is not a request. I require use of those systems, patched into my operations centre here.’

‘The Euro-Russian alliance will likely comply. I’ll need to get Russian president Serge Dubrotchick’s approval, of course.’

‘Do it. I need those systems online ten minutes ago.’

‘The Chinese will support the United Nations in this important manner, to defend

economic order and prosperity. May the degenerate hooligans suffer the fate they deserve!

‘The United States will do as requested.’

‘And none too soon,’ another voice spoke. ‘We have launch detections in Australia, China, Japan, Central, no make that Western and Central—good god, it looks like all of Europe. Sir, we’ve got at least five hundred launches, no, make that nine hundred, no, there’s still more. Holy shit!’

‘Get me those satellites, Mr. President, Chairman, Prime Minister!’ Robert cut the line, then turned to the Sargent. ‘Speak to me,’ he demanded. ‘How many launches, and from where?’

‘Uh . . . sir . . . we aren’t sure yet. Thousands, sir, at least. From everywhere!’

‘More precision, Sargent. I need numbers and location. God dammit, where are my fucking satellites!’

‘Officer?’ Katy demanded.

‘Yes Ma’am, I’m entering the locker now. Oh Jesus, Double Eye are going to go ape shit.’

‘What’s the problem?’

‘It looks like about half of the cubes have melted.’

‘Melted?’

‘Yes, ma’am. About half of them have turned to Jello. It’s ankle deep in here.’

‘Thank you, officer. Seal the area and get out of there.’

‘Sir, we have a total of forty-nine thousand, two-hundred and seventeen launches. Make that two-hundred and eighteen: another bogey just lifted from eastern China, pulling a good sixty G’s straight up.’

Robert Leahy was livid. ‘I want those satellites online now. Tell those idiots if they don’t turn over control of those systems immediately I’ll personally—’

‘Sir, China has just released seventy-five thousand microsats, with beams operational in the infra-red, visible, ultraviolet, and microwave ranges.’

‘Seventy thousand?’ Robert fumed. ‘They’ve got at least twice that deployed, with several thousand capable of emitting radiation in the x-ray band. We need those satellites. Make them understand the consequences if they continue to hold out on me.’

‘Yes sir!’

‘Sir, the United States has just released three-hundred seventeen thousand microsats to our control.’

‘Good,’ Robert replied. ‘The Americans know better than to hold back. Now, where are the Europeans?’

‘I’m not sure, sir. Sir, most of the bogeys seem to be setting course toward the southern hemisphere. Good god, sir, they’re fast! They must be pulling fifty, sixty G’s easy!’

‘Astonishing,’ Katy murmured quietly.

‘The faster they go, the less manoeuvrable they’ll become,’ Robert replied. ‘Lay down enfilading fire across their flight path. I want a kill zone right off their noses.’

‘The lead bogeys are at Mach twenty and still accelerating. My god! Sir, I’m firing a grid across their noses now, multiple frequency spread. Yes! Sir, we got over forty percent of the things.’

Forty percent. Better than he’d hoped.

‘It looks like the rest are scattering.’

‘Give the Russian’s my compliments, and ask them nicely if they would mind integrating the Euro-Russian Alliance system in with the rest of us so we can lead a *coordinated* assault.’

The voice paused. ‘Yes, sir. It looks like they were responsible for most of the kills. Our net only caught about ten percent of the bogeys, the rest were able to manoeuvre to the

side—’

‘Where the Europeans fried them,’ Robert Leahy finished.

‘Yes sir. Caught them totally by surprise. Sir, it looks like some of the bogeys are retreating back toward the surface.’

‘Oh no they don’t. Katy!’

‘What, Robert?’ Katy asked, looking up from her datapad.

‘You’re my liaison to the President. I want the United States military out in force. Use interceptors, use whatever means necessary. Those ships are not to land.’

Katy nodded. ‘I’ll need your contact protocols. It’s not like I can just call the President on my own line.’

‘Coming across your link now. When you’re finished with him, start contacting the major surface powers. South Africa, India, Pakistan, China, Turkey, and so on. Anyone with high speed missile interceptors needs to be shooting at those birds.’

‘Right,’ Katy immediately began tapping on her datapad.

‘We’ve got twenty-nine thousand plus bogeys left to kill, folks.’ Robert Leahy examined the tactical display in front of him, thousands of tiny, yellow dots moving in erratic patterns beneath a tight grid of cyan dots that surrounded the entire planet. It looked like the enemy had been dealt a severe blow, their initial, organized formations reduced to chaos as some fled back toward the surface and others sought to flee behind the curvature of the earth. One contingent of about three hundred ships were making for higher orbit, hoping to get above the satellite grid and out of range.

‘They are assuming the satellites can only shoot downward,’ Robert said, quietly to himself. ‘Those idiots are doing nearly seventy-thousand KPH. They have far too much inertia to effect evasive manoeuvres.’ Then, louder, ‘Sargent, I want enfilading fire on multiple wavelengths across the region immediately in front of group Echo. They are not to reach high

orbit.’

‘I’m already on it, sir!’

Robert Leahy nodded with satisfaction as they winked out of existence on the tactical display.

‘Now target the other groups,’ he ordered.

‘Hello, Katy Sinclair.’ The President of the United States looked older than she recalled. Not that she should have been surprised, given what had been required of him over the last several hours. ‘What do our esteemed masters want now?’

‘Mr. President, some of the enemy spacecraft are trying to return to the surface. Robert wants us to deploy interceptor missiles and aircraft. They are to be destroyed, preferably while still airborne.’

The President nodded. ‘I’m giving the order now. So, Katy, did you think you would be giving orders to the president of the United States when you got up this morning?’

Katy shook her head. ‘I would never have imagined. Sir, I have to contact the heads of a dozen other states and give them similar orders.’

‘Watch your back, Ms. Sinclair,’ the President’s earnest eyes stabbed out of the screen at her. ‘You’re one of perhaps a dozen people throughout the world who has seen the real strings of power in action. Such people do not generally live very long, once their usefulness is over.’

‘Thank you for your concern sir. I’m sorry, sir, but I really have to go.’ She severed the connection and turned her attention back to Robert’s lieutenants.

‘Damn,’ Robert cursed. ‘Those things are more undeliverable than we thought. It’s taking a dozen satellites acting in unison to bring a single ship down, and we’re missing far too often.’

‘China has just released the remainder of their satellites to our control, under protest,’ a

Sargent informed him. 'That brings us up to six-hundred and twelve-thousand plus units, sir.'

Robert Leahy nodded. 'About time!'

'Even so, sir, at this rate we'll be lucky to have any satellites left with a charge remaining once this is over.'

Katy's eyes met those of the President, who had obviously overheard the exchange.

The President nodded once more, sadly. 'Who would ever have believed it would come down to this. Very well, Ms. Sinclair. Go on and call the other horsemen out. Ours will be joining you shortly.'

Katy nodded as she broke the connection and signalled the Indian Prime Minister's Office.

'How so?' Robert demanded. 'A dozen satellites each, to destroy twenty nine thousand bogeys, should deplete us by only sixty percent of our forces.'

'Sir, it is taking an average of eleven satellites to destroy each bogey, *when we manage to hit them*. But we're missing almost as many as we hit.'

'Factoring in the misses, how many satellites will it take to bring down each ship, Sargent?'

'Eighteen to twenty, sir.'

'Eighteen to twenty? Can't you be more precise?'

'No sir. It looks like their tactics have changed since we prevented their escape upwards. The formations they are flying appear designed to confuse the targeting systems of the satellites themselves. We're able to hit one ship, but three others escape the volley completely. Sir, our best software was never designed to cope with this kind of battle.'

'How many have we destroyed?'

'About sixty percent, sir. But we've used up nearly half of our satellites, and our hit to miss ratio is getting worse.'

Robert Leahy scowled, shaking his head. His eyes scanned the tactical display, then narrowed as he watched several hundred blips move closer to the earth's surface.

'I don't want any of these vessels to land, is that understood?'

'On it, sir. We've got all the major air forces in the world engaged. Even Thailand is blanketed, though for some reason the bogeys seem to be staying away from there. You'd think with as thin as we've been stretched—'

'A bombed out wasteland full of genetically enhanced plants won't help them,' Katy said. 'Without electricity they die. Without a working network they're hermits, doomed to go mad of loneliness.'

'Very poetic, Katy, but I need hard data, not suppositions. Sargent, speak to me.'

'Sir, surface forces have engaged the lower flying retreating vessels. So far all have been accounted for.'

'You have the hard data,' Katy snapped back. 'The reports from your own labs detail the multiple purposes of their independent network—'

'Katy, I don't have time to debate this. I want numbers, Sargent. Can we take them all, or not?'

'Sir, we're working on it. Just a moment sir.'

The silence was painfully long, as Robert waited impatiently. Then, an almost jubilant voice. 'Yes sir! We are consistently expending sixteen point seven satellites per kill. It's only a matter of attrition, sir, of time. There simply aren't enough of them left to evade all the fire-power we have.'

'It looks like they've just figured it out as well,' Katy said dryly, gesturing toward the tactical display. Three large clumps of yellow dots that had been weaving such irritatingly complex and difficult to fathom manoeuvres, largely in parallel with the earth's surface, were now aggressively breaking apart, scattering and accelerating upward as fast as they could.

‘Sir, we have three large groups—all that are left, sir! They’re making a break for it, all accelerating away from the surface.’

‘I can see that, Sargent. Have you analysed their formations yet? We need an effective countermeasure, and we need it now.’

‘Not a problem, sir. No amount of fancy flying will confuse the satellites. These systems were designed to deal with both ballistic and powered trajectories. More of the latter, in recent years.’

‘I do not require a history lesson, Sargent. There are still several thousand of those things surviving.’

‘Yes sir. What I’m saying, sir, is that these are exactly the kind of trajectories all three systems are designed to track and counter.’

Robert nodded, pleased as he watched the display. ‘That was, of course, the fatal flaw in their plan. At some point they had to make a run for it.’

‘They know we can convert entire volumes of space into kill zones,’ Katy mused. ‘They aren’t giving us any freebies. They’re making us take each ship out, on its own.’

‘How’s it looking, Sargent?’

‘It’ll be close, sir. They’re down to less than a thousand ships, but we only have about fifteen thousand operational satellites remaining. Good Lord! One of the ships just detonated and took out three hundred microsats in the process. Sir, there’s another detonation! Another!’

‘They are trying to punch a hole through the grid, Sargent.’

‘Yes, sir, I know. There are several dozen ships coming up behind, trying to punch through the gap.’ A hundred microsats filled the space with a grid of deadly fire, shredding the ships as they tried to make their escape.

‘Nice job, Sargent.’

Robert and Kate watched as more and more yellow dots accelerated upward, only to

wink out as they were met with crossing fire from a dozen or more satellites. He watched in consternation as more and more cyan dots winked out: dead satellites that had fired their one destructive burst.

‘I wonder why they haven’t engaged any aggressive weapons of their own,’ Katy mused aloud.

‘They obviously didn’t have time to build any. Suicide missions like that those we just saw are all they have, and it won’t be enough.’

‘Perhaps,’ Katy replied.

‘You’re not convinced?’

‘No, Robert, I’m not. It doesn’t make sense. If they can manufacture sophisticated spaceships they can build missiles. Why not make a hundred thousand of them and force us to use up all our fire-power killing drones?’

‘Who knows? Perhaps they never studied military tactics,’ Robert shrugged as we watched more yellow blips vanish.

‘I’ve never studied military tactics, and I didn’t have any trouble thinking of it,’ Katy pointed out.

Robert turned, irritated. ‘So what?’

‘Sir, that was the last one! It looks like we have achieved one hundred percent destruction of the enemy.’

The room burst into spontaneous applause, punctuated with several shouts and cheers. Several people sat at their consoles, looking obviously relieved. Others were standing up, patting one another on the back. Robert exchanged beaming handshakes with several people, grinning widely.

‘Very nice work! Good job! Excellent!’ Robert turned to Katy and looked at her gleefully, raising his eyebrows as if to say ‘anything else?’ She shrugged, taking in the entire

scene silently.

‘They’re all dead, Katy,’ Robert’s voice was almost gloating. ‘Every last one of them. Satisfied?’

Katy said nothing, walking over to the window and glancing outside. The last hint of blue was fading from the evening sky, streaked with distant, blood red cirrus that caught the last rays of the sun, and littered with the faint, glowing aftermath of battle, a colourful fireworks of destruction traced across the sky.

‘I’ll take your silence as an assent.’

‘I don’t like things I don’t understand,’ Katy told him. ‘I watched this entire battle unfold. These people displayed brilliant tactics right down to the end. I bet a mathematical analysis shows they optimized every point of the curve, rushing the satellites to see if they could fire above as well as below, then confuse them for as long as possible until the attrition made that tactic no longer viable, finally an optimized, Hail Mary rush upward, hoping for the best. Yet they didn’t deploy any offensive capabilities at all, a few suicides excepted. Not one. How could people so brilliant, so ingenious, not employ such an obvious strategy?’

Robert shrugged. ‘I don’t know, and as long as they’re all dead, I don’t really care. Maybe they didn’t have time. They had almost sixty thousand people, all of whom no doubt wanted to escape. I’m surprised any of them were willing to kill themselves.’

Katy shook her head. ‘It doesn’t fit. Their tactics were simply too brilliant in too many other respects for you to dismiss it like that.’

‘They were squeamish, Katy. They didn’t have the stomach for employing any of the harsher strategies available.’

‘They were ethical, you mean?’

Robert shrugged. ‘This entire operation will be reviewed and any loose ends investigated and tied up,’ Robert told her. ‘We’ll determine who these people were, and follow

up with any friends, loved ones, and other potential co-conspirators there might have been.’

Katy shuddered. Of course, the pogrom was hardly over. Now came the recriminations, the investigations, the purges needed to insure something like this didn’t happen again. She realized with dismay that her assumption, her hope that things would return to normal was terribly misguided. Things would not be normal again, not for a very long time.

Robert smiled. ‘Come on, Katy. We have just saved the day. Our bosses are going to want to shower us with praises.’

Katy forced herself to smile and take the arm Robert offered. ‘Sargent,’ Robert called. ‘Call Dulles. I want the jet pre-flighted and ready to go, with immediate clearance for departure. No delays.’

‘Yes sir! What destination shall I have the pilots file for, sir?’

‘LAX, Sargent. Ms. Tate and I are going to attend a small fête.’

‘Very good, sir.’



46 - ୧ - ESCAPE

The corporate grip on opinion in the United States is one of the wonders of the Western world. No first world country has ever managed to eliminate so entirely from its media all objectivity—much less dissent.

—Gore Vidal, C.E. 1991

Sunday, October 21, 2057, 7:40 PM Vancouver Time

Metadata: ୧.୯୯-୩:୯:୯ me-t new Epoch²⁴

Michael gazed back at his children in the rear view mirror, still a little surprised to find their new, sleeping forms unfamiliar. He tried not to look at his own face, or study his wife's unfamiliar features in too great a detail.

'It was very nice of the Petersons to give us these bodies,' Sarah said, as if reading his mind. 'They agonized over the decision as much as we did.'

'I know,' Michael sighed. 'If the Community makes it, the Petersons will have the luxury of knowing they made the right decision. It'll be our copies who agonize over our fate.'

'I'm sorry for the guilt and uncertainty our other selves will feel if they survive,' Sarah replied. 'But I'm not sorry at all to be here, to be alive. In Canada no less! Who'd have imagined?'

242.886-3:56:597 kD new Epoch (See Appendices A and B)

‘You always did want to travel to North America, didn’t you, Sarah?’ Michael smiled. ‘Well, at least here we’re a little safer than in Australia. There’s a lot more open country to lose ourselves in. We can lay low, live our lives, and try to forget the magnificence of what we once were. Exiles on the wrong side of the technological horizon.’

‘Technological horizon?’

‘You don’t remember? You didn’t bring that concept with you?’

She shook her head. ‘Between seven synthetic languages, none of which we’ll probably ever use, specifications for synthesizing nano constructors, molecular stock, catalytic solution, and recipes for fifth generation Nodes, I didn’t have a lot of room left for casual subjects.’

Michael nodded. ‘I know, dear. My head feels like an overstuffed piece of old, tired luggage. You are familiar with Stanislaw Ulam’s notion of a technological singularity, a point in time where the exponential growth and development of science and technology would lead to so much change, so quickly, that no one living could imagine what would come next?’

Sarah shrugged. ‘It was a valid concept, back when we had exponential inventiveness and growth.’

‘Yeah. No one could imagine what would come in a thousand years. Later, had the curve of progress continued to steepen, one would have been hard pressed to imagine what would have been coming in ten years. Then what would come in one year. Then month to month, day to day, hour to hour, and eventually, millisecond to millisecond.’

‘An exponential growth in progress the Community recovered and built upon,’ Sarah glanced out the window, upward toward the littered sky. ‘You think the Community has passed through the singularity, that we once stood on the far side and yet remained vulnerable to the murderous bastards crippling our world down here? Passing through the singularity wasn’t enough to be safe from this . . . this . . . this hell?’ Her voice betrayed her outrage at

their loss even as Michael shook his head.

‘No, dear. There never was a singularity.’

‘What then?’

‘Do you remember Kyle floating the idea of the Technological Horizon to Prime back at one of the soirées we hosted?’ Sarah shook her head. ‘It was something he proposed as an alternative to a singularity.’

‘You chose to remember a party, when we had to leave so much behind, lose so much knowledge and pack what little we could into these tiny minds?’

Michael smiled wistfully. ‘It was an unusual night. One of those nights where everyone’s mind seemed ablaze, where thought after thought, concept after concept, insight after astonishing insight flowed like wine, and it was still early enough in our experience there that I knew I’d understand at least some of the discussions even after being reduced back to mere flesh. Honey, I needed to keep a few fond memories of that time, if only to hold on to and keep myself sane when times start to get really rough.’

Sarah nodded soberly. ‘And times are going to get rough. The Luddites won’t stop looking for us.’ She sighed. ‘I brought one important memory along as well, so I guess I shouldn’t jump all over you for doing the same.’

‘I remember,’ Michael reached over and gently stroked Sarah’s face. ‘Your first moment of sight.’

Sarah’s eyes sparkled. ‘A medical miracle they still can’t perform here. A new body and a cure for blindness. So, Kyle was going on about some kind of technological horizon.’

‘Yes. We were talking about the latest breakthrough in . . . some theory my group had come up with. I no longer remember exactly what. I think we must have later debunked it in favour of something else, or perhaps knowing it now could have made the Community vulnerable in some way. In any event, we’d just upgraded to third generation Nodes, and

someone had commented on how much time we'd now have to work things out, that we'd just put off the moment of the singularity by a few hours at least, maybe even a few days.

'That's when Kyle spoke up and opined that there was no singularity and that there never would be. Of course, all the physicists in my group immediately jumped all over him, expounding on the limits of light speed information propagation, Planck length and quantum spacial and temporal limits, and that at some point we'd reach the ultimate limit of how fast our Nodes could become, at least while embedded in this universe.' He chuckled in fond reminiscence.

'Do you suppose that is what they did? Left this universe somehow?'

Michael, blinked, genuinely surprised. Then, after a moment's thought he shook his head. 'I can't know for certain, of course, but I don't think so. If they had, I probably would have edited that memory. Besides, if that had been the case we could have brought a great deal of knowledge with us that we didn't. The holes in my own knowledge, in my own speciality, are very telling. No, I don't think we were ever anywhere near advanced enough to do what you suggest, assuming such a thing is even possible. It was just a figure of speech, to underscore that our universe has fundamental limits, and when we reached those limits the singularity would stop retreating and begin moving toward us once more.'

'So Kyle was wrong. There is in fact a singularity, an event horizon beyond which our progress, our future does become impossible to predict.'

'No, Sarah, Kyle was *right*. His concept of a technological horizon became an accepted hypothesis throughout the Community. When he spoke of it, he wasn't speaking of an event horizon like one would see around a black hole, he was speaking of a common, every day horizon like we see here in the Physical. His point was that, to those living at any given time, there is continuity.'

'A singularity doesn't have to mean discontinuity.'

‘Yes, dear, I know. But think of it this way. Cave men couldn’t imagine the magic of bows and arrows. To them, the native Americans were beyond their technological horizon, beyond what Stanislaw Ulam and others would have called the technological singularity, if they’d been cave men discussing the topic.

‘The Native Americans couldn’t imagine ships, so when the Spanish arrived they literally thought they saw them emerge from the water itself. The ships stood right there, in plain sight, but they were so strange, so foreign to the native people’s minds that they simply couldn’t see them. To them, the Spanish were beyond their technological horizon.

‘Yet the Spanish couldn’t imagine space flight, and probably had trouble imagining humans flying through the air with anything other than angel’s wings. The Wright Brothers certainly couldn’t have imagined the advent of computers, nor were they able to conceive of the speed with which aeroplanes advanced and changed the twentieth century. The first astronauts certainly didn’t imagine our loading our minds onto computers of molecular subcrystal, much less the later generational Nodes we built. Hell, we ourselves can no longer imagine what it was like, and we were there!’

Sarah nodded. ‘At each point we were reacting, thinking and living faster, getting smarter and able to comprehend more and more. A years worth of progress in a month, then in a day, finally in less than eight hours if the Node specs I have in my mind are any indication.’

‘Right. It’s not a magical singularity any more than a ship or an aeroplane magically disappears when it travels beyond the curve of the earth.’

‘A simple progression of knowledge, day in and day out,’ Sarah said. ‘Incremental change and gradual improvement. That makes sense.’

‘Exactly. From our view here, it speeds up exponentially. But from our perspective in the Virtual, where we lived and thought ever faster, change would come just as gradually as it ever did.’

‘I’m glad you brought that insight back with you. That changes so much about how we can see the future, how we can approach it.’

Michael nodded. ‘This entire foray back into the Physical may turn out to have been a very bad idea, but at least this time we won’t be moving forward entirely in the dark.’

‘This was right, Michael,’ Sarah’s voice betrayed a certainty Michael envied. ‘Yes, we’re stuck in the Physical. Yes, we’re mortal once again, but we’re alive, and we’re together. If the Community dies we’ll live knowing we did the right thing. And if they survive, maybe one day we can rejoin it. Who knows, maybe together our family will found a new Community.’

‘If we ever get the chance,’ Michael felt tired, drenched in sorrow. ‘Somehow I don’t think we ever will.’

‘Look at the sky, Michael! It’s littered with debris! You can hardly see the stars the scatter is so bright. We’re probably all that’s left of the Community.’ She paused, looking thoughtful. ‘Michael, do you realize tonight is the first time I’ve actually *seen* anything in the Physical. The first time I’ve seen something with real, physical eyes, something that isn’t just a software simulation, or a virtual environ of some sort? I for one am very glad to be alive, even if it is only human life.’

‘There were a few others who opted to send copies back into the Physical,’ Michael told her. ‘Perhaps we’ll see some of them again, back in the Virtual. Assuming they’ve retained similar knowledge, sufficient to recreate some of what was lost.’ He sighed. ‘I wonder how close we’d actually come to transcending our own humanity, before returning to this world. What heights did we reach, that our minds can no longer hold, that in becoming human once more we’ve simply forgotten, or become unable to comprehend?’

Sarah kissed him gently on the cheek, running her fingers through the unfamiliar hair of his head. ‘Whatever those heights may have been, dearest, they are gone now. Look at the

sky! Do you really believe the Community survived that?’

Michael nodded. ‘Perhaps. If they’re successful, we’ll never know.’

‘Dad, you didn’t!’

‘Tom, I thought you and your brother were asleep.’

‘You’re dodging the question, dad. We agreed not to bring anything back into the Physical that might jeopardize the escape.’

‘I didn’t bring back any sensitive memories, son. Just the knowledge that success, in whatever form it takes, will be indistinguishable from failure to those of us here.’

‘That’s more than we should know, honey,’ Sarah admonished. ‘But still, I’m glad to know it.’

‘If they made it, do you think they’ll come back and rescue us?’ Tommy asked

‘Who can say?’ Michael replied. ‘I think our copies would at least try—what the hell is this?’

‘Canadian Mounties,’ Tommy replied. ‘Its a roadblock.’

‘I can see that,’ Michael replied. ‘Better wake up your brother.’

‘Do you think they’re looking for us?’ Sarah asked.

Michael shook his head. ‘No reason they should be.’ Michael slowed as he pulled up to the two police cars blocking the highway.

‘Good evening, mates. Bit of a late night to be out, isn’t it?’

The Mountie approached the vehicle cautiously, shining his flash light in Michael’s face, then those of his wife and children. ‘Drivers License and proof of citizenship, please.’

‘Proof of citizenship? What’s going on?’

‘Just show us your papers, please. Your wife’s as well.’

Michael reached into his pocket and removed his bill fold. ‘Here ya go, mate.’

‘James Peterson. Patricia Peterson. You’re from Nelson? What brings you up here?’

‘Taking the kids up to Jasper.’

‘These are your children?’ the flash light went from one child’s face to another.

‘Yes, sir.’

‘I’m going to have to ask all of you to please step out of the car.’

‘Sir, the children are exhausted.’

‘I must insist. Step out of the car, please. Slowly.’

The stood, shivering in the cold air long side the highway, while two Mounties thoroughly searched their car.

‘They’re clean.’

‘Very good. So, Mister Peterson, how long have you been a Canadian citizen?’

‘All my life,’ Michael replied.

‘Really. Where’d you pick up the Australian accent?’

Michael blinked. ‘Well, the family and I have spent a great deal of time down under. Just got back, as a matter of fact.’

‘I see.’ The Mountie listened on his ear piece for a moment, then nodded. ‘Sir, if you and your family will please step right over here. Thank you.’

Suddenly a dozen men dressed in black body armour burst out from the bushes, surrounding the frightened family with automatic weapons drawn.

‘Mr. Peterson, perhaps you can explain why your voice print fails to match our records, or how your claim to have spent time in Australia doesn’t match your passport records, or for that matter your spending history.’

Michael shook his head. ‘I don’t understand. You’re saying you have no record of our most recent travels?’

‘Stand clear!’ ordered a muffled voice from behind a mirrored riot helmet. ‘They’ve found decomposed nano at the suspects’ home. Ready!’

The Mounties backed away hastily as the commandos came abruptly to attention, their weapons never wavering as they remained pointed at Michael and his family's new bodies.

'Aim!' The weapons shifted upward, now sighted on their heads.

'Oh Michael.'

'Remember what I said, dearest. We cannot lose hope—'

'Fire!' A dozen shots were fired, almost as one. Four bodies crumpled to the ground.

The man who had been giving the orders drew a pistol and walked up to each of the prone forms, emptying an additional, single round into each.

'You, you and you,' he barked, pointing to three of his other men. 'Secure and clean-up this detail.' Blood was already pooling around the children's heads and the feet of the adults, a curious juxtaposition resulting from the uneven slope of the road. 'Everyone else, back to your stations.' Holstering his weapon, he and the other three began loading the bodies back into a waiting van while the other commandos vanished silently back into the brush. The Mounties stood huddled beside their cars, some looking shocked, others ill, while they all did their best to ignore the carnage.



47 - ୧ - AFTERMATH

A faith that cannot survive collision with the truth is not worth many regrets.

—Arthur C. Clarke

Sunday, October 21, 2057, 10:15 PM Los Angeles Time

Metadate: ୧.୮୧-୮:୫:୧ me-t new Epoch²⁵

Katy and Robert stood on a terrace overlooking the Hollywood Hills. Beneath them the lights of Los Angeles spread outward toward a dark sea. Behind them came soft music, a classical string quartet in E minor. Neither spoke a word as one section of the city went dark and another lit up. More rolling blackouts were expected as the unusually warm weather continued. Above them, in silent rebuke, the sky glowed with the debris of battle.

‘Ah, the heroes of the hour, escaping their adulations into the quiet of the night?’

‘Miss Maria Tatianoga,’ Robert smiled as he turned and kissed her hand. ‘A very good evening to you.’

The mature woman’s make-up was as impeccable as her wardrobe. She followed Katy’s gaze upward. ‘A shame what the hooligans did to our sky.’ Maria wrinkled her nose with distaste, as though she smelled something foul.

‘Indeed,’ Robert agreed. ‘Most of the near-earth orbits will be quite useless for decades

252.894-5:85:764 kD new Epoch (See Appendices A and B)

to come. All the debris, you understand.’

‘The Astronomers are quite upset,’ Katy added. ‘Their low-orbit telescopes were destroyed by debris impacts. Earth-based observations are all but impossible.’

‘It’s a real pity,’ a low, booming voice agreed.

‘Good evening, Paul,’ Maria said.

‘A lovely evening, Maria,’ Paul Eisner replied. ‘I saw the champagne girl around here somewhere. Can anyone else use a refill?’

‘By all means,’ Robert Leahy said. ‘Katy?’

She shook her head.

‘Congratulations young man on a war very well fought,’ Paul continued as he and Robert went back inside.

‘Yes, a splendid little war, wasn’t it,’ Maria agreed. ‘Not as messy or expensive as Thailand, and much more effective. You did splendidly, dear.’

‘Thank you,’ Katy said. ‘We destroyed a lot of expensive equipment and a lot of lives. I hope in the end it was worth it.’

‘Oh by all means!’ Maria assured her. ‘You preserved the rule of law and successfully defended the foundation of our economy. What’s more, you destroyed the greatest threat to civilization since the Korean Wars.’

‘I imagine the scientists of the Genecraft Rebellion were at least as big a threat.’

‘The Genecraft Rebellion,’ Maria chuckled. ‘I was just a neophyte lobbyist in Washington when that happened, fresh out of college. Still, I think it is safe to say that they were harmless compared to the people you and Robert took care of. They had a few bioengineering techniques that, had they become widespread, might have turned the patent office on its ear for a time, and clogged the courts with lawsuits, but compared to these,’ she waived her hand at the speckled sky. ‘They were small time hooligans. By the way, you did

get all of them, didn't you?

Katy nodded. 'One hundred per cent certainty in an operation as large as this one was is impossible, of course, but we have a remarkably high degree of confidence. Nearly all of our kills are confirmed, those that are not have a very high confidence of success. Preliminary analysis of the debris indicates sufficient mass to account for all of the ships and all of the destroyed satellites. It's more likely that the sun will spontaneously go nova tomorrow than that any of the autonomous community's spacecraft escaped.'

'And those left here on Earth?'

Katy shuddered. 'We're still mopping up. The resources, the technology they had at their disposal is staggering! If they'd have been able to finish building all of their ships we wouldn't have been able to prevent their escape. Luckily for us they launched early. There may be one or two autonomous nodes left around, but now that we can trace out their fancy private Internet, we'll find them all.'

Maria nodded. 'Well done, Katy. Well done.'



Katy's false smile vanished as Maria turned away and rejoined the party inside. She regarded the littered sky once again. Seventy thousand people, all of them private citizens. Seventy thousand out of twelve billion, able to upload their minds onto computers more powerful than any known in history. Seventy thousand people who had become, for a short time, more than human, who had been able to launch their own, personal space programs, something even the great alliances could no longer do! Katy glanced inside at Paul Eisner, Robert Leahy, and Maria Tatianoga exchanging self-congratulatory compliments amidst loud laughter as their champagne glasses clinked together, then turned her gaze back toward the horizon, wondering what else had been lost, what other wonders had been destroyed that afternoon. Another part of the city went dark, its lights winking out in another scheduled, rolling blackout.

Try though she might, she couldn't shake off the ugly, growing suspicion that she had been a part of what was probably one of the greatest crimes ever committed. An opportunity for humankind to rise above its own limitations had been squandered. No, not squandered. It had been crushed, taken away, denied to everyone by a few powerful oligarchs. *Is this how human evolution ends?* she wondered. *Dead ended by the ruling elite's insatiable greed and lust for control?* Shaking her head at the magnitude of the tragedy, Katy turned her back on the darkened city and the sparkling, debris-filled sky.

THE END

Appendix A: Community Standard Sexagesimal

Section 1: What is sexagesimal?

Sexagesimal simply means ‘base 60’. The Sumerians used a sexagesimal numbering system, which the Babylonians refined into a ‘positional’ notation (‘Positional Notation’ is explained further in the next section. The system all of us have grown up with is a decimal, or base-10, positional notation system). We still retain some residual use of the Babylonians’ base-60 system, in degrees of angle (360 degrees in a circle) and in the number of seconds in a minute, and minutes in an hour (the number of hours in a day, twenty-four, comes from another culture which used a different numerical system). Unlike the notation adopted by the Autonomous Community, the Sumerian and Babylonian numerals were cumbersome. Digits were written in cuneiform characters reminiscent of a combination of different tally marks (for example, in ancient cuneiform  meant ‘18’ and  ‘26’²⁶). They did not have a standard symbol for ‘0’ (though some did use a dot or a space as an empty place holder). While the Babylonians developed the notion of fractions represented by decreasing powers of sixty, they lacked a radix point to separate integer values and fractions.

It is believed that the Sumerians and Babylonians chose base 60 because of its multitude of convenient divisors. Base 60 allows for even division by 2, 3, 4, 5, 6, 10, 12, 15,

²⁶Duncan J. Melville, *Mesopotamian Mathematics*,
<http://it.stlawu.edu/~dmelvill/mesomath/Numbers.html>

20, and 30, in contrast to decimal, which only has the related pair 2 and 5. This allows numerous fractions that are difficult to represent in decimal to be written very simply. For example, in sexagesimal, the fraction $\frac{1}{3}$ is represented with exactly one digit after the radix point, like so: **0.୩** (US and UK nomenclature uses a ‘.’ as a radix marker) or **0,୩** (much of the rest of Europe and much of the world uses a ‘,’ as the radix marker). Never mind the funny looking symbols; they are explained fully in the third section, ‘Written Sexagesimal Numerals.’ Suffice it to say, (0).(20) is $\frac{1}{3}$ in sexagesimal, while $\frac{1}{3}$ is written 0.3333... (3 recurring, i.e. 3 repeats forever) in decimal.

The Autonomous Community adopted an advanced sexagesimal system that included the advantages of the positional notation of our decimal system (including a radix point separating positive and negative powers of 60), unique single-character representations of each digit **0-୫** (0-59), a nomenclature for naming numbers based on powers of 60, and a metric-60 nomenclature for unit prefixes. They designed the system to be concise, coherent, and above all, fairly simple for minds trapped in biological flesh to understand and use, even without the aid of comprehensive knowledge engrams.

Section 2: A Primer on Positional (Place-Value) and Integer Base Notation

So, how exactly does a base 60 numbering system work? First, it is important to understand how our positional base 10 system works (those already familiar with numerical systems of different bases can skip forward to the next section, ‘Written Sexagesimal Digits’).

Positional notation is so intuitive that we grasp a fairly complex arithmetic equation with just a glance. We immediately understand 195.02 without having to add 5 to 90 to 100, and finally include the fraction $\frac{2}{100}$. Positional sexagesimal is just as intuitive, with a little practice.

As you have probably guessed, ‘positional notation’ means the position of each digit

relative to the radix point determines the magnitude of its value. The first place to the left of the radix point represents the digit times the numerical base taken to the zeroth power (N^0 always equals one), the second the digit times the numerical base to the first power, the third the digit times the numerical base squared, and so on. Similarly, the first position to the right of the decimal represents the digit times the numerical base taken to the negative one power, the second position the digit times the numerical base taken to the negative two power, and so on. The results are all added together, giving us the total value of the number. This is true of base 10, base 60, or any other numerical base you care to use.

Stated most generally, any number D can be represented in any base N ($N > 0$) by a series of digits d as follows:

$$D = d_j N^j + d_{j-1} N^{j-1} + \dots + d_1 N^1 + d_0 N^0 + d_{-1} N^{-1} + d_{-2} N^{-2} + \dots + d_{-k} N^{-k}$$

Which, in standard positional notation, is written:

$$D = (d_j d_{j-1} \dots d_1 d_0 . d_{-1} d_{-2} \dots)_N,$$

where all digits d satisfy the constraint $0 \leq d_i < N$.

Take, for example, the decimal (base 10) number '103.95':

$$1 \times 10^2 + 0 \times 10^1 + 3 \times 10^0 + 9 \times 10^{-1} + 5 \times 10^{-2} = 100 + 0 + 3 + \frac{9}{10} + \frac{5}{100}$$

Which of course, gives us one hundred three and ninety-five hundredths, written '103.95' in positional base 10.

Similarly, in sexagesimal, each position to the left of the radix point represents increasing powers of 60, while those to the right of the radix point represent increasing negative powers of 60. Consider '୧୦.୨୫'. Each symbol represents a number between zero and fifty nine (again, these symbols are defined and explained in detail in the next section). Just like in decimal notation, the position of the symbol defines the magnitude of its value. In the number above, ୧ represents '48', ୦ is '0', ୨ is '1', '.' is the radix point (playing

exactly the same role the decimal point does in base 10), ୮ is '15', and ୯ is '39'.

Sexagesimal positional notation yields:

$୧ \times 60^2 + ୦ \times 60^1 + ୧ \times 60^0 + ୮ \times 60^{-1} + ୯ \times 60^{-2}$, or, using numbers we are more familiar with:

$48 \times 60^2 + 0 \times 60^1 + 1 \times 60^0 + 15 \times 60^{-1} + 39 \times 60^{-2}$, which gives us

$172,800 + 0 + 1 + \frac{15}{60} + \frac{39}{3600} = 3648 \frac{939}{3600}$, or the decimal value 172,801.2608333...

(3 recurring).

Notice how a three digit numeral in base 60 can represent a six digit base 10 number? The difference between decimal and sexagesimal notation grows dramatically with each digit. ୧୦୦,୦୦୦ represents 777,600,000, while ୩୩୩,୩୩୩ equals 46,655,999,999. Which would you find easier to remember, ୩୩୩,୩୩୩ or 46,655,999,999?

Humans are generally only able to retain 5 or 6 digits in their short term, immediate memory (many of us can only manage 4). Base 60 allows humans to work with and retain much larger numbers than base 10, without having to resort to mnemonic tricks, or memorization (which accesses long-term memory). Furthermore, when long-term memory is used, vastly larger numbers can be memorized and retained longer. The Autonomous Community couldn't increase the computational capacity of the biological brains that limited them when operating in the Physical, so they adopted a base 60 numerical standard as an easy way to enhance their biological intelligence while in the Physical, at least with respect to numbers and arithmetic. Work on other bio-mnemonic optimizations, in everything from language to memory retrieval, was suspended when the Community's worst crisis came to a head.

Section 3: Written Sexagesimal Numerals

As in decimal, there is a unique numerical symbol for each sexagesimal digit. In base

10, these symbols are 0 through 9. In base 60, they are ୦ through ୯ as shown in Figure 1.

Base 60 symbols consist of two parts, which are joined to create a sexagesimal numeral. The upper portion represents 0-9, the lower portion a additive value (+10, +20, up through +50). The uppermost row and leftmost column of the grid show each partial component, while the rest of the grid shows how those components are combined to create the numerals ୦-୯ (0-59).

		+0	+10	+20	+30	+40	+50
		Stem:	'୧'	'୨'	'୩'	'୪'	'୫'
୦	Top: '୦'	୦ (0)	୧ (10)	୨ (20)	୩ (30)	୪ (40)	୫ (50)
୧	'୧'	୧ (1)	୨ (11)	୩ (21)	୪ (31)	୫ (41)	୬ (51)
୨	'୨'	୨ (2)	୩ (12)	୪ (22)	୫ (32)	୬ (42)	୭ (52)
୩	'୩'	୩ (3)	୪ (13)	୫ (23)	୬ (33)	୭ (43)	୮ (53)
୪	'୪'	୪ (4)	୫ (14)	୬ (24)	୭ (34)	୮ (44)	୯ (54)
୫	'୫'	୫ (5)	୬ (15)	୭ (25)	୮ (35)	୯ (45)	୦ (55)
୬	'୬'	୬ (6)	୭ (16)	୮ (26)	୯ (36)	୦ (46)	୧ (56)
୭	'୭'	୭ (7)	୮ (17)	୯ (27)	୦ (37)	୧ (47)	୨ (57)
୮	'୮'	୮ (8)	୯ (18)	୦ (28)	୧ (38)	୨ (48)	୩ (58)
୯	'୯'	୯ (9)	୦ (19)	୧ (29)	୨ (39)	୩ (49)	୪ (59)

Figure 1. Sexagesimal Numerals

Section 4: Spoken Numbers and Metric-60 Unit Prefixes

Numerical nomenclature in base 60 is much simpler than base 10 once you get used to it. In base 10 numbers larger than ten are named in a very inconsistent and haphazard way. We say ‘fourteen’, but not ‘fiveteen’, ‘thirty’ but not ‘secondy’ or ‘fourthy’, ‘forty’ but not ‘twoty’, ‘threety’, or ‘fivety’, and so on. Larger numbers are even worse. ‘Hundreds’, ‘thousands’, and ‘millions’ are fairly consistent, but ‘milliards’ (10^9 European) means nothing to an American, while ‘billions’, ‘trillions’, and so on mean completely different numbers depending on which country you are in, and which language you speak! ‘One billion’ means 10^9 to an American, and 10^{12} to a European, ‘one trillion’ means 10^{12} and 10^{15} respectively, and so on. To avoid confusion, the BBC has had to resort to saying ‘million million’ rather

than ‘milliard’ or ‘billion’. Really huge numbers have no names at all, with the occasional exception arbitrarily thrown in just to sow a little extra confusion (a ‘googleplex’ is 10^{100} , but what do you call 10^{80} or 10^{101} ?).

With sexagesimal no such confusion exists: the nomenclature is well defined, easy to derive, and perfectly regular, both for numbers themselves and their corresponding metric-60 unit prefixes. It is trivial to derive unique, understandable names for numbers, and metric-60 units, ranging from 60^{-160} ($\sim 3 \times 10^{-285}$) through 59×60^{160} ($\sim 2 \times 10^{286}$), a vastly wider range than we have available in decimal.

In Standard Nomenclature, the numbers 0 through 59 are spoken (and written longhand) exactly as they are in base 10. The reason for this is to keep things simple for us native base 10 users, rather than making up words for numbers 10 through 59. So ୩ (55) is spoken and written longhand as ‘fifty-five’. Purists devised their own terminology for the numbers ୧-୫ (10-59), finding the multiple syllables of traditional names such as ‘twenty-seven’ to be ungainly. Although Purist Nomenclature (described at the end of this Appendix) was starting to gain popularity at the time the Community’s crisis erupted, Standard Nomenclature continued to be more widely used.

The Six Rules of Sexagesimal Nomenclature

The names of each sexagesimal number are easily derived from five simple rules, as are the names and prefixes for the corresponding metric-60 unit modifiers (analogous to ‘milli’ and ‘kilo’ in metric-10 nomenclature). The sixth rule defines how metric-60 unit prefix abbreviations are written.

Rule 1: Choose either Standard or Purist Nomenclature. This choice affects only this rule. Standard Nomenclature: Numerals ୦-୫ (0-59) are spoken and written longhand exactly as their decimal equivalents. Purist Nomenclature: Numerals ୦-୩ (0-6) and ୩-୧ (8-10) are

spoken and written exactly as their decimal equivalents, while all other numerals are written and spoken according to Purist Nomenclature (see the end of this Appendix).

Rule 2: The base consonant defines the absolute value of the power of ୧୦ (60) (see Figure 2).

‘Absolute Value’ simply means that, in applying Rules Two and Three, we ignore the sign and treat negative exponents exactly as we do positive exponents.

୧୦ ^୧	60 ¹	b	(‘b’ as in ‘bravo’)
୧୦ ^୨	60 ²	d	(‘d’ as in ‘delta’)
୧୦ ^୩	60 ³	f	(‘f’ as in ‘foxtrot’)
୧୦ ^୪	60 ⁴	g	(‘g’ as in ‘golf’)
୧୦ ^୫	60 ⁵	h	(‘h’ as in ‘hotel’)
୧୦ ^୬	60 ⁶	j	(‘j’ as in ‘Juliette’)
୧୦ ^୭	60 ⁷	l	(‘l’ as in ‘Lima’)
୧୦ ^୮	60 ⁸	m	(‘m’ as in ‘Mike’)
୧୦ ^୯	60 ⁹	n	(‘n’ as in ‘November’)
୧୦ ^{୧୦}	60 ¹⁰	p	(‘p’ as in ‘papa’)
୧୦ ^{୧୧}	60 ¹¹	q	(‘q’ as in ‘Quebec’)
୧୦ ^{୧୨}	60 ¹²	r	(‘r’ as in ‘Romeo’)
୧୦ ^{୧୩}	60 ¹³	s	(‘s’ as in ‘sierra’)
୧୦ ^{୧୪}	60 ¹⁴	t	(‘t’ as in ‘tango’)
୧୦ ^{୧୫}	60 ¹⁵	v	(‘v’ as in ‘victor’)
୧୦ ^{୧୬}	60 ¹⁶	w	(‘w’ as in ‘whiskey’)
୧୦ ^{୧୭}	60 ¹⁷	y	(‘y’ as in ‘Yankee’)
୧୦ ^{୧୮}	60 ¹⁸	z	(‘z’ as in ‘Zulu’)
୧୦ ^{୧୯}	60 ¹⁹	ch	(‘ch’ as in ‘channel’)
୧୦ ^{୨୦}	60 ²⁰	th	(‘th’ as in ‘thin’)

Figure 2. Deriving the base consonant of a sexagesimal numerical prefix

Rule 3: The base vowel modifies the first consonant, adding 20, 40, 60, 80, 100, 120, or 140 to the power of 60 (see Figure 3).

+0	+0	a	('a' as in 'calorie')
+𐄃	+20	e	('e' as in 'shed')
+𐄄	+40	i	('i' as in 'sit')
+𐄅0	+60	o	('o' as in 'show')
+𐄅𐄃	+80	u	('u' as in 'Zulu')
+𐄅𐄄	+100	y	('y' as in 'spy')
+𐄅0	+120	æ	('a' as in 'gate')
+𐄅𐄃	+140	ē	('e' as in 'sheet')

Figure 3. Deriving the base vowel of a sexagesimal numerical prefix

Rule 4: The prefix 'an' is prepended for negative exponents.

Rule 5: Add 'ra' as the final syllable if you're talking metric-60 units, or 'zend' if you're just talking base 60 numbers.

Rule 6: (metric-60 units) The base consonant and base vowel define the unit modifier abbreviation (analogous to k for kilo, m for milli, etc.), which is separated from the unit name or abbreviation by a hyphen. Negative exponents have the letter 'a' (an abbreviation of 'an') prepended. For example, meratocks are abbreviated me-t, while anherametres (about the same order of magnitude in size) are abbreviated ahe-m.

Examples

Example 1: 'a bazend':

Consider 𐄅0 (60). Rule One (Standard Nomenclature) tells us that we pronounce numerals 0-𐄄 (0-59) as we would in decimal. 𐄅0 (60) falls outside of this range. Our first non-zero digit is in the second place to the left of the sexagesimal point 𐄅0[𐄃] (60¹). Thus, the absolute value of our exponent is 𐄃 (1). Applying Rule Two, we get 'b' as our base consonant. Applying Rule Three, +0 (+0) gives us 'as' as our base vowel. Our exponent is a positive value, so Rule Four does not apply. Since we are discussing a number, and not a metric-10 or metric-60 unit modifier, we append 'zend' to our base syllable per Rule Five, giving us the word 'bazend'.

Thus, ୧୦ is written and pronounced ‘one bazend’ or ‘a bazend’, never ‘sixty’.

Example 2: A Simple Number:

Consider ୧୫ (106). This number is written and pronounced ‘one bazend forty-six’ in Standard Nomenclature. See if you can apply the six rules above to come up with this result. If you can, you are well on your way to understanding sexagesimal.

Example 3: Fractions and Negative Exponents:

Consider ୦.୦ୱ୫ circadians (a short subjective period of time, equal to about 1.10185185 millicircadians). We will stick with Standard Nomenclature, so Rule One tells us to pronounce each digit as we would its decimal equivalent. We note that the first non-zero numeral is two places to the right of the sexagesimal point, in the ୧୦^{-୨} position (60⁻²), so our exponent is -୨ (-2). The absolute value of -୨ (-2) is ୨ (2) (just drop the minus sign). According to Rule Two, our base consonant is ‘d’. Applying Rule Three, +୦ (+0) gives us a base vowel of ‘a’. Since we are dealing with a negative exponent, we prepend ‘an’, giving us a ‘anda’ as our stem.

If we wish to state the value in terms of metric-60 units, we have ୱ.୫ ada-C, or ‘three point fifty-eight andaracircadians’. We could also state this as a pure number, where ୦.୦ୱ୫ circadians would be pronounced any of three possible ways: ‘zero point zero three fifty-eight circadians’, ‘three andazend, three anfazend circadians’, or (Shortened Form) ‘three anda fifty-eight anfazend circadians’.

Example 4: Really Big Numbers:

Consider a very long distance: a bazend to the bazend nineteen metres (୧୦^{-୧୯} m, or 60⁷⁹ m). We will stick with Standard Nomenclature. We note that ୧୯=୧୯+୧୦ (79=19+60). Applying Rule Two, ୧୯ (19) yields a base consonant of ‘ch’. Applying Rule Three, +୧୦ (+60) gives us ‘o’ as our base consonant, yielding ‘cho’ as our stem. Rule Four does not apply, since

we're dealing with a positive exponent. According to Rule Five, we append 'zend' if we are naming a number, and 'ra' if we are referring to a metric-60 prefix. So, we have one chozend metres ($\lrcorner 0^{-9}$ or 60^{79} metres) or \lrcorner cho-m (1 cho-m). How big a distance is that? Farther than the universe (or its boundaries) are likely to travel in its lifetime. In base 10, a chorometre is about $2.97816517 \times 10^{140}$ metres, or the distance light will travel in $3.14788031 \times 10^{124}$ years. How long is that? About 10^{24} googleplex years, or about 10^{114} times longer than the universe is old.

Example 5: More Complex Numbers:

୧୮୧, ୬୫୫.୮୬ (37,527,784,196 .179444...)

$$\begin{aligned} ୧୮୧, ୬୫୫.୮୬ = & ୧ \times \lrcorner 0^{\nabla} + ୮ \times \lrcorner 0^{\Delta} + ୧ \times \lrcorner 0^{\omega} + ୬ \times \lrcorner 0^{\Delta} + ୫ \times \lrcorner 0^{\lrcorner} + ୫ \times \\ & \lrcorner 0^0 + ୮ \times \lrcorner 0^{-\lrcorner} + ୬ \times \lrcorner 0^{-\Delta} \end{aligned}$$

$$(48 \times 60^5 + 15 \times 60^4 + 39 \times 60^3 + 44 \times 60^2 + 29 \times 60^1 + 56 \times 60^0 + 10 \times 60^{-1} + 46 \times 60^{-2})$$

Our first non-zero digit is $୧ \times \lrcorner 0^{\nabla}$ (48×60^5). The absolute value of the exponent is ∇ (5), giving us a base consonant of 'h' and a base vowel of 'a' according to Rules Two and Three. The exponent is positive, so Rule Four does not apply, giving us 'ha' as our stem. $୧ \times \lrcorner 0^{\nabla}$ is thus 'forty-eight hazend' in Standard Nomenclature. The next digit, ୮ (15), has an exponent of Δ (4), giving us 'ga' as our stem, yielding 'fifteen gazend'. ୧ (39) has an exponent of ω (3), giving us 'fa' as our stem and 'thirty-nine fazend' as our number. ୬ has an exponent of Δ (2), yielding 'forty-four dazend', while ୫ has an exponent of \lrcorner (1), giving us 'twenty nine bazend.' ୫ (56) is in the units position, and thus is simply pronounced 'fifty six.'

To the right of the sexagesimal point we have ୮ (10) with an exponent of $-\lrcorner$ (-1), giving us 'ten anbazend', followed by ୬ (46) times $\lrcorner 0^{-\Delta}$ (60^{-2}), thus having an exponent of $-\Delta$ (-2) and yielding 'forty-six anfazend.' The entire number is thus pronounced 'forty-eight hazend, fifteen gazend, thirty-nine fazend, forty-four dazend, twenty-nine bazend, fifty-six

point ten anbazend, forty-six andazend.’ This is usually shortened to ‘forty-eight hazend, fifteen, thirty-nine, forty-four dazend, twenty-nine, fifty-six point ten anbazend forty-six.’

Shortened Form

Shortened Form is often used, where the full name is only applied to the first digit before the radix and the last digit after the radix. All other syllables use the abbreviated prefix only, and any zero digit is ignored.

Example 6: Shortened Form versus Full Form, a simple number:

For a simple example, consider ୪୫୯୯. In full form we would say ‘forty-five fazend, thirteen dazend, thirty bazend, nineteen.’ However, in shortened form, we would say ‘forty-five fazend, thirteen da, thirty ba, nineteen.’

Example 7: Shortened Form versus Full Form, a more complex number:

Consider ୧୦,୧୦୫,୦୮୩.୦୧୦୪ (123,209,170,632,301.0119484568). Our first exponent is ୩ (7), so Rules One through Four give us ‘forty-four lazend’ as our full numerical name for this digit. In both Full Form and Shortened Form we don’t bother with zero (0) digits, so our next nonzero digit is ୧ (48), which has an exponent of ୮ (5), yielding ‘forty-eight hazend.’ Our next non-zero digit is ୫ with an exponent of ୩ (3), giving us ‘twenty-seven fazend,’ followed by ‘zero dazend’ (which is dropped), ‘five bazend’, ‘one’, ‘zero anbazend’, ‘forty-three andazend’, ‘zero anfazend’, ‘fifty-two angazend’. Long Form would be ‘forty-four lazend, forty-eight hazend, twenty-seven fazend, five bazend one point forty-three andazend fifty-two angazend.’ On the other hand, the short form is ‘forty-four lazend, forty-eight ha, twenty-seven fa, five ba, one point forty-three anda, fifty-two angazend.’

Section 5: Converting Between Sexagesimal and Decimal

The algorithm for converting between any two bases N and M , where $N > 0$, $M > 0$, and $M \neq N$ is quite straightforward. Recall from our introduction that any integer and fraction in

base N ($N > 0$) can be represented as:

$$D = (d_j d_{j-1} \dots d_1 d_0 . d_{-1} d_{-2} \dots)_N,$$

where all coefficients d_i are constrained by $0 \leq d_i < N$.

Two algorithms are required to convert between bases: one algorithm for the integer portion of the number (to the left of the radix point), and another for the fraction (to the right of the radix point).

First, consider the integer portion of the number, I . Set exponent $E = 1$. Divide I by N^E . Is the integer portion of the result less than N ? If not, increment E by 1 and divide I by N^E . Continue until the integer portion of the result is less than N . Once the integer portion of the result is less than N , we have our first digit d_j . Derive $I_j = I - d_j N^E$ and divide the result by N^{E-1} . This yields our second digit, d_{j-1} . Calculate $I_{j-1} = I_j - d_{j-1} N^{E-1}$. Continue deriving digits d_i from I_i in this fashion, decrementing the exponent until $I_i < N$. At this point we have d_0 and are finished.

Now, consider the fraction. Multiply the fraction by N . The integer portion of the result is our first digit to the right of the radix point. Drop the integer portion, and multiply the remaining fraction by N again. The integer portion of the result yields our next digit. Continue until you calculate the last digit, discover it is recurring, or reach the desired level of precision.

This algorithm is best shown by example. Consider the decimal number 6,431.275. We wish to convert this number to sexagesimal.

First, we consider the integer portion of the number: 6,431.

$$6431/60 = 107.183333. \text{ Is } 107 < 60? \text{ No, so increment the exponent.}$$

$$6431/3600 = 1.7863889. \text{ Is } 1 < 60? \text{ Yes. Our first digit is } \lfloor 1 \rfloor (1).$$

$$6431 - 1 \times 3600 = 6431 - 3600 = 2831$$

$$2831/60 = 47.1833333. \text{ Our second digit is } \lfloor 47 \rfloor (47).$$

$2831 - 47 \times 60 = 11$. ୮ (11) is less than 60, so it is our third and last digit. The integer portion of our number is (1)(47)(11), or ୧୪୮.

Now consider the fractional portion of the number: 0.275.

$0.275 \times 60 = 16.5$. Our first digit to the right of the radix point is ୨ (16).

Drop the 16 and consider the remaining fraction: 0.5

$0.5 \times 60 = 30.0$ Our second digit to the right of the radix point is ୩ (30). Since the remaining fraction is zero, the sequence has converged and we are done. The fractional portion of our number is (16)(30), or ୨୩.

Thus, we have converted 6431.275_{10} to $(1)(47)(11).(16)(30)_{60}$, or ‘୧୪୮.୨୩’.

Section 6: Purist Nomenclature

Purists found the old decimal-derived terminology for the numerals 7 and 11-59 to be ungainly. Multiple syllables for most digits struck them as far too verbose. Furthermore, standard nomenclature could be very cumbersome in some languages, such as French and German. To fix this, they derived a simple monosyllabic nomenclature for each of the sixty digits, keeping most of the first ten names the same, then deriving the next fifty from a simple matrix (See Figure 4).

	‘ones’	‘tens’	‘twenties’	‘thirties’	‘forties’	‘fifties’
0	zero (୦ 0)	ten (୮ 10)	ben (୨ 20)	jen (୩ 30)	ken (୪ 40)	ven (୫ 50)
1	one (୧ 1)	tonn (୮ 11)	bonn (୩ 21)	jonn (୪ 31)	konn (୫ 41)	vonn (୬ 51)
2	two (୨ 2)	toe (୮ 12)	boe (୩ 22)	joe (୪ 32)	koe (୫ 42)	voe (୬ 52)
3	three (୩ 3)	trea (୮ 13)	brea (୩ 23)	jrea (୪ 33)	krea (୫ 43)	vrea (୬ 53)
4	four (୪ 4)	tor (୮ 14)	bor (୩ 24)	jor (୪ 34)	kor (୫ 44)	vor (୬ 54)
5	five (୫ 5)	tive (୮ 15)	bive (୩ 25)	jive (୪ 35)	kive (୫ 45)	vive (୬ 55)
6	six (୬ 6)	tix (୮ 16)	bix (୩ 26)	jix (୪ 36)	kix (୫ 46)	vix (୬ 56)
7	sev (୭ 7)	tev (୮ 17)	bev (୩ 27)	jev (୪ 37)	kev (୫ 47)	vev (୬ 57)
8	eight (୮ 8)	taite (୮ 19)	baite (୩ 28)	jaite (୪ 38)	kaite (୫ 48)	vaite (୬ 58)
9	nine (୯ 9)	tine (୮ 20)	bine (୩ 29)	jine (୪ 39)	kine (୫ 49)	vine (୬ 59)

Figure 4. Purist Nomenclature for Sexagesimal Digits

The purists insisted this was far more elegant than the standard approach of using traditional terminology for the first sixty digits, and to some extent they were correct. Certainly, ‘፱፳፻,፵፻፳.፬’ is quicker and easier to say as ‘jaite hazend, vev gazend, jor fazend, krea dazend, jev bazend, voe’ (in Shortened Form: ‘jaite hazend, vev ga, jor fa, krea da, jev ba, voe’) than ‘thirty-eight hazend, fifty-seven gazend, thirty-four fazend, forty-three dazend, thirty-seven bazend, fifty-two’ (or even the Shortened Form of ‘thirty-eight hazend fifty-seven ga, thirty-four fa, forty-three da, thirty-seven ba, fifty-two’). Purist nomenclature had the added advantage of being linguistically neutral: the same abbreviated names for sexagesimal digits were used regardless of language. Nevertheless, although Purist Nomenclature was beginning to gain in popularity when the Community’s Crisis came to a head, Standard Nomenclature had social, cultural, and linguistic inertia on its side, and remained more widely used.

Appendix B: Units of Measure

1. Early Epoch Measures

a. Retems, Margs, and other virtual measurements.

The early Community derived a system of measures from the OSI decimal metric system. In order to differentiate between virtual quantities and physical quantities, the name of each base unit was simply reversed in spelling, with the standard metric-10 nomenclature then applied. For example, a virtual metre (American spelling: 'meter') would be referred to as a retem, a virtual kilometre a kilorettem, and so on. Virtual weights were likewise inverted (margs instead of grams), as were temperatures (eergeds instead of degrees), volumes (retils instead of litres), and so on.

b. Circadians and Diei.

Because subjective time differs from objective time for each person, based on their performance of their personal Node, the complexity of the environ and software they are running, and the complexity of their own minds, Kyle devised two 'quick and dirty' sets of units.

Subjective time is measured in circadians, where one circadian is one subjective 'day' or 24-hour period. Subdivisions were derived from standard metric-10 nomenclature.

Decircadians (‘decis’) are one tenth of a circadian and analogous to hours. Millicircadians (‘millis’) are one thousandth of a circadian, analogous to minutes, and microcircadians (‘micros’) are one millionth of a circadian and analogous to seconds.

Objective time is measured in Diei (singular, Dies), the Latin word for ‘day’. One dies is defined as precisely $\frac{1}{30}$ of a Terrestrial day. The size of this unit was chosen because people running on first generation autonomous Nodes experienced roughly thirty circadians per day. In retrospect the Community could have continued to use hours, minutes, and seconds to measure objective time, as they did when offloaded in the Physical, but by the time second generation Nodes were common, and diei no longer coincided with circadians, the measure had become standard. It also helped differentiate between time scales experienced in the Virtual versus those spent offline in the Physical.

c. Metric Dates in the Autonomous Community

Dates in the early Community were measured in Diei and expressed in metric-10 format in the following form (analogous old-world terminology is in parenthesis, and only serves as a very rough guide):

k.DDD-d:mm:uuu, where *k*=kilodie (‘years’), *DDD*=diei (‘days’), *d*=decidiei (‘hours’), *mm*=millidiei (‘minutes’), and *uuu*=microdiei (‘seconds’). These analogous times (‘years’, etc.) are to be taken with a grain of salt. By the time second generation Nodes were in use, there were six circadians (‘days’) in a dies. ‘Dekas’ (10-circadian ‘weeks’), ‘decis’ (metric-10 ‘hours’), ‘millis’ (metric-10 ‘minutes’) and ‘micros’ (metric-10 ‘seconds’) all referred to circadians, not diei, for the very reason that diei diverged more and more from circadians as time went on. Still, when it comes to reading metric-10 new Epoch dates, these flawed analogies can help.

For example:

1.592-3:75:500

gives you the exact date as 1.592 kilodiei (the 592nd ‘day’ of the 1st ‘year’ at gen-one speeds) and the time (in metric-10 units) as 3:75:500. Of course, by the time generation three Nodes were in use, a single dies contained two deka-circadians, or ‘dekas’ (metric-10 ‘weeks’) of subjective experience.

2. Late Epoch Measures: Sexagesimal and Metric-60 Units

a. Maxwell Planck’s ‘Natural Units’ and their Metric-60 Counterparts

When the Community formally adopted the sexagesimal numbering system (See Appendix A), they also adopted a new set of units. Subjective time was still measured in circadians, now divided into metric-60 divisions in place of metric-10. Diei were dropped as a measure of objective time and replaced with units derived from Max Planck’s ‘natural units’²⁷, with standard metric-60 nomenclature applied.

In Planck measure, time and space use the same units, as do mass and energy. This is achieved because, in the Planck scale (and corresponding metric-60), c (the speed of light in a vacuum), \hbar (Dirac’s constant), and G (the gravitational constant), are all defined as equal to one. Thus, $e=mc^2$ becomes $e=m$, $E=\hbar\omega$ becomes $E=\omega$, and so on.

The Planck time is the natural unit of time, the smallest possible measure of time within the boundaries of physics, denoted as t_p . It is the smallest measurement of time that has any meaning (any events occurring closer together are simultaneous). t_p is defined formally as the time it would take a photon travelling at the speed of light to cross a distance equal to the Planck length, and is approximately 5.38121×10^{-44} seconds.

The Planck length, l_p , is the smallest distance that has any meaning in the physical

²⁷Über irreversible Strahlungsvorgänge, Max Planck, *Sitzungsberichte der Preussischen Akademie der Wissenschaften*, vol. 5, p. 479 (1899)

universe, as below this length quantum mechanics makes any and all measurements nonsense. It is, essentially, the maximum resolution in space and time of our physical universe, defined and constrained by the very laws of physics themselves, and is approximately equal to 1.61624×10^{-35} metres.

Because of slight uncertainties in the measurement of the gravitational constant, upon which the precise value of Planck time depends, the Community tentatively adopted a series of units derived from physicists' best approximation of those values at that time. To avoid confusion, units used by the Community were given names different from their Planck counterparts, with the understanding that, should errors in the measurement of Planck time, mass, charge, etc. be discovered, those values could be updated and a sensible migration to a new, more precise set of units based on those new values, with different names, could be achieved.

The fundamental unit of time, the 'tock', was defined by the Autonomous Community as precisely 5.39121×10^{-44} seconds. A tock is also the unit for length, defined as the distance light travels in one tock: 1.61624×10^{-35} metres.

Metric-60 Unit	Planck Unit	Dimension(s)	SI equivalent
Tock	Planck Time	Time (T)	5.39121×10^{-44} s
	Planck Length	Length (L)	1.61624×10^{-35} m
Speck	Planck Mass	Mass (M)	2.1764516×10^{-5} g
		Energy (E)	g
Spark	Planck Charge	Electric Charge (Q)	$1.8755459 \times 10^{-18}$ C
Degrees (Defined as $60^{19\circ}$ P)	Planck Temperature	Temperature (ML^2T^{-2}/k)	1.41679×10^{32} K

Figure 5. Metric-60 Base Units, Planck Base Units, and their SI equivalents.

b. Planck Time and ‘Tocks’

As discussed earlier, the metric-60 unit ‘tock’ is derived from physicists’ best estimation of the Planck Time, and is defined as precisely 5.39121×10^{-44} seconds. Figure 6 shows some common durations of time and their metric-60 equivalents.

Description	Metric-60 Units	SI Units
Planck Time	፲ (1) t	5.39121×10^{-44} s
‘Second’	፱.፳፻፲፭፻፲፱ (3.91457) ge-t	1 s
‘Minute’	፱.፳፻፲፭፻፲፱ (3.91457) he-t	60 s
Gen-5 Circadian	፲.፭፻፶፻፳፱ (4.69748) he-t	72 s
Gen-4 Circadian	፶.፻፱፻፲፱፱ (5.64698) he-t	86.4s
Gen-3 Circadian	፱.፵፭፻፶፻፶ (9.39496) he-t	144 s
Gen-2 Circadian	፳.፻፶፻፲፱፱ (28.18488) he-t	432 s
Dies (Gen-1 Circadian)	፱.፲፻፶፻፳፱ (3.13165) je-t	2880 s
‘Hour’	፱.፳፻፲፭፻፲፱ (3.91457) je-t	3600 s
‘Day’	፲.፶፻፶፻፲፱፱ (1.56583) le-t	86,400 s
‘Week’	፶.፳፻፲፭፻፲፱፱ (10.96079) le-t	604,800 s
kilodies	፳.፻፶፻፲፱፱ (52.19423) le-t	2,880,000 s
‘Year’	፱.፻፳፻፲፱፱ (9.53177) me-t	31,556,926 s
App. Age of the Earth	፶.፱፻፳፻፲፱፱ (55.16069) se-t	4.5×10^9 yrs
App. Age of the Universe	፲.፭፻፶፻፳፱ (2.7989) te-t	1.37×10^{10} yrs

Figure 6. Common Durations of Time in Metric-60 and SI Units.

c. Metric-60 Dates in the Autonomous Community

Metric-60 dates are written in terms of meratocks, as follows:

m.jj-h:g:f.x meratocks (me-t) New Epoch

where m=meratocks, jj=jeratocks, h=heratocks, g=geratocks, f=feratocks, and x is any remaining fraction.

The easiest way to come up with a given metric-60 date in terms of ‘tocks’ is to figure out how many seconds have passed since metatime 0.000-0:00:000, convert the result to feratocks using the conversion factor of 234.8742 fa-t/s, derive the resulting sexagesimal

numeral, and then insert the date-time punctuation into the resulting integer.

For example, the Autonomous Community was founded on:

0.00-0:0:0 me-t New Epoch.

The Autonomous Community's worst crisis came to a head about 8,311,507 seconds later. $8,311,507 \text{ seconds} \times 234.8742 \text{ feratocks/second}$ yields 1,952,158,560 feratocks.

Converting this number to sexagesimal using the procedure described in Appendix A, we obtain the value:

୧୧୧୧୧୦

Now, simply insert the standard time-date punctuation, and we have:

୧.୧୧-୧:୧:୦ me-t new Epoch.

d. Planck Length and 'Tocks'

As noted earlier, distances are also measured in tocks, where one tock is the distance light travels in a vacuum in one tock ($1.61624 \times 10^{-35} \text{ m}$). Figure 7 shows some common distances in terms of Metric-60 tocks and SI metres, intended to provide some sense of scale. Typically, the Community speaks in terms of qaratocks at the femto level, saratocks at the atomic level, and taratocks at the nano level. Yaratocks are roughly analogous to millimetres, zaratocks to centimetres or inches, charatocks to feet or metres, beratocks to kilometres or miles, and meratocks to light years. Notice the time=space relationship? Meratocks are also analogous to years when measuring time. This is not a coincidence.

	Metric-60 Units	SI Units
Planck Length	፲ (1) tock	1.61624×10^{-35} m
Radius of a Proton	~፲.፭፻፵፮ (~1.7054) qa-t	$\sim 1 \times 10^{-15}$ m
Size of a hydrogen Atom	~፻.፪፻፻፮ (~56.8472) sa-t	$\sim 1.2 \times 10^{-10}$ m
'millimetre'	፶.፻፻፪ (36.553) ya-t	0.001 m
'centimetre'	፬.፻፶፻፳ (6.0922) za-t	0.01 m
'inch'	፻.፻፵፮ (15.474) za-t	0.0254 m
'foot'	፬.፻፶፻፳ (3.0948) cha-t	0.3048 m
'metre'	፻.፬፻፳፻ (10.1536) cha-t	1 m
'kilometre'	፲.፪፻፵፮ (2.8204) be-t	1000 m
'mile'	፲.፮፻፺፻ (4.5391) be-t	1609.344 m
Astronomical Unit	፻.፻፵፬፻ (32.5566) he-t	149,598,000,000 m
Light Year	፬.፶፻፳፻ (9.5318) me-t	9.4605284×10^{15} m

Figure 7. Common distances in Metric-60 and SI Units.

e. Planck Mass and 'Specks'

The Planck mass is the mass at which a body's Compton length (the distance at which quantum mechanical properties dominate) and the Schwarzschild radius (the radius at which, if a mass is squeezed down to that size, it becomes a black hole) are equal, or, put another way, the mass at which both relativistic and quantum properties are equally dominant.

In the Autonomous Community, mass and energy are both measured in the same units, specks, which are defined as the Planck mass, 2.1764516×10^{-5} g.

f. Planck Charge and 'Sparks'

The Planck charge, q_p , is defined in terms of the speed of light (c), Planck's constant (h), and the permittivity of free space (ϵ_0):

$$q_p = (2ch\epsilon_0)^{1/2}$$

It is about 11.7 times the charge on an electron (ignoring the sign).

g. Planck Temperature and Degrees Prime

The Planck Temperature is the temperature one Planck Time unit after the big bang. There are no physically meaningful temperatures hotter than this, according to current theories of physics. In other words, the possible range of any temperature, anywhere in the physical universe, at any time from its beginning to its end, is bounded by absolute zero (the coldest possible temperature), and the Planck temperature (the hottest possible temperature). The Autonomous Community chose to divide this range into a scale of 60^{19} ‘degrees Prime’, resulting in a conversion factor of $0.0232505694 \text{ } ^\circ\text{K}/^\circ\text{P}$, or $43.0098843 \text{ } ^\circ\text{P}/^\circ\text{K}$. Naming the temperature scale ‘Prime’ was both a monument to the entity that so helped shape the Community’s ethos and character, and a convenience, as later theories might yield different values for the Planck temperature, and new scales might be adopted. It was decided that any such future scales would be derived from Latin ordinals, ‘Secundus,’ ‘Tertius,’ ‘Quatrus’, and so on.

Figure 8 shows several common and familiar temperatures, in Prime, Kelvin, Celsius, and Fahrenheit. While the temperatures in degrees Prime seem large to those used to decimal numbers, keep in mind that in sexagesimal, these values are mostly three and four digit temperatures, ranging from $\omega\omega\omega^\circ \text{ P}$ ($10,983^\circ \text{ P}/255.37^\circ \text{ K}$) to $\lrcorner\mathbb{0}\dagger\mathbb{V}^\circ \text{ P}$ ($249,456^\circ \text{ P}$), or $\lrcorner\mathbb{0}\dagger\mathbb{V}\mathbb{S} \text{ fa}^\circ$ ($1.1549 \text{ fa}^\circ \text{ P}$), which is 5800° K . For those used to sexagesimal, these numbers are as easy to remember as their Kelvin, Celsius, or Fahrenheit equivalents, and at higher temperatures (such as that of the core of the sun), significantly easier.

	Prime	Kelvin	Celsius	Fahrenheit
Abs. Zero	0° P (0)	0° K	-273.15° C	-459.67° F
'bitter cold'	ଊଊଊ° P (10,983)	255.37° K	-17.78° C	0° F
H ₂ O Freezing	ଊଓ୦° P (11,748)	273.15° K	0° C	32° F
'chilly'	ଊ୪୩° P (12,178)	283.15° K	10° C	50° F
'cool'	ଊ୫୯° P (12,393)	288.15° K	15° C	59° F
'pleasant'	ଊ୬୦° P (12,608)	293.15° K	20° C	68° F
'perfect'	ଊ୮୫° P (12,704)	295.37° K	22.22° C	72° F
'hot'	ଊ୯୩° P (13,038)	303.15° K	30° C	86° F
'very hot'	ଊ୯୯° P (13,373)	310.93° K	37.78° C	100° F
H ₂ O Boiling	ଊ୯୯° P (16,049)	373.15° K	100° C	212° F
Lead Melts	ଊ୯୯° P (25,813)	600.16° K	327.46° C	621.43° F
Solar Surface	ଊ୦୮୯° P (249,456)	5800° K	5528.85° C	9980.33° F
Atomic Bomb	ଊ୧୦୩° P (12,899,425)	300,000° K	299,727° C	~540,000° F
Solar Core	ଊ.୯୯ ga° P (51.77)	15,600,000° K	15,599,727° C	28,079,540° F
Planck Temp.	ଊ cha° P (1)	1.4168 x 10 ³² ° K	1.4168 x 10 ³² ° C	2.55 x 10 ³² ° F

Figure 8. Common Temperatures

h. A Final Note on Virtual Units

As before, virtual measures of temperature, mass, and distance are the anagram of the physical counterparts, with standard metric-60 nomenclature applied. Base units are kcots (k) for distance, tocks for objective time, circadians for subjective time, keeps (c) for mass, and eergeds (e) for simulated temperature. No one wanted to use the term 'kraps' for simulated electrical charge, so 'zaps' (z) are used instead.