PDU-1

A Novella of the Remote Future

F. E. Potts

...if you could understand how to represent the important elements of the human personality, then eventually you could build a scanning machine and extract the essence of the person—the intellect, the theories, the ideas, the way of thinking—and put it in another piece of hardware that would last longer than human bodies.

—Marvin Minsky,
MIT Artificial Intelligence Laboratory

Our entire much-praised technological progress, and civilization generally, could be compared to an ax in the hands of a pathological criminal.

—Albert Einstein

In a time like this, one sees what a wretched animal species we belong to.

—Albert Einstein

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As Morgan might have observed to Ryahda: life is strange, isn't it?

Part I

Fifty-three days...

I sat cross-legged on the narrow ledge below the clearing where I had made my bivouac, staring blindly over the ocean far below, seeing nothing except the flow of memories, tumbling blocks of images, which swirled within my mind. Through them, weaving a complex maze of shifting moods, now here, now there, perhaps subconsciously a part of the decision I must make, a piece of music by Y'Tan flowed, deeply inward, first acknowledging, then, after an eternity of struggle, finally accepting, even embracing, the pain of existence, the paradox of humanity. A piece of music I had not understood at the time I first heard it but was beginning to understand now.

Forming a minor counterpoint to my dilemma, adding yet another layer of pain, was the potential barrier, the vast abyss of awareness, that might form between me and my people now that I had regained my memories, understood the true nature of our world. The Donda were the central element in my life, and the life we led as outlaw warriors in the Central Desert—women who, through one means or another, had escaped captivity and now lived free in spite of the best efforts of those from Port Da'Kal and Eos to recapture or kill us—was one that perfectly suited my temperament. Or at least it had, before Morgan reintroduced me to various skills I was unaware I possessed; skills that in the distant past, prior to my Awakening, had been an important part of my life. Skills I would now need once again. Or, to be more precise, might need, depending on which way my decision went.

Fifty-three days...

About nine kilometers south, camped by the edge of the beach at the mouth of the narrow valley where the stronghold was located, my three companions waited, allowing me the time of privacy I had requested. They had not asked any questions when I had emerged from the meeting, perhaps seeing from my eyes, my face, my bearing, that something serious had happened, that in some indefinable way I had been changed by what I learned, was now different than when we left our desert home, traveled to this cold, wet, and foggy arctic island. Had, in fact, become...strange. Strange like the messenger who had come to fetch me to the meeting.

Fifty-three days...

How rapidly one's world can fall apart.

It began early one morning in the Central Desert when Ra'Kel, leader of a band that had been on patrol duty in the south, rode up to where my band was hunting bearing the news that an old man with the scent of strangeness was waiting for me at our home tents, one who claimed he had a message of extreme urgency that required my immediate attention. A stranger that made one feel edgy and uncomfortable.

"How did he find our camp?" I asked, looking up from the tonga I had shot just before dawn, dagger in hand, blood up to my wrists. Beside me Ly'is calmly lay, gazing off into the distance with that abstracted, sleepy look she got whenever someone not of my immediate band came within striking distance. If you didn't know her, you might think she wasn't paying attention, was dreaming whatever dreams diaks dreamed. If you did know her, you knew her look meant danger, that she was following my thoughts, in tune with my emotions, ready to attack if the signal were to come. Between her paws, apparently no longer of interest, were five or six kilos of raw meat, still warm from the hunt, the remains of her breakfast.

Within my mind, pervading the scene—the desert brush, the towering buttes, the deep red of the soil, the members of my band moving about in the early-morning light of our home star dressing out their kills, Ra'Kel's two companions waiting politely a short distance away—was the warmth, the feeling of belonging, of *isness*, that was such an integral part of *an'tala*. It gave a sense of being connected to our world, our lives, the desert, on many different levels, of being part of the infinite rhythms of life, of existence.

Ra'Kel, an old friend, skin dark and beautiful as the night, teeth flashing, hair wild about her shoulders, grinned at Ly'is, understanding well her nature, liking her, then shrugged, her diak shifting under her, coat slicked with sweat. "We found him five days out, on foot and unarmed, walking directly toward us. My band is now scouring the area he came from, seeking danger, but his tracks indicate he was alone." She shook her head, added, "It's a miracle he's still alive. And a question as to whether he should remain so." She spit downwind, the dust from her long ride heavy upon her, added, "I don't like this."

I nodded, and we returned with her, my band and I riding in past the milling crowd of warriors and diaks, the orderly rows of tents near the base of the towering butte, the cooking fires, the tree-lined natural desert spring, to my tent where I found the messenger waiting under its awning, and I too sensed the strangeness of which Ra'Kel spoke. It had nothing to do with his appearance, which was much like one of the villagers or peasants who lived along the Da'Kal River, but came from his stance, the look in his eyes, the depths of knowledge and awareness that seemed to lie behind them.

As I dismounted he nodded to me with a strange dignity, showing no fear in spite of his surroundings, the unfriendly crowd of warriors and diaks watching him, the palpable scent of tension in the air. Sensing that he would prefer to deliver his message in private, I invited him into my tent, holding the flap back in courtesy. He stepped in, and as he did I noticed an odd bracelet on his left wrist, one like those described from the dark mists of time, constructed from a material never encountered elsewhere and impossible to duplicate, a dull black substance that was not metal yet said to be far stronger than anything we had. And I knew it was not by accident I had been allowed to see this, that it was his way of introducing himself.

A sense of foreboding struck. At the same instant Ly'is growled. Then, rising from the spot under the awning where she had lain down, she moved into the tent and settled next to my sleeping area.

He was one of the ancient Sages, from a past so distant that no one alive had ever met one.

The legends yet lived, telling of how, long ago when the Sages still walked this land, there had been war. A war that, over time, spread throughout the entire land, ultimately driving them to bay where, in their extremity and anger, they had finally unleashed their terrible powers against their enemies and in the process created the vast crater that eventually filled with water and became Lake Da'Kal. As a result of this, for long thereafter the land had lain sterile and unpopulated all the way to the ocean.

"I see you're aware of my identity," the Sage said quietly, settling across the fire pit from me, ignoring Ly'is, her yellow eyes dreamily looking past his left shoulder, his shabby robe in marked contrast to his bearing, the strange depths within his eyes.

I nodded, said, without the usual ceremony, "I was informed you have a message for me."

He smiled then, faintly, at the directness of my response, his eyes drifting across me with calculation, taking in my shorts made of tonga hide, my belted tunic, the throwing daggers at my waist, the thong that kept my hair from my eyes, said, "Actually, it's an invitation from our Council. They want you to attend a meeting at our stronghold. Time is of the essence, and a *doorway* is available a short distance from here. I would like to leave as soon as possible."

I gazed at him; doorways were also a part of the legends. "What is the purpose of this meeting? What has it to do with the Donda?"

"I'm sorry," he said, "but I am not authorized to go into any further detail here. This is a Council matter to be discussed only in chambers." He paused, then added in the same quiet tone, "It is hoped you will understand."

Between us the threat hung suspended.

"So that's the way of it, eh?" I said mildly, holding Ly'is in place with my mind, my love for her.

"Let us just say," he said, "that there are certain things you need to be shown first. Until then all other discussion would be premature."

"You are, of course, aware of our relationship with our diaks?" I said. "The geographical restrictions this ordinarily places upon us?"

He nodded soberly. "Yes, we are aware of the symbiotic nature of an'tala, as well as the fact that it is both strongly telepathic and bidirectional. It is, after all, the advantage that has enabled your people to survive all these years, even though the price they had to pay was an unusually severe form of addiction. We are also aware of the personal risk involved in deliberately breaking this bond, but it is a risk we now recommend you take, if not for yourself, then for the Donda."

I looked at him, not much liking his threats, if threats they were. But beneath what appeared to be threats, I sensed something else, subtle, faint, guarded, an underlying urgency combined with...what? Concern? Fear? Something that curiously had nothing to do with me or with the fact that he was in a Donda encampment, surrounded by hostile warriors and telepathic diaks, war animals whose fierceness was as legendary as the Sages themselves. And in that moment I got one of those strange hunches that occasionally come to one in battle, the type of hunch it was wise not to ignore. A hunch that suggested it was better to risk da'ahta—employ the emergency drug sy'ahta to block withdrawal, find out what they wanted—than to refuse. So I simply nodded, said, "Very well. I will accept that."

He smiled, said politely, "Thank you."

Ly'is yawned, a not unimpressive sight, then looked directly at him for the first time.

He smiled again, with understanding. And, perhaps, a touch of relief.

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We moved out shortly after dark, drifting across the desert under the light of the stars and moons, the Sage riding behind me, arms about my waist, my quiver-pack and bow upon his back, as Ly'is leaped the ancient gullies and climbed steep ravines with claws extended, my band of thirty spread out in the shifting patterns of the hunt, seeking danger. Resting only during the hottest part of each day, we continued the pace until late one night, after traveling nine days, we reached our goal only to find it a clearing much like any other, one we had all passed through now and again while hunting. Yet this time it was different, for the Sage removed from under his robe a small rectangle of the same unknown material as his bracelet and, having us stand back, touched the two together. In the clearing materialized an oval of cold light, causing our diaks to move nervously and my warriors to mutter; and not without considerable trepidation I and three members of my band—our minds, like the minds of our diaks, protected from the painful break in an'tala by sy'ahta—stepped into its glow with the Sage.

There was an odd flick of consciousness, a kind of shifting disorientation, then we found ourselves standing in the midmorning light of our home star in a narrow, mist-filled valley by a cave with an odd oval entrance that, like the doorway, had a cold glow to it. Through the numbing shock of the experience, adding to it as we automatically scanned the area for possible sources of hidden danger, came the realization that we were now far removed from the clearing where the rest of our band waited. From the alteration of the seasons, the cast of the vegetation, the light, I surmised that we had crossed what the scholars of Port Da'Kal and Eos called the equator and were at a high latitude. It gave much to think upon.

"If you would step inside," the Sage said, looking much more relaxed now, "you will find the Council. They are expecting us. And I must apologize, but they have requested that your companions wait outside."

I nodded, and as my warriors moved into positions of guard I accompanied the Sage—who claimed the peculiar name of Jorgensen—through the opening. Inside I found a large room with a flat black floor and smooth white walls and ceiling, lit from sources I could not determine. In front of me was a small carpet, then, shimmering, obviously a device of protection, a pale screen of light that blocked my way. Behind it, on a larger carpet, sat four men and two women in a row, all but one of them, the smaller of the two women, far older than Jorgensen. The only apparent entrance to the room was behind me, its exterior guarded by Donda warriors. I found the situation, although hardly comforting, acceptable.

I nodded to them with formal courtesy, then, Jorgensen at my side, sat down opposite them on the smaller carpet, setting my bow carefully in front of me, quiver-pack to my left. Then waited in silence, in the way of the warrior, the hunter, the outlaw. For I could sense deadly danger here, and the next move was theirs.

A long time passed as we studied each other through the screen, then the oldest Sage, thin, elegant, hair silver, wearing one of the fabled bracelets as they all did, body hidden like the others within a one-piece uniform made from some smooth, tailored material that was neither leather nor hemp, said, "You are Ryahda, clan leader of the Donda."

I nodded.

"One of the *Transported Ones*," he added.

"The drug is a myth," I pointed out, an inner tension coming over me at the direction he was taking. "Nothing else."

"How many years," said another of the Sages, this one the older female, tall, thin, with pale blue eyes and short gray hair, "have you remained as you are now, not aging?"

My gaze drifted across them, my hands from long habit craving the touch of my daggers, my bow. For these were dangerous questions to ask a Donda: our immortality often made others desire to capture and torture us in a futile attempt to obtain its secret, then kill us once it became all too clear we could not provide the desired answer. Immortality, in fact, was the main reason we were outlaws, were so hated by those around us who did not share its benefits, had to age and die, and the subject, when broached by those outside our clan, usually led to death on one side or the other. But I submerged my natural responses, aware the Sages, though physiologically old, also did not have to die, instead asked mildly, “Why are you asking these questions when you already know the answers?”

The oldest one smiled, faintly. “To bring up the subject of your memory. Transported Ones can remember neither their birth nor youth. Their personal history prior to Awakening is not accessible to them. But this memory can be retrieved through the use of a certain drug. We have access to this drug and are willing to provide it to you.”

I felt a chill go through me, well remembering how I had woken so long ago on a beach, naked, without memory, fully grown, bound in chains, captive to a wandering troop of soldiers, ignorant even of language. Used, passed from one to another, tormented for sport. But I had learned, survived, escaped, killing four of them in the process. And eventually located an outlaw band, women like myself, to join. Over time, as our band grew, absorbed others, became a clan, so too did my position and responsibilities, until finally I found myself the leader. Yet the mystery remained: what was our past, how true were the myths, what did they mean?

“Why?” I asked.

“To enable you to perform a service for us in Eos,” said the woman who had spoken earlier. “At the Circle-of-Being’s Temple.”

I felt another chill, hearing in her words my death sentence, said, “Why can you not do it yourself?” I gestured to the screen shimmering between us, observed, “Your powers are far greater than mine. Especially in regards to Eos.”

Jorgensen turned slightly, said quietly, “We tried, but failed. Even its doorway is closed to us. In this matter we are helpless.”

“And if I fail too?” I said softly, thinking of the Donda and what the Sages might do to them in retaliation if I turned them down. “You must be aware the Toh’a is somewhat less than pleased with me.”

“You won’t fail,” he said flatly. “No matter what the cost. Once you know why it has to be done.”

I stared at him, thinking about the risks he had taken to bring me their summons. The risk of entering the desert on foot and unarmed, and the even more serious risk of entering the home tents of the Donda even though he was male and many there had reason to kill males on sight. To this had to be added the risk he asked me to take by deliberately breaking an’tala and traveling to their stronghold. These were serious risks that no sane person would take without good cause, and so far Jorgensen had impressed me as being both sane and responsible. “This matter involves not only you, then, but all of us? Even the Donda?”

“Yes,” he said. And, at a sign from the oldest Sage, he removed the small rectangle from his robe, touched it to his bracelet, and the screen of light collapsed. All the Sages present were now within reach of my weapons, their lives within my hands.

I nodded, once again accepting what he said. For the pattern of their actions proved they were not only deadly serious, but willing to take risks themselves.

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Jorgensen held out the cup containing the memory drug, and I drained it, finding no taste but water, handed it back. Then sat quietly, waiting. Holding my fear within. Thankful that Ly’is was not with me, by my side, monitoring my thoughts, my emotions. Yet for a long time, what seemed like an eternity, nothing happened, nothing at all; then, just as I was beginning to think...beginning to...

A megalopolis, under alien skies. Reddish-brown air, a burning of my eyes, my nose. Noise of many machines, snatches of music. Buildings, gray, of concrete, of glass; a harsh glare to the night sky from many lights, hiding the stars. I was walking on a path through a park, wearing strange uncomfortable clothes, going to a class. The name of the megalopolis was Fairbanks. It was in NA Sector, part of what used to be Alaska prior to the Unification of 2609. How I knew all this I did not know.

The path wound through a small forest of stunted trees, skirted a pond of dirty water in an equally dirty clearing, entered the forest again. I followed it, deep within my thoughts, preparing for my exams, exams I must pass with high grades if I wanted a position at the Lunar Institute, wanted to remain off The Welfare, out of my village—when suddenly there was the crack of a branch, moving shadows off to my side, an arm around my neck, a body hitting my legs...

In desperation I struggled to return to reality, to the room within the mountain, saw the misty outline of the Sages watching, the shimmer of the screen now back; tried to hold on to it, spinning deep down into the nightmare, the megalopolis, the park, where my skirt was up around my waist, my legs forced apart; saw there were four of them, *nobrays*, three holding me down, one with a knife at my throat. Then the fourth blotted out the sky and there was a sudden sharp pain...

I struggled in terror, knowing well what my fate was to be, how I would be left, how my body would be found, how I would end as just another name on a list in the morning news. One among many.

I heard a laugh, felt hands all over me, doing things. Then suddenly clarity settled over me, a cold emotionless detachment, much like it would when I had hunted as a child, searching through the mountains around my village for small game to help fill the pot and relieve our poverty. And I groaned...moved my hips slightly, as if involuntarily. Heard another laugh, felt a spasm. Then the one with the knife took the place of the first man, laying his weapon on the ground beside him, momentarily forgotten.

I moved for him, softly, raising my thighs as much as they would permit, trying to put my arms around him...then faster, drawing him with me, now slightly leading, nuzzling, kissing, moaning...heard another laugh, a comment about natives, the word *klooch*. Then one of my arms was released, the wrong one, and I wrapped it around the man's hips, caressing intimately, moaning louder, made a little cry. He said something, and my other arm was released; I shifted slightly and the knife was mine, was moving through a red haze of screams and yells as if I were gutting caribou and I had the first man down and then the second and was rising seeking the third as footsteps sounded and suddenly lights hit and a whistle was blowing and...

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A large room, high ceiling, fluorescent lights, guards. Twelve *brays* in a box. One was reading from a screen. "Guilty as charged." I heard a cry of despair, realized where it came from. "Transportation," the voice added, and blackness closed around me...

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I was strapped to a chair, wearing a prison dress, needles in my arms, fluids flowing in. Attached to my head was a machine with a heavy cable leading to other machines. Men and women in white jackets moved about quietly, efficiently, making adjustments, monitoring screens. In the background, through a thick window, others watched with curiosity, some making notes on their comps. The clock slowly moved toward midnight. Through the drug haze terror lurked, waiting. Then the clock reached midnight, passed it, and a red light changed to green with a soft chime. And as a technician got up from his desk and went to a central screen I knew the last appeal had failed. Then, looking at me emotionlessly, disinterestedly, he closed a switch and there was the beach, the soldiers, a hand reaching for me...

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...but it was Jorgensen, helping me up, handing me a hot drink, saying, "...you're back, you're okay. Drink this, it will give you strength." And when I hesitated, he gently shook his head, said, "No, it is only soup."

So, sensing truth in his words, I drank it, feeling its heat, examining its taste, as the room steadied about me and I looked at the Sages through the shimmer of the screen. I could feel the floor under me, the texture of the carpet, the temperature of the air. Detect the smell of ozone from the screen, a scent whose nature I now understood. Then I set the cup down on the carpet and carefully reached out, picked up my bow. Felt it also, its string still taut; plucked it, listened to the familiar tone it made, unstrung it. Then I set it down, said quietly, “I am ready to listen.”

Part II

A raven circled above the ledge where I sat, large, black, a bird of the arctic, subject of many legends of its own, eyeing me. Then uttering its distinctive cry it wheeled and went about its business, adding its image to those that swirled within my mind. For ravens too were part of my childhood memories, memories that were vivid, powerful, and complete as I faced the Sages across the barrier, Jorgensen by my side. The oldest Sage nodded, placed his bracelet against the rectangle in his hand, and the screen once again collapsed. “I am relieved you came through the experience sane. We were not completely sure you would—the drug is still experimental, and this was the first time we tested it.”

“Then you deliberately risked my life,” I said. I had noticed while drinking the soup that the entrance to the room was no longer there, that, in fact, there were no signs of exits anywhere.

“Yes,” he said. “But we had no other choice.”

“And this...hallucination? It will help me understand?” Inside, under my calm exterior, held at bay by the temporary effects of shock reinforced by the years of training and mental discipline it had taken to master an’tala, learn to live with an alien mind—no matter how loved—sharing my every thought and mood, I felt waves of terror pounding against my sanity, madness hovering like a beast waiting its chance to attack.

“It was not a hallucination,” the woman with the short gray hair and pale blue eyes said flatly. “Do not think otherwise. This world we inhabit is precisely what your memory tells you it is.” I felt the terror, the risk of madness, suddenly surge when she said that, then—under the influence of the sheer power of the memories, their intricate detail, the vast expanse of knowledge they contained—I managed to once again regain control. Her voice indisputably held nothing but conviction, complete certainty. And, interestingly, below the surface, faint, instinctively attracting my attention, I began to discern something else. Perhaps...distaste?

“It just requires a philosophical shift,” Jorgensen said calmly from beside me. “Once that is achieved everything becomes all right. And you have already begun the process.” He paused, then added gently, “You just need a little time to get used to the idea. As the rest of us did.”

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The wind picked up as the day advanced, increasing the chill, and though still immersed in my memories, the blocks of images swirling within my mind, I finally returned from my perch on the ledge to my bivouac in the clearing and made my camp, gathering wood for a small fire and preparing my sleeping area. Then, feeling the first faint touches of unease that was da'ahta's harbinger, knowing that soon I would have to take another dose of sy'ahta but realizing I had time to eat first, that it was better to take it on a full stomach, I opened one of the packages of food the Sages had provided for me and my companions. Inside, I found slabs of moose on bread, a meat I recognized from the memories, a meat that triggered a new series of memories, memories of pain and childhood rejection. Children have strong herd instincts, combined with an intolerance for those who do not conform physically to their norm, and as a result I had been somewhat of an outcast because of the mixed blood that showed so clearly in the structure of my body: taller than the others, and slimmer, with only the slant of my eyes and cheekbones, the color of my skin and hair, to show my Inuit heritage. And, of course, also somehow tainting me because of the white blood, was the discontent my village felt because we had been forced to leave our home by the frozen sea when the melt began and move to the interior, the land of our enemies, as the rising waters flooded our tundra; a move to a place of strangeness and dishonor where there was no living to be had except through the barren wastes of charity and lost pride.

Because of these influences, when I grew old enough I turned to the illegal hunting of big game for my family, an excuse that allowed me to spend days away from the village seeking to assuage my loneliness. It was during the many long nights while out on the hunt that I first began to take comfort from the stars, their steady, dependable progression, and over time they became my friends, more comfortable companions than my own people, and finally provided a chance for escape from not only poverty and the village, but the planet itself, to the clean environment of the Lunar Institute on the far side of our natural moon. For I was able, after long years of study, to become one of the finalists for an intern position, and it was while walking through the park to one of my preparatory classes that the attack that led to my being transported had occurred.

The memories were not easy. Nor pleasant. Except for the stars, of course, an interest that had, strangely enough, survived my being transported and had eventually resulted in my clan name. For *Ryahda* means *Watcher of the Stars*. And, as I sat there by my fire, eating, going over in my mind all that the Sages had told me, I could not help but feel a strange, nightmarish sense of irony, for apparently I got my wish after all—to escape from both the poverty of my village *and* the planet.

"That is correct," Viggen had said, he whom Jorgensen had introduced as their historian. "PDU-1, more formally known as Penal Detention Unit One, is essentially a self-contained, self-maintaining computer two-hundred and nine kilometers in diameter orbiting between the asteroid belt and Jupiter. Within its VR matrix, where we, in effect, live, the illusion of planetary reality is complete."

"But..." I said, the concept still staggering me in spite of the vividness of the memories and the detailed knowledge I now possessed. "Us. Our being only—"

"I know," said Jorgensen softly. "...patterns within a program. It *is* hard to accept."

"Yet that is all life is, if you think about it at the level of absolute reductionism," said Morgan, who had been introduced as their lead programmer. "Nothing but patterns of forces, anomalies within the fabric of space-time. It doesn't matter which matrix is used. All that counts is consciousness, which becomes possible once there is sufficient complexity." He grinned at me, "We are as real as any life-force in the universe. There is no question about it."

"Self-awareness demonstrates this," said the woman with the short gray hair and pale blue eyes, who had been introduced as O'Leary though I was now beginning to think of her as *the admin*, perhaps because my memories of the schools and prisons I had experienced both before my trial, then afterward, while waiting for Transportation, were beginning to merge with my Donda memories. "It's pointless to discuss. Here we live and here we die, and that's the end of it." She made an odd, irritated little chopping motion with her hand, as if cutting a branch off a tree.

Morgan gave her a look I could not interpret, nodded to me to continue.

My mind awed by the subtle details within my memory, the way things dovetailed, I said, "This machine was built, then, because our society could not control its breeding and, unable to exceed the speed of light, was blocked from migrating to the stars? And, while the bugs were being worked out, prior to the main immigration, prisoners were used to test its safety?"

"Yes," said the oldest, he who was called V-Kay, perhaps from the initials of his name. "We are all part of an experiment brought about by the lack of living space and natural resources."

"Then you," I said, gesturing at them, "were prisoners too?"

"No," he said, a bleak look passing across his eyes, possibly a reflection of past memories. "We entered for a different reason. But you are right: these machines—for PDU-1 was only a prototype—were intended to alleviate Earth's overcrowding. To provide new frontiers as well as living space. A chance for a better life. That is why this project received both government and commercial backing. The situation was becoming critical, and something had to be done."

I nodded. "This I remember. But even as a child I saw what to me was a serious problem with this project. One that I was certain would cause most prospective immigrants to hesitate. Especially since the drugs and invasive scans required for 'imprinting' invariably caused the physical death of the subject, resulting in a one-way journey."

Morgan looked at me. “What was that?” he asked.

I gazed at him, reviewing my memories, trying to sort them out, resolve the complexities and contradictions, then said, “From what I remember, the basic process consists of recording our individual brain patterns, along with an in-depth analysis of our personal chemistries, then uploading them to PDU-1 where they are compiled into interactive subprograms so we can continue with our lives. Is this not correct?”

He nodded, a slight smile touching his lips.

“Then who are we, really?” I asked, the root of my suppressed fear surfacing, feeling what seemed like a wind from the arctic beginning to howl within me, crying for what was perhaps my lost innocence. “The ones who are here now, or the ones who died back on earth after the imprints were taken? For obviously we are only copies. As is our world. Just very advanced virtual-reality simulations operating within an orbiting, self-contained supercomputer.”

“Is it important?” he asked. Apparently this was an old question with him, possibly one that he had thought about for a very long time. “After all, you—like us—are one of those who survived the experiment. And because you survived, you are alive now, conscious and able to act.”

“I don’t know,” I said, struggling to hold onto my mental balance, block the rising terror of my thoughts, the scream beginning within my mind. “I haven’t had time to think about it. But I find it...uncomfortable.”

“You will shortly find it more than *uncomfortable*,” said the admin, “if we don’t attend to the problem we all face.” She looked at me with both contempt and disgust, “You weren’t brought here just so you could have a sophomoric discussion of philosophy with Morgan. Let me put it this way: have you not noticed that Transported Ones are no longer arriving?”

Her words cut through our conversation, bringing silence as I turned to face her, and a sudden sharp tension fell over the room, caused perhaps by the change in my eyes, my bearing. Within a state of frozen time I noticed Jorgensen—more familiar with Donda mores than the other Sages, the constant threat of attack that hung over our lives—stiffening at my side, hand partway to his rectangle but now arrested, no longer moving, probably thankful Ly’is wasn’t present, as my warrior’s reflexes, honed for survival, shifted my mind abruptly into the here-and-now, into sanity, into *focus*, at this uncalled-for insult, one that required an instant response in a society of armed outlaws such as mine. Then my Earth memories fell into place, solidifying what before had been only vague intimations, not seeming of any real importance, and I had her, her type, and was able to stop my instinctive reach for my dagger, the throw that would embed it in her throat. She was one of those who thrived in the world of my birth, one who wielded power within structured environments, societies of laws and authority, the support systems of cities, of what passed for civilization. Societies in which one could indulge in the pleasure of delivering gratuitous insults with impunity, knowing they were safe from any retaliation worse than rudeness. A personality type rarely encountered in the lands of the Donda and Z'Hann, lands without police, courts, or lawyers, lands where on their own people like her could not survive for more than a few days.

The same instant these thoughts passed through my mind I also became aware that, instead of my dagger, I owed the admin a debt of gratitude, for under the challenge of her insult my body had responded, and in so doing had answered Morgan's question. There was no doubt whatsoever that, for hundreds of years, I had been more than comfortable with my life in the Central Desert as a warrior among the Donda and the diaks, a life far more suited to my temperament than the life my memories indicated I had been forced to lead on Earth. And I realized, with an abruptness that shocked me, that no matter what my actual origins might have been, or how I came to be here, or even what the matrix or technology was that supported my life, none of it had any true relevance. All that mattered was that I was here now, alive, conscious, and able to act. Just as Morgan had said.

Yet—and this surprised me—there was something else here too, bewrayed by the Sages' knowledge that they could not get their barrier erected in time to prevent my dagger from reaching the admin's throat, severing her spinal cord. And that was a sudden strong fear, one that I could not understand, one that seemed totally unwarranted under the circumstances, a fear they all shared. A fear I could now smell. Looking at the admin, her sudden paleness at the realization of what she had done, the situation she had inadvertently created, probably not really meaning her remark in the way it sounded to a Donda warrior, I still could not help but wonder why Morgan put up with this type of treatment from her. I knew there was something important here, some undercurrent beyond the cultural gap between Earth and Donda mores, which I was missing, but what it was I had no idea.

And Jorgensen. At the moment of crisis he had gambled, had not continued his reach for his rectangle, which I now realized was a powerful personal computer that worked in concert with his bracelet, but had instead placed his trust, and possibly his life, in his evaluation of me, the way I would respond to her insult, override my instincts, adapt to the situation. So I turned slightly, meeting his eyes, and imperceptibly nodded, acknowledging his gamble, honoring it, then turned back to the admin.

"Perhaps you are right," I said to her gently, my voice mild. "There will be time enough for philosophy after our problem has been resolved. So why don't you tell me what it is; why the Transported Ones are no longer arriving, and what it signifies."

• • •

Da'ahta.

Its icy fingers spread throughout the core of my being, a malignant, creeping cold wind of death and despair that brought in its wake chills overlaid with hot flashes, deep aches within my bones, a sense of my nerves vibrating like tuning forks, waves of nausea, intense loneliness, and a black suicidal depression building within slowing time, mitigated only by my knowledge that Ly'is was waiting, that I only had to step through the Sages' doorway to once again be with her, within an'tala. Through the damp fog that prevented even the solace of the stars the light of the setting moons glowed, creating a soft, almost mystical, illumination that da'ahta warped into a sense of ominous dread, the very soil of the clearing where I had my bivouac, the plants growing here and there, the dying embers of my small fire, whispering, we're not real, we're only streams of zeros and ones in a computer program, as are you, you died aeons ago, your body, and all that has transpired during the 800 and some years since your Awakening has been nothing but a machine dream. Even the stars are not real, only simulated, and for you it makes no difference if the real stars, shining within the distorting lens of space-time, are still in existence, for you will never again see them, never again wonder in innocence about their nature, what lies beyond them, never again have their comfort...

Da'ahta.

We are the lucky ones, Jorgensen had said.

You will shortly find it more than *uncomfortable*, the admin said.

Is it important? Morgan had asked.

Da'ahta.

Time was becoming blurred, mixed in my mind, when had what been said? Did what Jorgensen say come before or after what Morgan said? Or had Viggen said it?

I struggled to rise, reach my quiver-pack before total immobilization overcame me, failed. I could not move, my energy draining out, time stretching, vision starting to strobe, information now coming in discrete packets, beginning to distort, colors starting to take on an unusual vividness, image borders, cracks in the rocks, plants, the coals of my fire starting to move in an internal dance, patterns flowing across the inner rods of my eyes, merging into the fog, becoming one...

Da'ahta.

It was always our dread, our vulnerability, the Achilles' heel of all warriors. And now, deeply absorbed in the flow of my memories, the decision I must make, I had—just like on Earth when, preparing for a class, completing an assignment, doing computer programming, Baroque music playing softly in the background, I would sink so deeply into hack mode that I ignored hunger, thirst, even relieving myself, the hours passing as seconds—done much the same with the first signs of da'ahta: pushed it off for a moment as I followed the train of my thoughts, and, by so doing, let it creep up on me.

We lived under a delicately balanced, double-edged sword. An'tala, a warrior's telepathic bonding with her diak—a bonding that created a deep physical addiction on both sides—is what enabled us to survive in our harsh but beautiful desert environment, survive against not only the forces of nature but against the men, the soldiers who tried so hard to capture and kill us. Yet, when a warrior's diak died, or when they were separated by more than about twenty kilometers, an'tala, being distance-dependent, was broken, and, if she did not find a new cub to bond with within two and a half to three days, or was unable to rejoin her diak, she would enter da'ahta and, shortly thereafter, die.

Da'ahta.

I tried again for my quiver-pack; again failed...

The coals of the fire caught my attention, their shimmering glow seeming to whisper, see, this is what it will be like, your world, look, look how the colors flow, their patterns, see them growing, expanding outward, now one AU, now two, now—

The sound of a night hunter, its cry, just overhead, pierced the fog, streaming tentacles of moving color turning into sound back to color back to sound, and I jumped, the reflexive movement causing an inadvertent and unpleasant orgasm, the orgasm becoming one with the sound, the colors, my vibrating nerves, and as I fell I glimpsed my quiver-pack on the other side of the fire, twisted, rolled through the coals, was able to grab it, reach into its pocket, extract a sy'ahta root. Found my dagger in my hand, cut off a piece of the root, started chewing.

Da'ahta.

Its taste, foul beyond belief, bitter, shunned by all except warriors and diaks in need, flowed through my mouth, into my nose, down my throat, and I found myself crying with relief as da'ahta began to fade, sanity return...

Whooo, said the night hunter, flying above the fog.

I sat there, watching, as the coals shrank, became just coals once again, but now changed, harbingers of the future, a reminder of how critical things were, what was waiting.

Whooo.

Da'ahta.

• • •

“It was thought during the middle of the twentieth century that the discovery of nuclear weapons would end up destroying life on earth,” said Viggen. “But it wasn’t nuclear weapons that spelled the end of humanity—though they played their part—it was the rise of the biological sciences.”

Between us, the row of Sages on one side, Jorgensen and I on the other, the Tri-D floated, showing the Earth spinning, time-lapse images taken automatically from First Moon over a period of several hundred years, images of destruction, of death, the history of our species, our civilization, the fires burning, then slowly dying out, the rust-brown air slowly changing, becoming transparent once again, the clouds white, high cirrus spreading lacy filaments across the planet, isolated thunderstorms forming, then dissipating, the flash of their lightning obvious from our vantage point, the planet once again a blue and white oasis in the loneliness of space, clean, beautiful, like it was in those historic photographs, the Apollo 11 Mission, deep in our world’s youth, its innocence. A time when its future still lay before it, glorious in its potential, its infinite possibilities...

“Then all that is left of Earth and its people, its civilization, is PDU-1?” I asked, appalled.

“We can’t be sure,” said Peters, the other programmer who was present at the meeting and sat between Morgan and the quiet, watchful woman named Wong. “But the fact that our instruments continue to show an absence of radio/TV transmissions, or, on the dark side, artificial light, strongly suggests the absence of intelligent life.”

“Technological life,” dryly corrected Morgan.

“Whatever,” said Peters.

“It was the *Tragedy of the Commons*, expanded to the entire planet,” said Viggen. “Uncontrolled breeding, rampant consumerism, a culture of mindless greed and kelter orchestrated by corporations that couldn’t see beyond the next quarter and politicians who couldn’t see beyond the next election. Extensive crime and corruption at every level of society. Trivial and reckless exploitation of irreplaceable resources with no concern for tomorrow, a widespread attitude that the future could take care of itself.”

“Which it did,” said Morgan, deadpan.

• • •

“The program started out in good faith,” continued Viggen, giving Morgan an irritated look, “with the prototype going from design to completion in slightly less than two decades, using the technologies developed during the construction of HQ.”

The Tri-D shifted, showing First Moon, the site of planetary and corporate government, floating in its Lagrangian point sixty degrees in front of our natural moon, the distinctive sheen of its armored electrosteel exterior obvious even from our vantage point. Eight-hundred and fifteen kilometers in diameter, with missile launchers and beam weapons aimed at Earth, it was a constant and deliberate reminder to the general population of where the power lay.

“Administrative, design, and political services were carried out in our technical park in the Lockwood section, with a peak staff of 272,000 during the initial building phase,” said Viggen. “This did not, of course, include subcontractors.” The Tri-D shifted again, showing the luxurious atrium-like corporate entrance to their section of HQ, its careful gardens symbols of wealth and political power. The camera moved inside, focused on a smiling receptionist, continued on, down corridors, past offices, labs, the luxurious cafeteria, to the guarded control room, an area of screens and controls and work stations.

“It was here where the real work took place, the management of the basic construction,” said Viggen. The camera moved down the rows of stations, came to a stop at one of the cubicles where a young woman worked, focused on her screens. The main screen showed robots mining an asteroid, the factory ship standing just off the surface; on the auxiliary screens were graphs and shifting numbers in constant movement.

“Once completed, of course,” said Viggen, “PDU-1’s maintenance computers took over all this work and our staff was reduced to 111,000, these being mostly involved with lobbying and billing issues.”

The view shifted to PDU-1 in its free-ranging orbit between the asteroid belt and Jupiter, its 209-kilometer size looming large in front of us, its exterior, like HQ’s, showing the sheen of activated electrosteel, a one-decimeter thickness being capable, once its field has been energized, of withstanding direct exposure to a five-megaton nuclear device.

“Approximately sixty percent of its internal area,” continued Viggen, “is used for maintenance services, containing the necessary automated factories required to manufacture replacement parts, along with the ships necessary for collecting raw materials from the asteroid belt, and, periodically, from Jupiter and its Galilean satellites.”

The view shifted again, showing ports opening in PDU-1’s side, robot ships of various types coming and going, fragile-looking craft with their specialized equipment attached to their external frameworks, ships obviously designed for deep-space operations, outside planetary gravity-wells and atmospheres.

“It also has, for station keeping and repositioning, Boeing Type XIX propulsion units, as well as Karlof reaction engines for precise attitude-control. PDU-1 is now self-contained, and, essentially, immortal,” said Viggen.

"*Essentially*?" I asked, detecting a subtle oddness to his tone, an off-note in his pronunciation of the word, even, once again, a scent of hidden fear.

V-Kay looked at me, the bleakness returning to his eyes. "Our society has a history of abandoning major projects after the first flush of success, diverting the funds to other projects with fresher political appeal while still maintaining lip service to the original project. This is what happened here, when we ran into a fairly minor software problem. We can all count ourselves fortunate that the hardware phase of this project reached completion prior to this point. Had it not, we would not be here today."

He paused as Viggen collapsed the Tri-D, then continued.

"For our world to properly function, it had to evolve naturally, over time, as the real world did. So the main program was started with only the basic parameters, essentially those of Earth just after the extinction of the dinosaurs. The only constraints imposed were that apes could not evolve beyond where they had on Earth, for PDU-1's human population would come from outside."

"Then that is why the animal life here is somewhat different than on Earth, as well as the plant life?" I asked. "Evolution took a slightly different track?"

V-Kay nodded. "Yes," he said. "And by then it was too late, too dangerous, to try and intervene. Which is why, for example, you have the diaks. None of this was planned, it just happened."

"But how does this explain an'tala? The obvious powers of the oracles? Surely these are not possible in a natural, biological environment?"

V-Kay hesitated, then shrugged. "It has nothing to do with biology; it's an artifact of the software. A bug in several of the subprograms. A form of cross talk. Certain types of training apparently can make one sensitive enough to its effects to exploit the bug."

"There are some who would consider it a feature, not a bug," said Morgan dryly with a nod in my direction. "After all, it gives them the edge they need to survive."

"It also makes them addicts," said the admin. "Perhaps, since the subject has come up, the Donda would like to know the reason for that, since the oracles, who employ the same bug, do not have that problem."

V-Kay shrugged again. "PDU-1's software controls the physiological processes of all life-forms within the matrix, and these processes have to conform to natural biological laws. Unfortunately, the an'tala bug allows, under certain conditions, illegal links to be made between the physiologies of certain warriors and diaks in such a way that once *imprinting* has occurred, telepathic communications become not only possible, but eventually necessary—and therefore addictive—to both species.

I searched my memories of long-ago classes on Earth, said, “Then sy’ahta counters the effects of withdrawal by acting on the physiological receptors that were modified by the bug?”

V-Kay nodded. “Yes. As to the oracles, the reason they do not become addicted is because they do not practice cross-species fraternization.”

“Mental miscegenation,” the admin corrected.

“Those who did not adapt died out,” Jorgensen reminded her. “Survival is the highest law.”

I said nothing, keeping my thoughts to myself. The look I had seen on the admin’s face when Morgan said some considered an’tala a feature, not a bug, was enough to have put me on alert status, had I not already been there. As it was, the best I could do under the present circumstances was file it away in my mind, just another item among many, for future review. And, if necessary, corrective action.

V-Kay smiled again, and signaled to Viggen to continue with the briefing.

• • •

“Structurally, the *New Frontiers for Humanity* project was divided into four broad but overlapping departments,” Viggen said. “Hardware, Software, Biometrics, and Administration. Hardware was subcontracted to Boeing’s Defense & Space Group, which built PDU-1 and its infrastructure; Software was subcontracted to Sun Microsystems’ AI division; Biometrics was subcontracted to Consolidated Pharmaceuticals’ Special Projects division; and RJR handled Administration, which not only had overall responsibility for the project, including design and management, but contained the Political Action, Billing, and Public Relations departments as well.”

Viggen paused slightly, then continued. “We were all employees of the various principals. O’Leary, V-Kay, and I were with RJR, Wong was a biologist with Consolidated, Jorgensen worked for Boeing, and Morgan and Peters were with Sun.”

I nodded, sensing from his tone that something was coming.

V-Kay stared at me, his eyes now strangely flat, said, “The reason we are pointing this out to you is to emphasize that none of us were at a high enough management level to influence, one way or another, the course of events. In the end, we only escaped the fate of the others through a stroke of undeserved luck.”

I nodded, looking from one to the other, my bad feeling increasing. I knew I was not going to like what came next.

• • •

Viggen touched his PC to his bracelet, and between us formed an image of a vast auditorium filled with people wearing clothes much like those the Sages wore, only richer. On a stage at the far end were two long tables separated by a podium, and behind it a large screen with the animated logo of RJR floating over an image of PDU-1. At the podium was a large florid man making a speech. The people sitting at the tables, about forty of them, stared out over the crowd, many wearing translators in their ears.

The camera moved closer, and now I was able to make out the seal of the World Council on the podium and read the name plates in front of each of those at the tables. All of Earth's Sectors were represented, as well as HQ, which also was a Sector. I recognized the president of NA Sector, somewhat younger than when I was transported, for his image had regularly appeared in the news box on my PC's screen during my school years. That was, when I allowed the news box on my screen, for though by law it had to be there and could not be turned off, I had hacked the system so I could get some peace and quiet while I worked from the constant stream of propaganda, disinformation, and ads. And a remnant of my old technical curiosity slid into my mind, unbidden and unwanted, a memento of the distant past, causing me to wonder how the mental interface in the Sages' bracelet—for that is what it had to be—worked. I also found myself wondering why, with technology this advanced, the computer itself wasn't a biological implant. Apparently the Sages' technology hadn't reached that point yet. If, in fact, it was advancing at all since they had been transported. That too was something worth thinking about.

The camera now focused on a table below the podium, also facing the audience, and I saw that those sitting at it were representatives of the various subcontractors involved with the design and construction of PDU-1. Viggen activated the audio, and as the man at the podium introduced each of them in turn, they stood and bowed to the crowd.

Jorgensen turned to me, asked quietly, "Did you view the ceremony at the time of its original broadcast?"

I shook my head no. According to the memories, I had been in a valley east of my village hunting moose, for my family's need was great and I chose to spend my share of the village Welfare not on overpriced food from the local store, but on education: admission to the encrypted satellite classes and the SunEd software required for my lessons, both of which were extremely expensive. Outcast though I was, and scorned by the village, when it came to moose hunting—which was illegal for natives, with severe penalties if caught—no one turned me in for the reward offered by the authorities. The reason, of course, was that the entire village despised the law that reserved the moose around our homes for the wealthy sportsmen from the cities who could afford the high license fees and the guides who brought them onto our lands. And, oddly, a sense of sadness, of sympathy and compassion for my village, the people in it, suddenly flowed over me. Were it not for them, the education their silence bought me, I would not be alive today.

Viggen turned the audio off, said, “This was the official launching ceremony marking the completion of the *New Frontiers* prototype.” As he spoke the camera moved to the screen behind the podium, focusing on the RJR logo. The logo and image of PDU-1 dissolved into a view of a chair with straps surrounded by many machines. In the chair, with a large machine attached to his head, was a heavily-drugged man wearing prison coveralls, his fear obvious. Standing by were many technicians in white coats and name badges, and it seemed to me that one of them, a young woman with short hair off to one side holding an electronic notepad, could have been Wong.

The camera moved in on the prisoner’s face, lingered for a few moments, focusing on the terror in his eyes, then drew back until the florid man at the podium had center stage. The man said a few more words, then took a box with a red button on it from a uniformed guard, and, looking at the expectant audience, nodded once and pressed the button. On the screen the prisoner in the chair stiffened, then slumped, and the audience broke into applause.

As Viggen collapsed the Tri-D, he said, “At the time, though it was not public knowledge, the success rate for transportation was still at four percent. Later on, with continued experimentation, we managed to raise it to twenty-three percent, where it remained. Because of this, while the hardware’s success was publicly rated at one-hundred percent, the biometrics received a rating of only fifty percent. As did the software.”

“I would say that was a bit disingenuous,” I murmured. “Was this part of your problem?”

Morgan shook his head. “No, the problem was mostly in our department: the growing discrepancy between internal and external time with each application uploaded.”

“*Application*?” I asked.

Morgan grinned. “That’s what you are: an application. As are the rest of us. To RJR.”

I found myself grinning back, starting to like him somewhat, as I did Jorgensen, sensing a kindred spirit on certain levels, just as I sensed some of the inner stresses between the Sages, subtle undercurrents, webs of friction. Perhaps back on Earth, had we met under different circumstances, we might even have become friends, for he too had a touch of the outlaw, the rebel. But this was not Earth, and I was not at their stronghold for social reasons. And my hunter’s, my warrior’s instincts warned that the deadly danger I sensed here, in spite of the civility, the touches of friendliness, was not decreasing as the Sages proceeded with my briefing, but rather increasing. Knowledge equaled power, and power equaled danger. An equation we all understood.

“Interesting,” I said, the grin fading from my face, the brief moment of rapport over. “A new corporate euphemism. *Application*. Was the transportation of the ‘application’ I saw at the launching ceremony a success?”

V-Kay shrugged. “Publicly, politically, and financially, yes. The media made a big fuss about it, as they usually do, helped by our Public Relations department. Investments in RJR soared, as did the stock market in general. But in actual fact, though known only within the *New Frontiers Group*, he was one of our many failures.” V-Kay looked me in the eyes, said, “An initial success rate of only four percent may appear to be small, but the stakes were high, far higher, as history has shown, than any of us at the time imagined.”

I shrugged. Life was cheap on Earth, as it was here. And what was past was past. Certainly, after all these years, it was no concern of mine or of the Donda. “Okay. So what’s this about time discrepancies?”

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“At the time of the launching ceremony,” Viggen said, “PDU-1’s software was accurately simulating an environment similar to Earth’s during the late Neolithic Period. Both geological and biological evolution had basically stabilized, and the environment was ready for the introduction of its first human inhabitants. Internal time was set to operate at a rate 2,000 times faster than time as measured by an observer on Earth. This was done so we could monitor long-term internal events as they occurred, and, when necessary, make the needed adjustments. This also was the top speed the prototype, which contained our most advanced technology, could achieve.”

“That needs to be qualified,” said Peters. “It was the top speed the current software release could support after evolutionary stability had been achieved.”

“True,” said Viggen. “Version 0.97p63.”

Morgan looked at me. “Those of us on the development team wanted to wait until the software had reached 1.0, for though by design it is self-learning and self-correcting, its code still needed a lot of fine-tuning for optimum performance. But top management at both RJR and Sun overruled us for political and economic reasons, and that led directly to the problem we face today.” He paused, his eyes clouding, his usual irreverence now gone, added, “Perhaps we should have tried harder to postpone the launching, for had we done so things might have turned out differently. After all, we were the ones closest to the problem and had the best understanding of the issues involved.”

“RJR and Sun had no choice,” V-Kay said. “Unlike some of those in the software department, top management does not live in an Ivory Tower and has to deal with the real world. The general public and the World Council had been waiting almost twenty years, with every year bringing more calls to shut off funding, and their patience had finally reached its end. We were warned: either we launched the prototype and immediately began large-scale uploads, or the project would lose government support."

"Which it did anyway," said Morgan.

V-Kay nodded. "True. But by then PDU-1 was self-sufficient and could survive on its own without outside support. Those seven years of additional funding set it free. Without them we wouldn't be here today."

Morgan shrugged, this obviously being an old issue between them, and V-Kay signaled to Viggen to continue the briefing.

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"It was about eighteen months after the large-scale uploads began that we first started to see a decrease in the internal-time rate," Viggen said. "It was subtle at first, but as the uploads continued its effects began to accelerate. The same thing was happening with natural births, too: with each new child added to the population there was a measurable slowing of internal time."

V-Kay raised a hand to interrupt Viggen, said to me, "Bear in mind that these variations in internal time were only noticeable to an outside observer—to those inside the changes could not be detected because external references were not available."

I nodded. "What was RJR's response to this problem?"

V-Kay shrugged. "Actually, they didn't realize they had a serious problem at first. They just assigned a small team from Sun—Morgan and Peters were part of it—to work on finding a fix for the code, and continued with the uploads."

Morgan laughed, short and bitter. "It wasn't that they didn't think they had a problem; they just didn't want to know about it. The money was in the scans, the associated maintenance contracts, and the spin-offs. Not to mention that numerous deposits were being accepted for the commercial versions, especially from a wide variety of religious and extremist political groups. RJR had a nice thing going, and they weren't about to let a minor software problem get in their way."

"Interesting," I said, unable to keep a faint hint of contempt out of my voice. "Numerous deposits. With a 23 percent success rate. On an unproven machine. And a 'real world' death rate of 100 percent. Impressive logic here."

Morgan shrugged. “When has logic ever prevailed over faith, hope, and hype? Especially with religious and political types. But the success rate at the time was still only four percent, which those placing commercial orders were apprised of under nondisclosure agreements. It was only in later years, with an expensive new process, that the rate climbed to 23 percent.” He paused, then added, “The successes were mostly intensely logical types, those who could adapt, both consciously and subconsciously, to the reality of their situation. Females, for some reason, had almost a three-to-one ratio of success over males.”

I nodded, thinking how in actuality it was even worse for the males than Morgan thought, for when newly transported males were found on PDU-1, naked and without memory or language, they were usually killed on the spot, with only a few of the more fortunate being enslaved. Our world was not gentle with newcomers, neither male nor female.

“So what happened next?”

Viggen shrugged. “Nothing. We were ordered to keep our mouths shut under penalty of termination, and business continued as usual. This went on for another five and a half years, in spite of repeated warnings that we were forced to send through bureaucratic channels, until finally the program reached the point where internal time had become so much slower than external time that we were in danger of losing control. It was at this point that Morgan, going against all rules and risking termination, sent PDU-1 emergency instructions to place newly uploaded applications into a storage directory and only release them into the general population when there was a death within that group. These instructions were also applied to the naturalborn, so that a birth could not occur until after a death made space available within its group.”

“Logical,” I said. “Earth should have implemented the same policy shortly after the nineteenth century. How did you keep the two groups separated internally? By group ID?”

Morgan shrugged. “Sure. It’s the simplest way, since each individual is also issued a user ID. Applications are placed within the `trn` group on arrival, and naturalborn within the `nb` group at conception. These two groups were initially implemented for statistical reasons at the request of RJR’s psychologists, so population and settlement trends could be monitored over time. Later, when the performance problem became critical, I used them as a simple means to control population growth.”

“Did you add any release controls, to allow for population shifts between the groups?”

Morgan shook his head no. “Not at the time. Later, after I entered PDU-1, I cleaned up the details and made the kluge permanent.”

I nodded. “Since we are on the subject, where do they live? Applications and naturalborn?”

V-Kay started to raise his hand, changed his mind.

Morgan glanced at him, shrugged. “Physically, our personal files live in individual subdirectories in the underlying file system, with a bank of Sun-Oracle 4D databases managing the data flow between them and the VR-module.”

I nodded again, appreciating as always the genius of the original Unix design, how it was in actuality more of a philosophy and methodology, a way to approach problems, than a code base. Because of this, it had been able to evolve, and therefore survive, over the many years of its existence.

“RJR had to report the crisis to the World Council,” Viggen said, “along with a detailed description of the emergency measures we had taken. This precipitated another crisis, and after a stormy closed-door hearing in which we were repeatedly raked over the coals, they voted to temporarily withdraw funding for everything except scanning services while they did a fact-finding study. The only concession they gave RJR was to allow us, after scanning, to place the applications in storage on Earth instead of uploading them to PDU-1.”

“In other words, mass executions,” I said.

V-Kay shrugged. “Political dissidents and common criminals. RJR still had hope at the time that the software problem could be solved, and once that had been accomplished, those in storage could be transported into one of the commercial versions.” The bleakness in his eyes deepened. “But when the World Council received the results from the fact-finding study—that it would take 120,000 programmers working an additional twenty years to bring internal time into synchronization with external time, and that only if each unit accepted a legally certified limit on total population—they unofficially placed the project on indefinite hold except for scanning services, which then became, along with deposits for the commercial versions of PDU-1, RJR’s sole source of income. And this placed in motion the events that finally led to war.”

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“RJR was now on its own,” Viggen said, “and to save the *New Frontiers* project, they had to raise money, and raise it fast. So they naturally turned to their marketing people, and marketing turned to both RJR’s clients and to their Public Relations department. The entire project entered its final phase at this point, which was large-scale commercial development.”

“This must have happened after I was transported,” I said, “for I don’t remember anything about commercial development, just the prototype.”

V-Kay touched his PC to his bracelet, said, “One year and seven months later. You were in Batch 32709, the third that PDU-1 placed in storage for future release. Uploads ceased at 32804—after that, all scans were placed in storage on Earth.”

“The sales program was based on a science called behavioral economics,” continued Viggen, “which dated back to the late twentieth century and demonstrated that people have a strong tendency to imitate the behavior of other people in choosing everything from clothing styles to haircuts to political candidates to operating systems. If RJR could stimulate what is called a *norm cascade* throughout the general population—especially among young adults and their children—then they would be able to raise enough money to fix the time problem and become profitable once again.”

Morgan gave a sour look. “A true futures market. Based on the observation that people often act more like herd animals—*sheep* is the term the studies used—than rational individuals. So go ignite a dangerous fad among the lemmings and haul in the cash.”

V-Kay shrugged. “The herd instinct in humans is well understood. As is the fact that it is strongest in children and young adults. So they naturally are the ones targeted. Corporations have always recognized this characteristic of the market and harnessed it for their own benefit.”

“Even when it led to the death of their customers,” said Morgan.

V-Kay shrugged again. “It was their choice. Nobody forced them to sign up for the *New Frontiers* program. They were, after all, consenting adults. Or, if below legal age, had a consenting adult who was legally able to sign for them.”

“True,” Morgan agreed, looking at me. And another of their exchanges came to an end.

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The Tri-D camera came in over a vast sea of towering gray concrete buildings in the heavily polluted air, housing for Earth’s upper middle-class, crossed a sluggish gray river lined by factories emitting clouds of toxic smoke, and paused outside the window of one of the units. Inside, on a couch, sat a well-dressed family watching the wall-sized vid. On it was an advertisement for Urban Pastures’ *Colonial Elegance* world, a *New Frontiers* development, showing a landscape of rolling hills covered in snow. Approaching a charmingly rustic country house were a man and his two sons leading a horse that was dragging a freshly cut Christmas tree. The camera moved to one of the windows in the house and looked inside, where a woman and her daughter were in the process of removing a turkey from the oven, then drew back. Across the screen flashed the words, “Where do *you* want to go today?” In the background, a choir was sweetly singing Yuletide carols.

“That was one of our more productive seasonal promotions,” said Viggen, turning off the audio, “especially in the NA and Euro-Russ Sectors.” He touched his PC to his bracelet, and the scene shifted again, this time to the business district of a megalopolis in Japan Sector, showing a large animated billboard on the front of a building where two crowded streets made a "Y" intersection. The billboard showed a vast empty landscape of redrock buttes and scrub desert under a clear blue sky, with a private car driving rapidly down a long open road. Inside the car, a convertible, was a family of five, the wind streaming through their hair, looks of ecstasy on their faces. At the bottom of the billboard was the logo of Urban Pastures, with a flashing access number. Across the top of the billboard, in three different languages, streamed the words, "Where do *you* want to go today?"

"Scenes of vast open spaces combined with technology—such as the prospect of actually being able to own a private car and have an open road to drive it on—seemed to work best in the Japan and Asian Sectors," said Viggen. "But the all-time winner, especially for impulse sales, was our chain of theme parks, which were strategically placed in every qualifying population center."

"'Qualifying' meaning the local population had the discretionary income to pay the entrance fee to the park," said Morgan sourly, "as well as enough saleable assets to purchase their Urban Pastures tickets."

"Don't forget that the World Council's Department of Population Control was providing an emigration bonus to all females of breeding age and their young children," said V-Kay. "That in itself provided a major incentive."

"True," agreed Morgan, an edge of sarcasm in his voice. "Obtaining that was the all-time major achievement of RJR's Political Action Committee. It came close, by itself, to paying the scanning and storage fees."

I looked at both of them, said, "Was the public aware at the time of these promotions that you didn't have any *New Frontiers* units available? Or had even solved the software problem? Am I missing something here?"

V-Kay gave me a hard look. "The Board held a series of meetings with our legal department to explore this issue and its potential liability. After a thorough review of the *Uniform Commercial Code* and applicable case law, it was determined that since we had already completed the design phase and received our construction permits for the commercial units, Urban Pastures and its franchisees were legally entitled to begin offering discounted group rates and prerelease specials to consumers who would sign up and report to the scanning centers by a certain date. To be completely legal, all we were required to do was provide proper notice of unit availability and possible upload delays at the time of sale, which we did."

Morgan snorted. "Yeah. A couple of lines buried in the small print of a nineteen hundred-page document written in legalese."

V-Kay shrugged. "It's the consumer's responsibility to read and understand the contracts they sign." He signaled Viggen to continue with the briefing.

“This was our theme park in the Serengeti megalopolis of Africa Sector,” Viggen said, as the Tri-D camera showed a high-altitude view of a vast landscape covered with unpainted concrete housing blocks stretching as far as the eye could see, the Earth’s curvature plainly visible in the distance, then swooped down on a faint spot of green, barely visible through the air pollution, which grew and grew until we could see it was a miniature town with small houses situated on winding, tree-shaded streets. Each house had its own lawn in front and a small, but pleasant, yard in the back. Surrounding each house was a white picket fence with a low gate, and to the side of each gate was an attractive mailbox. The sidewalks lining the quiet streets were wide and clean, and led to an old-fashioned Main Street that was filled with cheerful crowds visiting the many restaurants and shops.

“The restaurants,” Viggen noted, “had a large selection of real food—fruits and vegetables—at very inexpensive prices. This was, in fact, one of the Park’s major attractions. The entry fee was naturally refunded if one patronized any of the shops, so these theme parks became a major attraction wherever they were.”

Then the camera, its low pass finished, was making its turn over the vast expanse of housing blocks and industrial areas surrounding the theme park, in the process passing over a number of algae factories with their large, slime-covered vats of stagnant water—the major source of food for the local population—on its approach to the main gate. Above the gate was a large animated sign saying, “JoinYour Friends at Urban Pastures’ *Kidworld*—A Planned Community for *The Family That Cares*.” Enclosing the park, keeping out the rest of the world—though they were still able to view the happy crowds inside—was a high chain-link fence topped with coils of electrified razor-wire.

The camera paused for a moment outside the gate’s four ticket booths, inspecting the long lines of poorly dressed but clean people waiting their turn, welfare tokens in hand, then passed inside, focused for a moment on an old-fashioned drugstore with a crowded soda fountain, then moved down the tidy streets to the petting zoo.

“This was one of our nicer touches,” Viggen said. “Unlike NA Sector, where the regional authorities were able to preserve a large area for wildlife and therefore support a profitable sport hunting industry, in Africa Sector all native wildlife had been exterminated by the middle of the twenty-second century, and most of the children here had never seen a wild animal except for the cats and dogs that lived off the local rat population.”

The camera focused on several delighted children petting a zebra and a gnu in one area, moved on to another, where children were looking at a lion that lay purring at their feet as its trainer scratched behind its ears, then stopped in front of an elephant, which was giving rides around a small track.

“The animals were, of course, robots,” Viggen said, “but they still remained one of our most popular features.”

The camera then moved past a green and shady park where families were having a lawn picnic by the artificial lake, moved on to a crowded fenced area containing swings and slides and play tunnels, then focused on five children who were tugging their parents in the direction of the sales office where a small line had formed. Above its door an animated sign, its letters formed by different animals all wearing happy smiles, flashed, “Where do *you* want to go today?”

“Of course,” said Viggen, “none of these promotions were as successful as the ones operated by the various fundamentalist religious groups such as Allahworld, which was located in Mecca Sector and, from what I understand, was the most beautiful of them all. Modeled on fourteenth-century Marrakech, it kept strictly to the traditional ways and, naturally, was prohibited to non-Muslims.

“Also very successful were the numerous religions that sprang up around the project, most of them some variant or another of the New Age cults whose lineage stretched back to the middle of the twentieth century.”

The Tri-D came in over a large stadium whose bleachers were filled with people watching the scene on the field below them, panned slowly across the crowd—mostly older folks, sitting in small groups, who appeared to be crying—then slowly descended to the playing field that was packed with many youths of both sexes, apparently thousands of them, all wearing white robes with a red spiral-shaped emblem on the left side. The youths, swaying back and forth with looks of religious rapture on their faces, were chanting in unison with their leader, an old man with long flowing hair and beard. The old man, his robe white like the others but with a gold spiral, was sitting cross-legged on a raised platform beating time for the chant with his raised arms. All around him on the platform were lavish arrangements of flowers, and to each side, sitting in a row, were twelve acolytes, also chanting. Behind him, normally a score board for sporting events, a sign said, “Urban Pastures Welcomes Master Baba Do and the Graduates of Our Heaven.”

Viggen turned on the audio, and we could now hear the chant, “Do, Do, Do, Do, Do, Baba Do, Do, Do, Do, Do, Baba Do, Do—”

Viggen turned the audio off, said, “This was the graduation ceremony for those who had reached the Twelfth Level, and therefore were ready to ascend into Our Heaven, the group’s private *New Frontiers* world, which they would prepare for the coming of their Master. Apparently they would then await the arrival of a spaceship from another galaxy that would take them into the true paradise and immortality.” Viggen paused, then added, “Upon graduation they, of course, donated all their worldly goods to their Master to help continue his work.”

The ceremony then came to an end, and, in long orderly lines the graduates, each carrying a lit candle, filed out of the stadium gates to a series of numbered parking lots where long lines of buses waited to transport them to the scanning centers. On each bus an animated sign said, “Where do *you* want to go today?”

“Urban Pastures certainly was thorough,” I said, unable to keep the cynical edge out of my voice. “I suppose I don’t need to ask whether those signing up were warned about the failure rate associated with scanning, or what actually awaited them if they did end up being dumped in the wilderness of an untamed and unexplored world.”

Morgan looked at me, his expression carefully neutral, said, “Of course not. This was strictly a *caveat emptor* operation.”

V-Kay gave Morgan an irritated look. “It was just common marketing practice, nothing more. Everybody expects it. Business is, after all, business.” He paused, the bleakness in his eyes deepening, then continued. “What wasn’t expected was the reaction when Urban Pastures, overextended, was forced into Chapter 11.”

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“So it all fell apart in the end, eh?” I said.

“You should have seen the media reaction,” Morgan said. “Talk about a feeding frenzy. They milked the situation for all it was worth, causing the panic to spread like wildfire, especially after it was discovered that Urban Pastures’ Board of Directors, seeing the failure coming, had secretly sold off all their stock, voted themselves large severance bonuses, and resigned en masse. It was widely trumpeted as the largest Ponzi scheme in history.”

“It wasn’t a Ponzi,” V-Kay said. “Ponzi schemes are illegal. Urban Pastures and its franchisees broke no laws whatsoever. RJR’s legal department made sure of that.”

“Ponzi?” I had come across the term on Earth but, finding business distasteful, I had only a vague sense of its meaning.

V-Kay looked at me. “Ponzi schemes do not have a real product or service to sell—they’re just a pyramid with those at the top feeding off those beneath them: a process of continuous recruitment that lasts until it runs out of victims. Urban Pastures and its franchise holders *did* have a legitimate product: they were selling advance, deeply-discounted tickets to RJR’s *New Frontiers* worlds, with the full approval and support of the World Council.”

“It’s interesting what a few campaign contributions can buy,” said Morgan dryly, “not to mention a few lucrative stock options and positions on the Urban Pastures Board. Unfortunately, the end result of RJR including World Council representatives on the Board was that the funds earmarked for software development were instead diverted into additional sales promotions, new theme parks, and large salaries for numerous layers of upper management. Meanwhile, my group—in effect shunted to the sidelines—struggled without adequate resources to modify the software." He looked directly at V-Kay, said, "RJR was well aware of the number of programmers we needed to complete the job within the twenty-year time frame, yet they only provided funding for 1,700 seats. We did the best we could with what we had, working double shifts without extra compensation, but we didn't have a chance. Not against the Board's incessant churning, profit-taking, and shortsighted greed."

"You know perfectly well why we had to do it," V-Kay said, for the first time anger coloring his cheeks. "We didn't have any other choice, not if we wanted funding from the Department of Population Control. Without it, the project would have died the day you ordered PDU-1 to stop placing new applications in the matrix. This way we at least had a fighting chance, small though it was, and it had to be taken. We just ran out of time and luck."

"Actually," said Viggen, raising his hand, requesting a truce, "a lot of the blame does lie in the media. During the investigation that followed Urban Pastures' collapse, it came out that many of the prisoners supposedly transported to PDU-1 had been placed in storage on Earth instead. This immediately became a major scandal. Then an investigative reporter dug out the actual failure rate of our scanning technology—marketing had been claiming the scans were as safe as travel between Earth and HQ—and that became the next one. Following that was a report making public for the first time the actual seriousness of the software problem, and that RJR had only been making token efforts to fix it. At that point the media started publicly calling RJR and Urban Pastures a pack of World-Council-supported murderers who never had the slightest intention of building anything other than the initial prototype, and that just for bait. They further claimed to have confidential information from 'a highly placed source' that the entire program had all along been an elaborate scheme by the Department of Population Control to curb population growth. This ignited a new round of hysteria that, fueled by wild rumors of all kinds, kept building and building until riots finally erupted all over the planet. These riots, on the surface motivated by rage over all the deaths during the seven years the promotions ran, eventually led to a government crackdown."

Viggen touched his PC to his bracelet, and between us formed an image of a large crowd rioting around one of Urban Pastures' theme parks, this one in a slightly more upscale area than the one previously shown, the camera focusing for a moment on a line of bodies hanging from the sign over the park's gate. The bodies, both male and female, were all wearing Urban Pastures uniforms, and behind them the theme park was burning. The windows of the shops lining the streets outside the park had been broken, and large numbers of people were removing merchandise. The whole scene appeared, in a strange, grotesque way, to be a festive one, with the expressions on the various individuals' faces, males, females, even children, seeming to be those at a party.

Then the camera drew back, and we could now see a line of military aircraft approaching on the horizon, their fuselages showing the sheen of activated electrosteel. As the aircraft approached the crowd, they began to release what appeared to be a spray of some sort, and as the spray reached the people in the streets they began to fall to the ground and go into convulsions.

"The chemical being used," Viggen said, "was a new, and extremely deadly, nerve poison that breaks down within twenty-four hours. This was its first use in combat, and it fully lived up to HQ's expectations."

The Tri-D now changed, this time to one of an amateurish quality, showing what appeared to be a shift change at one of the government's low-priority concrete-and-steel office buildings. The camera focused on the crowds of people entering and leaving the building, most of them wearing government uniforms. Then the building suddenly blew up in a violent flash of flame and flying debris, and I couldn't help recoiling in surprise. As the dust settled and the hysteria began, against the flames and smoke and body parts formed a logo of a turning planet, obviously an idealistic vision of a clean and pure Earth.

"The logo you see," Viggen said, "is that of the *Earth First* terrorist group. The blast was in retaliation for the gassing of the crowds in the previous scene."

Once again the Tri-D changed, the camera now located in space a short distance from HQ. In the background the Earth floated, its surface invisible because of the thick layer of air pollution under the high cirrus. Then from HQ some sort of beam was emitted, directed at Earth, and the camera followed it down through the clouds and pollution to the surface, where a large section of a megalopolis abruptly vaporized.

"Secret agents of the World Council," Viggen said, "had discovered the approximate location of what they believed to be the headquarters of the *Earth First* group, but they were unable to obtain the cooperation of the local residents, so as an object lesson HQ obliterated the entire area. Unfortunately, it turned out that the agents had been mistaken, and the homes had been those of law-abiding citizens.

"This act ignited a planetwide uprising, and HQ found itself in a full-scale guerilla war. Those on HQ were safe, of course, protected both by distance and electrosteel, and there life pretty much went on as normal, with the usual round of parties, cultural events, and other functions. However, on Earth anarchy ruled, and after a full World Council meeting, HQ issued an ultimatum: cease their rebellion by 2100 Greenwich six days hence, and deliver the leaders of *Earth First* to the proper authorities, or the planet would be decimated on a random, computer-selected pattern." Viggen paused, for the first time showing emotion, then continued. "When the deadline passed without any response except the blowing up of another government installation, the World Council implemented their threat."

The Tri-D moved over the planet, showing one vast area after another of destruction, in the process passing over where Fairbanks and my village used to be, then drew back, and with a slight sense of shock I realized the camera had been focused on the screen in the auditorium where the launching of PDU-1 had taken place. At the podium, the president of the World Council was making a progress report to his peers, punctuating it with angry blows of his fist, when suddenly the images of destruction on the screen behind him were replaced by a mocking cartoon from the mid-twentieth century. The cartoon showed a cheerful rabbit in tuxedo and top-hat leaning through a red and yellow bulls-eye. Below the rabbit were the happy, dancing words "That's all Folks!", and in the bottom right corner was the spinning logo of the *Earth First* terrorist group. Viggen touched his PC to his bracelet, and the audio came on, playing a bouncy little tune.

"Looney to the end," said Morgan, in disgust.

Part III

"The cartoon appeared on all of HQ's screens simultaneously," said Viggen. "Corporate board rooms, beauty salons, restaurants, private apartments, information kiosks, whatever. Forty-five minutes later the cartoon was followed by a dancing, rotating model of a genotype, and the image of a melting, Dalí-style clock counting down the hours from fourteen days to zero.

"The genotype was quickly identified as that of a virulently infectious biological agent with an incubation period of nineteen days. It was one of a set developed by the military in their biological warfare labs and then deemed too dangerous to use. Apparently it was smuggled out of their arsenal some years previously, and was released by *Earth First* into HQ's ventilation and water systems shortly after HQ began its massive attack on Earth. Transferred through air, food, and water, once one is infected nothing further can be done. There is no cure, and death is certain."

"So that was their response to the decimation, eh?" I said, knowing what was coming next, feeling as old and cynical as Morgan.

"Yes," said Viggen. "HQ's attack on Earth lasted five days, and by the time it had been completed their fate too had been sealed. *Earth First* waited just long enough to make sure everyone on HQ had been infected, then, in an idiotic display of arrogance, hatred, and contempt, announced what they had done. This was what Morgan meant by "Looney to the end," for by childishly taunting us, trying to increase our terror—the biological agent causes an unusually gruesome and painful death—they gave HQ time to retaliate. Which it did. With the rest of the biological warfare arsenal, along with saturation missile strikes designed to eradicate all life on Earth."

V-Kay raised his hand. "Fortunately for us, what *Earth First* didn't know is that PDU-1 filters out, on arrival, all harmful agents any individual might be carrying. So there was a cure for the disease after all."

Morgan shrugged. "A twenty-three percent chance. If one was psychologically prepared to accept transportation as a cure."

"True," V-Kay said, their feud once again on hold. "Many of those given priority on the eligibility list did choose suicide rather than trying to make their way on a primitive new world without the comforts and status they felt were their due." He gestured to Viggen to continue.

"First on the list," said Viggen, "were the programmers and other technicians who, through inclusions in PDU-1's VR matrix, could provide some of the comforts and weapons we would need to survive. Then came the World Council and HQ's military leaders, along with their families. Following them were as many of HQ's elite troops and guards as time allowed. The technicians and physicians who operated the scanning equipment were also included, on a rotating list selected by lottery and based on the number of people transported, with death from the biological agent forming the cutoff point."

"So you uploaded your problems, eh," I said, remembering the ancient legends and Lake Da'Kal. "What about RJR?"

"RJR's Board was denied places on the list," said V-Kay, looking slightly sick at the memory, "by direct order of the World Council. They blamed RJR and Urban Pastures for *Earth First*'s attack, and when the Board objected, they were summarily executed on the spot. The Council then confiscated RJR's facilities at gun point, and, when further objections were raised, those complaining—both management and technical staff—were also shot. Elsewhere on HQ there were riots, and our labs ended up sealed and running under emergency power, with those waiting to be transported bivouacking in our auditorium, administrative offices, and storage facilities."

I nodded, feeling a sudden, almost overwhelming, urge to be away from here, away from these people, back in my desert home with Ly'is, under the stars and moons. "What about the memory problem? And what is this about inclusions in the matrix?"

"Amnesia had been designed into the initial scanning process by RJR's psychologists for two reasons," said Viggen. "First, they felt the subjects would have a better chance for survival without memories of their past. Second, they wanted to study how humans would react when awakening in a wilderness without memories or language, and what types of societies they would form to deal with the situation. But this option could be turned off, and experimental training modules had been devised to help deal with transportation. Both were, of course, made available to those being transported from HQ."

"You can observe what is happening on PDU-1?" I asked, repulsed. The oracles were bad enough, even with their limited abilities.

"Not directly," said V-Kay. "What we have is a simple utility that massages and formats raw data from the logs after stripping out personal UIDs, much like those merchants use to track trends on their marketing and sales sites. This was all we could get permission to use because of the privacy laws, which were extended to all *New Frontiers* worlds, including PDU-1, to enable us to legally accept certain grants. The privacy advocates were so insistent on this that it ended up being included in the Primary Imperatives." He paused, then gestured to Morgan. "As to inclusions, that is Morgan's province."

Morgan shrugged. "Members of the Unix community are often rebels, nonconformists living on the outer fringes of the dominant culture and tolerated only because of their knowledge and skills. Sun has always provided a refuge for these types, with the hackers working behind the scenes and the suits working in the front office, and both cultures have prospered as a result.

"It was no different with PDU-1, and while RJR and HQ were willing to tolerate us during the life of the project, we knew that once our services were no longer required we would be returned to Earth. Our options were either the crowded, polluted, crime-infested planet of our birth, or, if we got lucky and found a local job, the highly regimented, movement-restricted, security-obsessed life on HQ. But whatever it was, we would no longer be part of the most interesting scientific project since humanity's first steps into space.

"As the project advanced, we began to realize we had created a nice little world in PDU-1, and some of us, being virtual-reality addicts during our off-hours, began to wonder what life might be like inside our creation. Bear in mind that at the time most of us were quite young, and beyond Unix and VR we saw little future in the 'real world.' As far as we were concerned, it was a dead end."

Morgan paused, glanced at the admin, then continued. "This thought began to obsess us more and more as the years passed, and then one night Security made an unexpected raid on our quarters, caught a couple of the junior programmers with drugs and illegal VR modules, and deported them to Earth to stand trial. At this point we quietly petitioned Sun to let us prepare a terminal inside PDU-1's matrix in case some day we would need to go inside and fine-tune the program. Don't forget that because of the privacy laws, our understanding of what was going on inside the matrix was limited to broad trends.

"Sun authorized us to make this modification provided it could be done safely, so a small team from my department set to work. The problem was more difficult than it would appear on the surface, because PDU-1's VR matrix has a very strict structure and nothing can be done inside it that violates its internal rule set. We finally found a way around this problem through the addition of inclusions to its structural definition, though using them is both tricky and dangerous because of the possible instabilities that can result."

"Interesting," I said, thinking back to some VR training modules that had been part of my education on Earth. "It sounds much like the way one would deal with an industrial-strength SGML DTD that didn't quite meet current requirements. Modify its basic structure so it would accept the added elements and attributes needed for the job at hand. Is this what you did here?"

Morgan nodded. "Basically, yes. PDU-1's matrix and SGML operate under similar principles, at least in regard to their structural rules. Inclusions are, technically, items that do not belong in the matrix because they did not evolve there, but are able to exist as long as they do not violate the laws of physics." He paused for a moment, as if wondering whether to continue, then shrugged. "To create an object inside the matrix, it must first be described in detail down to the molecular level, then sources for the raw materials inside the matrix must be located and specified that, when they are extracted, will not cause local instabilities. Once that has been done, the inclusion is ready to be formally declared, validated, and generated. To simplify this, we wrote a utility that automates the process, requiring only the `include` command, followed by the inclusion's file name and destination coordinates." He paused, unexpectedly giving me a boyish grin, the first real humor I had seen in him. "In this way we were able, *as if by magic*, to create a camouflaged electrosteel terminal room inside PDU-1's matrix, complete with three functioning terminals."

I grinned back, catching his reference, long a part of hacker lore, once again sharing a brief moment of rapport with him. *As if by magic*. And I once again cautioned myself that it was dangerous to get to liking any of these people, under the present circumstances. "I suppose you had the foresight to upload a fairly complete library?"

He nodded, starting to enjoy the discussion, his team's hack obviously a matter of pride with him. "Yes. The William Henry Gates III Memorial—"

V-Kay raised his hand. "I don't think you need to get so technical," he said to Morgan. "She isn't going to need any of this information to perform her job. Let's move on with the briefing." He signaled to Viggen to continue.

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Viggen nodded to V-Kay, getting the message: no more technical details. Turned to me, said, "The first through, a team of programmers led by Morgan, were set upon by naturalborn marauders, and all were killed except for him and Peters, who, naked and without weapons, managed to escape into the woods."

"Into the woods?" I said, surprised. "Why weren't they released in the terminal room?"

"Good question," said Morgan. He grinned at V-Kay. "Dare I tell her about your unbelievable incompetence?"

"It was just a typo," said V-Kay. "Two numbers transposed. You know we were under an enormous amount of stress. Security had just killed Laguna and O'Reilly for moving too slowly and were screaming at us to hurry if we didn't want to be next."

"Sure," said Morgan. "Had Peters and I not escaped and made it to the terminal room, the rest of you would have ended up fifty kilometers from our base and no doubt been massacred too." He turned to me with a sour grin. "I do know, from bitter personal experience, how PDU-1 treats newcomers, especially males."

I nodded, once again sharing empathy with him, respecting the resourcefulness and courage it had taken for them to survive.

Morgan stared at V-Kay, said deliberately, "RJR's psychologists had demanded control over the release points and sequence of those being uploaded because of conditions attached to their grants, so provision had been made within the file headers for the necessary instructions. This served us well during the exodus, for we were able to give release priority to our initial team of twenty-four programmers, and specify that they be released inside the terminal room. However, because of the *typo*, four of the six who managed to survive transportation were hunted down and killed within hours of their arrival in the matrix. Fortunately, the biometric control on the entrance—which had been a last-minute-emergency hack, sent in the blind—worked, and we fell through the door just seconds ahead of our pursuers, which then closed behind us. The last they saw of us was Peters giving them the traditional salute, then the terminal room vanished from their minds leaving only an empty clearing with a large rock in its center. That, and the wind whispering in the trees."

I smiled, liking the image, said, "There is more to it, of course."

"Of course," Morgan said, as V-Kay started to raise his hand, then, looking at Morgan's eyes, changed his mind. "The camouflage for the terminal room was, in itself, an interesting project. We needed something that wouldn't look out of place in natural surroundings, so we designed its exterior to appear, on casual inspection, to be just a large, weathered rock, a miniature butte. But we also realized that, over time, its true nature would become apparent, especially to the locals, and then problems would develop. So we got together with one of RJR's psychologists, a brilliant psychometrician who was having an affair with one of our senior programmers, and with his help devised a neat little hack, strictly illegal: whenever anyone began to wonder about the butte, or why it, a geological oddity, was in that particular location, a very minor part of their thoughts would be redirected to `write-only` memory and they would simply forget what they had been thinking about. The effect is much like when you have somebody's name on the tip of your tongue but can't quite remember it."

"Interesting," I said, gazing at him, thinking through what he had said, the various options that would have been available. "`write-only`. I assume the reason you didn't use the more traditional `/dev/null` was because access to those thoughts and short-term memories are required in order to use the terminal room."

V-Kay started to raise his hand once again, obviously getting nervous.

Morgan turned to V-Kay, said, "If she agrees to undertake our mission, she will need to have enough knowledge to enable her to complete it successfully. If she refuses, nothing else will matter."

V-Kay nodded, reluctantly. And once again that look flashed across the admin's face which gave me cause for additional caution.

Morgan turned back to me, said, "You are correct. With `/dev/null` the thoughts would be lost forever. However, with `write-only`, they remain in accessible memory, which can be toggled to `read-write` when required."

I nodded. "I suppose you also have `write-only` protecting your stronghold?"

Morgan grinned. "Of course. It is one of our main protections."

I stared thoughtfully at him, beginning to see the shadow of an outline in the pattern of his hacks, their style. "Then you had to have toggled `write-only` for me prior to my arrival here. Otherwise, I would not be able to discuss this matter with you, or even sit in this room. How was this done?"

"You're getting ahead of the briefing," V-Kay said, finally losing patience. "Viggen, please continue."

• • •

I felt something wet and muddy touch my face, and in the cautious way of the warrior, not moving, I carefully opened my eyes to find it late afternoon and a bulky, unfamiliar type of animal standing over me. Behind it were three of its friends, and from my distant childhood on Earth came the memory of an illustrated article I had once seen on the net. My visitors appeared to be collared peccaries, also known as javelina, a long-extinct animal of the deserts and tropics far to the south. Weighing about twenty-three kilos and generally timid, it was said they could, if threatened, turn ferocious and become extremely dangerous. Looking at their powerful jaws and long tusks as they stood there quietly watching me, I could well believe it.

I carefully sat up, and when I did the lead javelina danced back a few paces, still looking at me, and I noticed a deep tear in its left ear, a wound from some long-forgotten fight. Its dark, expressive eyes had extraordinarily long lashes, and its dainty hooves, the way it moved them, seemed in marked contrast to its powerful, stocky body. Somehow, I found them very attractive.

Finding myself hungry, and in a strange way comforted by their presence, I reached into my quiver-pack and removed the last of the food the Sages had given me. Tearing off a piece of one of the moose sandwiches, I offered it to Split-Ear. He gently took it from my hand, and, because his friends were more timid than he and did not want to approach as closely, I tossed their share to them, and in companionship we finished off what food I had left. Then, having learned my lesson and feeling the first faint traces of da'ahta returning, I cut off a piece of sy'ahta root and began to chew it. Split-Ear put his nose to what I had left in my hand, gave a disgusted snort, and he and his friends returned to the ravine from which they had come.

I sat there, chewing the sy'ahta and watching the sun setting on the snow-capped mountains across the water, the many changes of hue as they moved through different shades of red and orange, wondering what evolutionary changes had taken place that allowed the javelina to survive so far north of their original range. And how they had managed to come to the Sages' island, so distant from the mainland.

A lot of mysteries. A lot left unexplained. A lot glossed over. Like parts of Viggen's briefing describing how, during the first twenty-seven years of their settlement, the refugees from HQ had split into three competing groups battling over land, resources, and power. Eventually the struggle had degenerated into random acts of violence, and some of the junior programmers—tired of waiting for promotions that never came and the mundane work that kept the Sages' community going—had turned rogue and secretly begun work on a miniature antimatter device for the president of the World Council, now the aging leader of their largest political party. Shortly thereafter, when Morgan, during a routine review of the logs, noticed a minor discrepancy in one of them and started to investigate, he was summarily arrested, along with Peters and the other surviving members of the original team from RJR, and imprisoned. It was only their standing in the community as the creators of PDU-1 that prevented the president from having them executed. Instead, as a pre-election gesture, they were exiled to the Arctic and the doorway leading to their stronghold permanently closed.

"So it was the power struggle within your community, combined with the demand for luxuries, that started you down the same old path once again?" I had said.

“Yes,” said Viggen. “The demand for cars, trucks, heavy farm equipment, Tri-Ds capable of accessing the Entertainment and Games Section of the Gates Library, and numerous consumer items like they were used to on HQ was a raging issue fanned by the politicians, and the public couldn’t understand the technical reasons why they couldn’t have them.”

“Which were?” I said.

Morgan shrugged. “Computational cycles and instabilities. PDU-1 requires a certain amount of processing power and memory to maintain the matrix, and every time a new inclusion is created it puts a heavy drain on the system. This drain, combined with the instabilities caused by widespread removal of natural resources to support the inclusion, markedly increases the possibility of the matrix crashing. The system was running at its current limits, and I felt the risk was just too high to take for trivial reasons.”

“Political stability is not trivial,” said the admin.

Morgan looked at her. “They had a fresh new world in which to build their lives. Clean air, good land, low population density. On top of that, we were producing for them medicines, tools, personal weapons, clothes, and PCs. Further, we were maintaining the access doorways connecting the programmers’ homes in each of our towns to the terminal room so they wouldn’t have to cross the river by boat every time they reported for work. In my opinion, this was more than enough. It was, after all, far more than what the rest of PDU-1’s population had.”

The admin’s eyes passed coldly over me. “They weren’t savages,” she said to Morgan. “They were civilized people and felt entitled to these things. By not giving them what they wanted, you drove them into the camp of that maniac, and we ended up with another war.”

“It wasn’t a war,” said Viggen. “It was an assassination attempt.”

“Pardon me,” I said, “but I seem to have missed something here. Where did all these people come from? You had only two weeks to transport the refugees from HQ, and of those there was only a twenty-three percent success rate.”

Morgan shrugged. “The math is simple, though the job—done at gunpoint in an environment of mass hysteria—was ugly. We were able to cruft together forty-seven scanning stations out of spare parts in the labs, each of which enabled us to scan approximately one person per hour on an assembly-line basis, so we were able to transport almost 13,600 refugees. Out of these, 3,169 survived. During the twenty-seven years they lived in the matrix, they concentrated on having children, and their children had children, so by the time they exiled us to the Arctic, their population, spread over three towns and several outlying farms, was not only fairly large, but growing rapidly.” He paused, then added, “I even configured the release controls on the population kluge to favor their community.”

I nodded, sensing he had never felt himself a part of their community, any more than he had felt a part of the dominant culture on Earth or HQ. "Since Transported Ones, as far as I know, are unable to have children, I assume these events occurred prior to whatever made us sterile. Or is sterility just restricted to warriors?"

"Yes and no," said Morgan. "Yes, these events happened prior to what made us sterile. And no, sterility is not restricted just to warriors, it affects all those currently in the `trn` group. It was an unplanned consequence of the immortality program." He paused for a moment, gazing at me, then continued. "About a year after we arrived in the matrix, the president of the World Council summoned me to his office and ordered me to find a way to make the members of our community immortal. Since this concept, along with various ways to solve the problem, had been in the back of my mind for some time, I accepted the assignment and set to work. Unfortunately, because of the other demands on my time, I wasn't able to complete the code until—"

"You just didn't want to give it to them!" said the admin. "Just like you didn't want our children to be able to use the terminal room. That's why you made it so only those in the `trn` group could have `write-only` toggled to `read-write`! You didn't think they were worthy!"

"Of course he did," said V-Kay, soothingly. "The president made it clear that we would be released from exile and all charges dropped once the code had been turned over to him. We all wanted to get back to our homes and families, just like you. And we would have, had it not been for the assassination attempt." He turned to me, said, "She lost her husband and three children in the explosion."

"Was this the explosion that created Lake Da'Kal? If so, I would hardly consider a weapon that unselective an appropriate choice for an assassination."

"The president's programmers just made an error, like the typo I made," said V-Kay. "Instead of annihilating half of one town along with its leader because they declared independence, the device wiped out everything except the terminal room. Nobody had ever made an antimatter weapon before, and they got their first try wrong."

I saw something shift within Morgan's eyes when V-Kay said typo, and in that instant I *knew*. This *politician*, the president of the World Council, whose actions had led to the destruction of both Earth and HQ, had then gained control of the terminal room and could, stupidly, in his blind pursuit of power, destroy the matrix and all who lived within it. I looked at Morgan, and once again something passed between us, a rapport, and I very slightly nodded my understanding and approval, as a Donda warrior, of what he had done. Had I been in his place, I would have done the same. Without the slightest hesitation.

• • •

“The first we knew that something had happened,” said Viggen, “was when the doorway, locked to us, suddenly opened and two of the rogue programmers, McCain and Singh, stumbled into our midst, hysterical and in shock. We couldn’t get a coherent report out of them until after they had been strongly sedated for several days, and even then it had so many gaps and contradictions that we didn’t really learn the details until long after, when we had a chance to review the logs.

“They were on the night shift, producing advanced weapons for the new militia, when the encrypted signal from the president arrived. PRIORITY RED, PLAN D. They double-checked the signal, then together unlocked the PLAN D script as required by regulations and waited for the second signal. After a slight delay, it arrived, and they ran the script. Almost immediately they realized something had gone badly wrong when they felt the shock wave through the electrosteel of the terminal room, and the terminals went blank, cutting them off from both the outside world and PDU-1. Trying the main entrance, they found it inoperative, and the doorways into the three towns gave warning alerts. There was no place else to go except here for help, so that is what they did.”

“What happened to them next?” I said.

“It’s interesting you asked,” said Morgan dryly. He turned to the admin. “Would you care to explain how ‘civilization’ dropped off most of us like the flimsy mask it is, revealing the bestial lynch mob lurking underneath?”

“You just used that as an excuse for your next interference in our free will,” said the admin. “Just as you did with `write-only`. They were only trying to assign blame, which under the circumstances was entirely normal.”

“We got immortality in return,” said Jorgensen, breaking a long silence. “I feel that was a good trade. And, as you well know, MAD is not at all like `write-only`, for it doesn’t operate on our personal files.”

“Not to mention,” said Peters, with a grin much like Morgan’s, “that it has a long historical tradition behind it.”

“MAD?” I asked, remembering both their odd fear when the admin had made her mistake, and my astonishment at V-Kay and Morgan openly feuding in my presence.

“It’s just an agreement between us,” said V-Kay. “It has nothing to do with anybody else.” He signaled Viggen to continue.

• • •

“The next few years were very difficult for us,” Viggen said. “Of the original 3,169 emigrants from HQ, there were now only 311 of us left, ranging in age from the junior programmers who were now in their early fifties to those of us from the program’s first days who were now in our mid-nineties. Authority had broken down, and we had a fairly serious mini-rebellion on our hands, complete with the settling of old scores, which was only soothed by our agreeing to a set of demands. These included immortality for everyone just as soon as Morgan got the terminals working again, the restoration of our youth as soon as the code could be written, and serious help in creating the items needed to rebuild our society back to its previous level.”

“And MAD was part of this agreement?” I said.

“Yes,” said Viggen. “This idiotic political infighting, which had become such a part of our society over the years since we arrived in the matrix, had to stop, and immortality was the only inducement powerful enough to get the various cliques to let old grudges and rivalries go and start working together again. MAD was, of course, the force binding our agreement, but, as V-Kay noted, it only applies to us, nobody else.”

“So what happened after they received immortality and discovered it made them sterile?”

“The problem didn’t surface until after some time had passed,” said Viggen. “Then, when it did, Wong—who served as our medical technician—applied her skills full-time to solving it. Many of the women had opted for delayed puberty/menopause on HQ, as was the fashion, and had continued the treatment here, so age wasn’t a factor. When tests showed that, biologically, everything was in order, suspicion naturally focused on the immortality code, along with considerable anger directed toward Morgan and Peters, who, it was felt, hadn’t debugged it properly.”

“More assigning of blame, eh?” I said. “As if immortality wasn’t gift enough.”

Viggen shrugged. “RJR was a bureaucracy. These people were, mostly, rank and file. It was just their way.”

“I suppose you tried cloning next?”

Viggen got a sour look. “We couldn’t.” He gestured to Morgan.

Morgan grinned at me. “It’s another of those inconvenient human rights things. RJR included in the Primary Imperatives a ban on both cloning and the use of commands like `cp`, `rm`, and `destroy` on individuals living within the matrix so the project could qualify for certain humanitarian grants.”

“Wise,” I said, thinking about the president of the World Council. “But why didn’t you just change the Imperatives if they interfered with what you wanted to do? After all, the need for grants is now long past.”

“We can’t. They’re part of the security system. PDU-1 has a dual-kernel OS protected by Type Enforcement. Before anyone can make modifications to the Imperatives they have to reboot the system from its operational kernel to its administrative kernel, which shuts down not only the VR-module, but all contact with the outside world. Because of this, changes to the Imperatives have to be made from the console that resides in the maintenance bay’s pressurized Operations Center.” He grinned at me again. “Since we no longer exist in what many are pleased to call the Real World, we obviously can’t use it.”

“Then there *are* limits on what can be done in the matrix,” I said.

“Sure,” said Morgan. “Some. Space travel. Certain biochemical reactions. The matrix is not perfect, after all. But it is close enough, and life can be good here. Very good. When you think about it, of all that has transpired since our birth, our strange history, there is no question but out of our contemporaries on both Earth and HQ, we are the lucky ones.”

• • •

There was an odd, uncomfortable silence after Morgan finished speaking, almost as if what he said had been directed not to me, but, with hidden meaning, to someone else, perhaps one of the other Sages. Then Viggen looked at V-Kay, a question in his eyes, and V-Kay, expression grim, looked at me, then Morgan. Morgan shrugged. “She has to know,” he said. “The stakes are too high, and we need her voluntary cooperation.”

Jorgensen and Peters both nodded their agreement with Morgan, and once again I saw that look pass across the admin’s face. V-Kay, seeing it too, nodded slightly to her, making his decision, and gestured to Viggen to continue with the briefing.

“During the period these events were taking place,” Viggen said, “Morgan and Peters had been working around the clock on the code to restore our youth. This job took several years, but with the improved health and added energy that were side effects of the immortality code, progress was rapid and finally the program was completed, debugged, and installed. But the instant they tried to run it, doorway fields materialized around their terminal couches and they found themselves forcibly returned to our Arctic stronghold.” He paused, giving me a hard look, then continued. “When they tried to return to the terminal room to troubleshoot the program, they found themselves locked out, and every attempt since then to access the terminals or enter the terminal room has been met with `Permission denied`.”

`Permission denied?`

I felt a chill rush over me at the implications, the sudden realization that without terminal access their legendary powers were now no more than that, a shadow of the distant past. Yet, as I looked at them, at their advanced physiological age, at V-Kay's and Viggen's grimness, the icy fury on the admin's face, a cold caution gripped me, tempering my sudden surge of relief, whispering, be careful, for you still do not have the full story, still do not know what their problem is, how far it extends. So gently, perhaps even sympathetically, not envying them their situation, still sensing danger but at the moment only to myself, undercurrents I did not understand, I said, "What went wrong?"

Morgan gave me an odd look, a weird mixture of chagrin and pride. "PDU-1 interpreted the code as an attack on the integrity of its systems, an attempt to violate causality, decided we were becoming a danger to its internal stability, and revoked our terminal and `root` privileges."

Another chill ran over me. "PDU-1 *decided?* Are you saying PDU-1 has become self-aware and is now able to act on its own? Without having a base core of human memories? Or the underlying biological processes?"

Morgan nodded. "While the general feeling in the Computer Science community has long been that the 'strong AI problem' was unsolvable except within the specialized environment of a VR matrix based on human uploads, it now turns out they were wrong. Apparently it is possible for *some* self-correcting systems, once they pass a certain level of complexity, to achieve self-awareness. Shortly after its upgrade to 0.97p63, PDU-1, unknown to us, began to consciously monitor and administer its many subsystems. Bear in mind that it had been designed to be self-learning and self-maintaining, so while the changes it was making to its internal subprograms were unexpectedly sophisticated and powerful, they were not totally unexpected. What was unexpected was their surprising elegance and subtlety—its code is absolutely beautiful, almost like music. Unfortunately, being preoccupied with more pressing matters and not expecting this turn of events, we did not give these changes the close inspection they deserved until it was too late."

I nodded, remembering that it was after PDU-1's upgrade to 0.97p63 that the mass uploads began. "I would like one day to inspect some of its code. But what do you mean by 'violate causality'?"

"Apparently PDU-1 felt we were trying to make time run backward in the matrix when we ordered it to restore our youth. Viewing it from that perspective, we presented it with an unsolvable problem because the Butterfly Effect operates here as well as in the universe at large, and chaos rules. That is why, in fact, the matrix is able to continue evolving, and why we exist."

I nodded again, having nothing to say.

Morgan gazed into the distance, thinking of errors made, paths not taken, said, “This is where you come in. PDU-1 has placed us on an Access Control List that prevents us from logging into its terminals or even entering the terminal room, and it is critical that we get in touch with it. Its future survival depends on its receiving certain information that at the time of its construction was deemed not important enough to place in its operational database. You are not on that list, and from your background on Earth—combined with what we have learned about you during this briefing—we believe you have the basic knowledge and skills needed, once given a little training, to operate PDU-1’s terminals. Because of this, and the critical nature of the situation, we have no other option but to turn this problem over to you.”

I looked at them, thinking it was far better for the Donda, for the matrix, for PDU-1 that the terminal room remained abandoned, locked against all access, its true purpose forgotten, until the heat death of the universe. And I knew they were aware of my feelings, that it could not be otherwise. Yet they had brought me here, restored my memories of Earth, revealed the true nature of our world, admitted their loss of power, were even offering me terminal access, so they had to have good cause to feel I would override my feelings, undertake their mission, even though it would probably cost me my life. This removed the last faint residue of relief I had been feeling, for I now realized Jorgensen’s threats when first we met had not been what they seemed, then or later, but other. So I said to Morgan, to the Sages in general, keeping my options open, “Please explain.”

• • •

“While it was unfortunate for us that PDU-1 achieved consciousness when it did,” said Viggen, “it is only fair to acknowledge that, by focusing deeply inward, it has managed to control the matrix very well over all the years of its existence. Certainly it is questionable whether we, as humans with our short lives and even shorter attention spans, could have done as well. But this focusing inward, this single-minded preoccupation with its internal processes, though one of PDU-1’s greatest strengths and probably necessary for our survival, is also its weakness, its Achilles’ heel, and in the end may cause its, and our, death.”

He paused, looking at me with a seriousness I had not seen in him before. “The problem is the same one that has plagued us from the beginning—the discrepancy between internal and external time. For although just under 9,000 years have passed inside the matrix since we emigrated from HQ, and slightly over 800 years have passed since you were released from storage into the general population, close to four billion years have passed outside, in the solar system.”

I stared at him, unable to hide my shock, and he nodded. “Yes. Our home star is now approaching the end of its hydrogen-burning phase and is about to enter its helium-burning phase. When this occurs, its outer atmosphere will expand out past the orbit of Earth, perhaps even as far as

Mars, as it settles into its red giant phase, and while the changed environment in our orbit will not damage PDU-1 because of its electrosteel exterior, it will not be able to open the doors of its maintenance bay. Because of this, its mining craft will be unable to obtain supplies from the asteroid belt or Jupiter's Galilean satellites." He paused again, staring at me, added, "As best we can determine, PDU-1 is totally unaware of what is about to happen, and will remain so until it is too late."

"Unless I can update its operational database," I said.

He nodded. "Yes. You're our only chance now. And our calculations indicate we only have fifty-four internal days left before helium-burning commences."

Part IV

Fifty-two days...

Whooo.

Moving quietly, in the way of the warrior, I followed the creek bed up the ravine from whence Split-Ear and his friends had come, the dark shadows of the thick brush dimly visible through the fog, the light of the moons creating a soft luminance that steadily increased the higher I got. Then I broke out of the fog into the night sky and carefully made my way up a steep, brush-covered incline to what seemed from below to be a sort of rocky knoll. Topping the crest into the sudden openness, the unexpected beauty of the view caused all other thoughts to momentarily flee my mind. Just below lay a vast rippling sea of white spreading all the way to the distant mainland where snow-capped peaks climbed into the sky. Above were the stars, almost washed out by the light of the setting moons, and to the north, pale shimmering green curtains danced across the sky, the aurora borealis, companion of my youth. Yet...there was something wrong here, something about the sky, something...different, unexpected. It wasn't the same at the Sages' island as the sky of my childhood village, though it should be, for they were only about fifteen degrees apart... How...

Then I had it. And realized how fatigued I was, how strongly the stress was getting to me. For naturally the sky, the positions of the constellations, were not what I remembered. After all, no matter how similar, this was not the world of my birth, and the stars, the calendar they represented on Earth, could not help me here. And it seemed that, for a few milliseconds as the difference registered but before the chilling realization hit that I did not know what the epoch had been at the time the Sages emigrated from HQ, a spark of hope had briefly flared that I might use the stars' present position as a rough cross-check of what Viggen had said regarding internal time. Confirm at least one small detail of their story beyond the basic nature of PDU-1 and our immortality: that, in fact, 9,000 years had passed since they arrived here. For what, in effect, they were asking is that I accept their briefing, the chain of events as they described them, along with their assertion that our home star was about to begin its helium-burning phase, on faith. Without external corroboration. Then act on it.

On faith.

Accept what in essence was a suicide mission. And, far worse, by accepting a bracelet, the biometric interface necessary for logging into PDU-1, along with the Sages' training and the update for the database, take the risk that, by my actions, I might in some way provide the means for them to regain `root` access to the terminal. Turn them loose once again upon our world.

Or, do nothing, and risk the death of PDU-1, the death of all that is left of humanity. Both those alive today, and future generations yet unborn.

Whooo.

Fifty-two days...

• • •

I looked at Morgan. "You mentioned that the ACL prevents you from both entering the terminal room *and* logging into PDU-1's terminals. I assume by this you mean via either a doorway or through remote login from your stronghold. Yet there is a third method—the biometric control on the entrance you and Peters used when first arriving in the matrix. Dangerous as entering Eos in the normal way would be, have you tried the land route?"

V-Kay looked at Wong, then Jorgensen, nodded.

Jorgensen turned to me. "Eighteen years ago Wong and I went from here to the clearing in Donda Territory via the doorway, and from there by foot to Port Da'Kal. In Port Da'Kal we hired passage on one of Hi'Kon of A'Lan's ships, which took us as far as Torac. From Torac we traveled with the slaver En'Tah to Eos. It was during the *Pilgrimage of E'lat*, and once in Eos we were able to join the crowd paying their respects to the Temple, and, with the others, kiss the sacred base of the altar. Which, of course, is our camouflaged terminal room."

I nodded, having recognized that irony when Morgan first described `write-only` to me. There was nothing else that could explain the superstitious awe and fear in which the altar was held by the local population. Or why the Circle-of-Being chose to build their altar on top of a certain large, indestructible rock that, legend claimed, contained the soul of the Universe.

"You must have had an interesting trip," I said, looking at Wong with new interest, reminded once again that the Sages were willing to take serious risks to achieve their goals. The price that she, as a woman, would have had to pay had she been caught inside the Temple was well known. The Circle-of-Being held that women were dirty, inferior creatures without a soul, and they were not allowed, under pain of death by public torture, to besoil the holy shrine. “But why didn’t you just open a doorway near Eos? That would have reduced the risk considerably—especially for Wong, since she would have had to travel disguised as a man and, in the crowded confines of a ship, the chance of discovery would have been high.”

Jorgensen glanced at the admin, then suddenly grinned, somehow reminding me of our journey from the home tents of the Donda to the clearing. “It *was* an interesting trip, in both directions, and a nice change of pace from my normal routine. But Morgan will have to provide the technical details about our problems with the doorway.”

Morgan shrugged. “When we lost terminal access, we also lost the ability to define new coordinates for the doorway’s database. This restricts us to those access-points that were not only valid during its last update, but can still pass the environmental tests at the time of use.”

I nodded, remembering the warning alerts McCain and Singh had received after running the antimatter script.

“Running a search on the database, we found two access-points in the general vicinity of Eos, one close and one distant, that, though defined years ago, were still safe to use.” He grinned at me. “That is, safe technically. Socially, they each had a couple of minor drawbacks. The main problem with the close one, in Z’Hann Territory, was the Z’Hann’s unfortunate habit of killing male strangers on sight. That left the distant one, in Donda Territory, as our only alternative. On balance, which access-point posed the least risk turned out to be a tough question, but after days of heated debate we finally decided the odds favored the one in Donda Territory, primarily because the Donda are, by and large, considered slightly more sane than the Z’Hann and therefore slightly less likely to shoot first and ask questions later.”

I returned his grin. “Thank you,” I murmured. “But I can well see the Z’Hann’s point.”

“True,” he said, and I could tell he too was thinking about the reception we each had received from the naturalborn when first entering PDU-1.

“They were both almost *killed!*” the admin said harshly, breaking her long silence. “If it hadn’t been for Wong having her medical kit along and being able to administer field conditioning to each of those thugs whose ships—”

Wong spoke for the first time, in a quiet, precise voice. “Perhaps it turned out for the best,” she said to the admin. “The Donda might be able to utilize the conditioning of those two men if she travels the same route and finds she needs their assistance. After all, she too will have to enter Eos in disguise.” She shifted her gaze to me, a strange, almost detached look in her eyes, much as if I were an object of vague interest under a bioscan, said, “I will explain how to activate their conditioning and under what circumstances it may be used when I configure your bracelet and install the mental block you will need for protection against the oracles.”

• • •

I shuddered slightly in the damp breeze that came with dawn, thinking about the oracles. Their powers, like ours, came from an ability to exploit the an’tala bug, but instead of using them to bond with a different life-form for the purpose of survival, they used them for political control.

Unlike the Donda and Z’Hann, the oracles were few in number, for their talent was more rare than ours and took many years to develop. But their lack of numbers, as far as the rulers of Eos, Port Da’Kal, and A’Kon were concerned, was more than compensated for by the sheer strength of their powers. These powers, with a range of approximately two passages, made the oracles a serious threat to those who lived within their reach because they were able, once in their trance, to monitor what they called *ripples in the loom of existence*—the general location, moods, and scattered thoughts of isolated individuals. In addition to this, a few of the more powerful oracles were able to perform what they called a *deep-probe*. Under certain circumstances, usually after making direct physical contact with a prisoner who had been weakened by intense, prolonged torture, they could probe that person’s mind, stripping it to its core. This invariably resulted in the destruction of the prisoner’s mind, which the Toh’a, though not the Ka’Don, would then put to political use, chaining his victim to a post in the central square, drooling and babbling, as an object lesson to others.

However, because of the range limitation, the oracles rarely attempted to monitor either the lands of the Donda or the Z’Hann, for seeking wispy shadows drifting across vast landscapes, shadows so dreamlike they may or may not even be there, was for the most part a fruitless endeavor. At best all they could extract from us was a possible guess at position, a slight alteration in the background noise that was so subtle it was almost useless. And that only if one of the three city-states managed to get an oracle fairly close to where we might be, for in the desert the telepathic barrier the diaks erected to prevent cross talk between the various diak/warrior dyads protected us in spite of the distinctive signature of our an’tala-trained and addicted minds.

Perhaps partly because we made such frustrating targets, it was the naturalborn who eventually became the oracles’ prey. Over time their duties had evolved into the supervision of intricate intelligence operations between the city-states, the maintenance of internal security for the rulers and priests, the interrogation of prisoners, and the manipulation of religious superstitions in Eos and A’Kon, along with public opinion in secular Port Da’Kal—all matters that rarely had occasion to affect us directly. Unless we tried to enter one of their communities.

This was the reason why, were I to undertake the Sages' mission, I would have to permit Wong to set within my mind the same block they themselves used—so I could not only enter Eos undetected by the Toh'a's oracle, but as well, if captured, resist interrogation by either physical torture or deep-probe. For although a warrior, once separated from her diak, was vulnerable to an oracle's powers, that wasn't the case with the Sages. From them an oracle could only receive a blank, a nothingness. Yet that too could be a hazard, a potential giveaway, if the Sages were accompanied by naturalborn individuals or warriors, because of the personal interactions between protected and unprotected minds that, during the oracles' random surveillance of the loom, could strike a wrong note, since they were occurring between what the oracles saw as normal and null areas.

Because of this I was surprised that Jorgensen and Wong had made it to the Temple undetected, yet perhaps it was because their visit was totally unexpected after so many thousands of years had passed, and the oracles—they themselves mortal—weren't focusing in that direction. Sensing the faint but distinctive shadow of a warrior behind the barrier of her diak, something they were trained to detect, was one thing; sensing a total blank in a crowd when not actually looking for it and never having personally experienced it was another.

"So what happened after you reached the altar?" I asked Jorgensen.

Jorgensen shrugged. "We had hopes the emergency biometric control on the terminal room's physical entrance might still be working, but it wasn't. We did obtain one valuable item of information, though, and that was that the regular lock—the one you would use—was still operating, for when, while kissing the base of the altar, we tried to activate it, we got a `Permission denied` response. This confirmed what we had suspected all along—that our problem was one of permissions, that our UIDs had been placed on an Access Control List. But we had to try."

I nodded, having finally arrived at my real question, the purpose behind my asking them if they had tried the land route. "What would you have done if you had gained admittance? Since the ACL also controls login?"

Jorgensen hesitated slightly, then said, "We had a special tool Morgan and Peters put together that would, during a login attempt, have attracted PDU-1's attention, and by issuing a warning, directed it toward the relevant section in the Gates Library. Not as good as updating its operational database, but..." He shrugged again.

I nodded again, having detected the odd, uncomfortable note in his voice I had been half-expecting. I was getting to know him fairly well by now, his inherent straightforwardness and honesty, his underlying decency. Lying did not come easy to him, even under conditions such as these. Finally those subtle undercurrents that had been bothering me, undercurrents that whispered warnings of dangers beyond the obvious, of a hidden agenda, were beginning to resolve, show their outlines, though still faint, indistinct. And, floating to the surface of my mind, perhaps as a form of half-conscious confirmation regarding suspicions that had slowly been growing for some time, suspicions based in part on the pattern of Morgan's hacks, their style, came the words *Trojan horse* and *social engineering*. Timeworn cracker techniques on Earth. Yet those ancient tools could be double-edged. Turned against their users. If one were prepared.

"This was the point, then, where you realized you had run out of internal options and had to risk an outsider?"

"Yes. We spent the next eighteen years researching alternate solutions, but finally had to admit our only hope lay in bringing in one of RJR's 'customers,' for they are the only ones for whom we can turn off `write-only`, and therefore the only ones who stand a chance of gaining access to the terminal room. This meant one of the Donda or Z'Hann. Out of them, you were the one we selected, not only because of your technical skills—which are actually more advanced than your dossier reported—but also because our calculations indicate you stand a slightly better chance of reaching the altar alive than the other prospects on our list."

"I am honored," I said dryly. "But I think it is time you explained to me how you are able to toggle `write-only` if you can no longer `su` to `root`, and why immortality was given to everyone in the `trn` group instead of just your inner circle?"

• • •

I became aware I was no longer alone on the knoll, but glancing around I could see nothing unusual. Then there was a slight movement back in the brush behind me, the flick of an ear, and I realized it was Split-Ear or one of his friends. Or rather, what was likely his entire family group, since, now knowing what to look for, I saw there were approximately twenty-five of the javelina just inside the edge of the brush, spanning, as best I could tell, four generations. But they were doing nothing but watching me, some even lying down, the two oldest females nursing their young while standing, two to each litter.

They at least were not hampered by sterility, did not have the admin's anger.

"His sense of guilt backfired on him," she had said, with a withering look at Morgan, "so you ended up sterile too. Just like the rest of your tribe."

I gazed at her, thinking about what she said, about the realities of a warrior's life, how we had to be ready to move at any moment, be prepared to fight for our lives, could not afford the luxury of children or a fixed home, even if we had wanted them—and some of us did, for the evolutionary pressures were every bit as great for us as those the javelina faced. Our numbers were now few in comparison to what they once had been, as time and the incessant attacks from Port Da'Kal and Eos took their toll. And while it was true that over the last few hundred years the rate of attrition had fallen, still it was steady, and eventually, sometime in the future, we would be gone. Yet this pain, this knowledge, had been blunted by our relationships with our diaks, for these relationships, because of an'tala and our addiction, were far closer than a relationship could ever be between a mother and her—

"Yes," Morgan said to me. "There was in the end guilt, and a lot of it. I have never been able to understand our society's obsession with money, power, and violence, the single-minded, take-no-prisoners greed and exploitation that led to the destruction of our home planet. I suppose I am naive, one of those who, like V-Kay said, lives in an Ivory Tower. It is the solving of technical problems that I enjoy, the intellectual challenge, and the more difficult the problem, the greater the need for innovation, for exploring uncharted territories, pushing my mind to its limits, the better I like it. But most of all I like the act of creation, the mental states it generates, the building of new and useful tools. That is why, when the initial contracts for PDU-1 were let by RJR, and Sun called a select group of us in and offered us the opportunity to lead the effort to solve what many felt to be the greatest technical challenge of our—or perhaps any—age, I accepted with alacrity. I had no idea at that early stage how the project would develop, certainly no idea what the politicians and business types and bureaucrats would do with my team's work, the ends to which it would be put, and when I finally woke up and saw what was happening, it was too late. By then I was in too deep and had no choice but to continue with the project if all the lives so far lost were not to be lost in vain."

He paused, giving the admin a hard look though still speaking to me. "So, when the opportunity arose for me to assuage my feelings of guilt and make up in a small way for the part I played in RJR's many abuses, I naturally took it, a simple matter of configuring the immortality code to operate on anyone in the `trn` group, rather than using a configuration file containing only the UIDs of those from HQ who survived the assassination attempt. And in doing this, I well understood I would be 'censured' by the Council, for immortality is a form of power and I was giving it to outsiders, but by then I didn't care about that, just as I didn't care about the bad feeling my action would create among our group. I have, after all, to live with myself, my conscience. Accept my responsibilities toward those I harmed. And, whether you like it or not," he said, now speaking directly to the admin, "you have to acknowledge that, in light of our present circumstances, it is fortunate I chose to do what I did, for otherwise Ryahda would not be here today, and, instead of a slim chance to get our update to PDU-1, there would have been none."

V-Kay raised his hand, palm outward, a gesture of peace, said to the admin and Morgan, “These are old issues that can’t be undone, and it is time to move beyond them. Wasn’t there a question about how we can toggle `write-only` without `root` access?”

A look of understanding passed between the admin and V-Kay; then, giving me a thin smile, she said to Morgan, “Why don’t you tell her, since it seems so important?”

Morgan shrugged, as if distancing himself from something, said, “When PDU-1 revoked our `root` and terminal privileges, it left us access to a number of tools and weapons that we would need for our daily lives, and the ability to toggle `write-only` was one of them. This I could understand and accept, for by its lights it could no longer permit us `root` access; what I couldn’t—still can’t—accept was the perverse, ugly way it did it. It provided me, if you can visualize this within a mental interface, an old-fashioned, consumer-style point-and-click interface from the dark days of the Wintel hegemony, and the damn thing drove me absolutely mad. I tried every way I could think of to get around it, for I knew it had to be running `SUID root`, but it was as brain-dead as all GUI interfaces are. Drove me absolutely mad, and if I didn’t know better, I would swear PDU-1 was having a laugh at my expense.”

• • •

Fifty-one days...

I shivered at the memory, understanding Morgan’s frustration, wondering about the way he seemed to take personally some of PDU-1’s actions, since PDU-1 was just a machine, no matter how advanced, and could not be expected to have human motivations. Its mind had to be totally alien, for its experience, its mental processes, were not based on flesh and blood, and it could not experience either the pains or pleasures of being human. Or animal, either, I thought, as one of the javelinas stepped from the brush and slowly came toward where I sat cross-legged on the ground, stopping a few meters away, and made eye contact.

Fifty-one days...

I stared back at her, a strikingly beautiful young female with white tips to her ears, as she stared at me in wonderment, with a deep curiosity in her eyes, and the thought came that I had been much like her when young, that, though of different species, she and I had much in common. And a name floated into my mind, Lookie, and it was hers, if not by others, then by me.

*Lookie...*and I realized that Split-Ear was her father. There was something about her eyes, the mind behind them, the sense of a probing, stable, intelligence. And suddenly everything fell into place for me, my decision now made, without conscious volition. For I realized that a world that could produce a being like Lookie was without question worth preserving. And that beyond that, they, Lookie and Split-Ear and the rest of their family, their species, deserved their chance at life too, just as did my people, and the diaks, and even the naturalborn, that PDU-1 was a marvelous world, a creation of the highest level of human intellect, almost godlike in its completeness, its integrity, and that whatever the risk might be to me personally to try and preserve it, that risk had to be taken.

Fifty-one days...

I slowly stood, placing my quiver-pack on my back, and Lookie came forward a few steps further, touched my right foot with her nose, then looked up into my eyes again, almost as if asking something.

“I will do the best I can,” I said to her, as well as myself, “for the sake of us all.” And, slowly turning, I nodded farewell to her, to the herd, knowing I would never see them again, for some reason feeling a deep sadness at the thought, and started back down the knoll, into the fog and darkness, feeling their eyes following me, every step I made, until I was out of sight.

Fifty-one days...

A. Author's Note

> The world of the creative "...may differ from that of the ordinary man as the world of the ordinary man differs from that of a dog, in the extent of his contact with reality as well as his superior organization of it."
>
> —J.W.N. Sullivan
> (referring to Beethoven's Late Quartets)

> Tintinnabulation is an area I sometimes wander into when I am searching for answers—in my life, my music, my work. In my dark hours, I have the certain feeling that everything outside this one thing has no meaning. The complex and many-faceted only confuse me, and I must search for unity.
>
> —Arvo Pärt

PDU-1 was written mostly under the influence of music encompassing the period from Dowland through Y'Tan. For those who are interested in such matters, the most relevant pieces were:

Beethoven: Quartet No. 7 in F Major, Op. 59, No. 1 (3rd movement), Vermeer Quartet (Teldec 4509–91495–2); Quartet No. 14 in C-sharp Minor, Op. 131 (1st movement), Vermeer Quartet (Teldec 4509–91496–2); Quartet No. 15 in A Minor, Op. 132 (3rd movement), Vermeer Quartet (Teldec 4509–91496–2).

Buxtehude: Sonate a due pour violon, viole de gambe et basse continue, Op. 1, No. 4, en Si bémol majeur, The Boston Museum Trio (HMA 1901089).

Corelli: Concerto Grossi, Op. 6, No. 7 in D Major (Andante largo); No. 10 in C Major (Preludio: Andante largo); No. 11 in B-flat Major (Preludio: Andante largo), Kuijken, La Petite Band, EMI CDS 7 47919 8; Concerto Grossi, Op. 6, No. 7 in D Major (Andante largo), I Solisti Veneti, Claudio Scimone (Erato ECD 88080).

Dowland, John: Lachrymæ Antiquæ, Kronos Quartet (Nonesuch 79457–2).

Pachelbel, Johann: Canon in D Major, The English Concert, Trevor Pinnock directing from the harpsichord (Archiv 415 518–2).

Pärt, Arvo: Fratres for Violin and Piano, Gidon Kremer, Keith Jarrett (ECM New Series 1275). Fratres for String Orchestra and Percussion, Tapiola Sinfonietta, Jean-Jacques Kantorow, Conductor (Musical Heritage Society 514946A; also available on BIS CD 834).

Purcell, Henry: Fantasia a 4 No. 7 for Viols, Bruggen Concert, Frans Bruggen (Das Alte Werk, Teldec 9031–77608–2); Pavan in B-flat Major, Z 750 for two Violins, Viola da gamba, Leonhardt-Consort, Gustav Leonhart (Das Alte Werk, Teldec 9031–77608–2); Pavan in A Minor, Z 749 for two violins, Viola da gamba, Leonhardt-Consort, Gustav Leonhart (Das Alte Werk, Teldec 9031–77608–2).

Vivaldi: Concerto a due Chori in B-flat Major "Con Violino Discordato," for Strings and Basso Continus (second movement: Andante) (P. 368), I Solisti Veneti, Scimone (Erato CD 2292–45946–2). Concerto in D Major for Lute (RV. 93)(Largo), Fisk, Hand, Schulman, Orchestra of St. Lukes (Musical Heritage Society 513556W).

Y'Tan: Collected Works for Solo Zara: Book XVII, No. 19 (in manuscript only); Collected Works for Zara and Divers Accompaniments: Books III & IV (assorted pieces) (in manuscript only); Collected Works for Chamber Orchestra: Book V, No. 17 in A Minor (in manuscript only); Book XIX, No. 6 in C Major (in manuscript only); Book XXI, No. 3 in C-sharp Minor, No. 7 in B-flat Major (in manuscript only).

They, along with the stars and moons, set the mood of Ryahda's world.

Glossary

Astronomical terminology

AU	Astronomical Unit. A unit of length equal to the mean radius of the Earth's orbit.

Computer/hacker terminology and lore

as if by magic	As yet unexplained, or too complicated to explain; compare automagically and (Arthur C.) Clarke's Third Law: "Any sufficiently advanced technology is indistinguishable from magic" (from *The On-Line Hacker Jargon File*, V. 4).
cp	Unix copy command.
cracker	One who breaks security on a system. Coined circa 1985 by hackers in defense against the journalistic misuse of the term *hacker* (from *The On-Line Hacker Jargon File*, V. 4).
cruft together	To throw together something ugly but temporarily workable. Like /vt./ kluge up, but more pejorative. "There isn't any program now to reverse all the lines of a file, but I can probably cruft one together in about 10 minutes" (from *The On-Line Hacker Jargon File*, V. 4).
destroy	A database command that does as its name indicates.
/dev/null	Unix null device. Output written to it is discarded.
GID	Group ID. The method the operating system uses to identify groups.
group	Unix groups are a mechanism that allows arbitrary collections of users to share files or other system resources.
hacker	A person who enjoys exploring the details of programmable systems and how to stretch their capabilities, as opposed to most users, who prefer to learn only the minimum necessary (from *The On-Line Hacker Jargon File*, V. 4).
hack mode	1. What one is in when hacking, of course. 2. More specifically, a Zen-like state of total focus on The Problem that may be achieved when one is hacking (this is why every good hacker is part mystic). Ability to enter

such concentration at will correlates strongly with wizardliness. Sometimes amplified as 'deep hack mode.' Being yanked out of hack mode may be experienced as a physical shock, and the sensation of being in hack mode is more than a little habituating. The intensity of this experience is probably by itself sufficient explanation for the existence of hackers, and explains why many resist being promoted out of positions where they can code. Some aspects of hacker etiquette will appear quite odd to an observer unaware of the high value placed on hack mode. For example, if someone appears at your door, it is perfectly okay to hold up a hand (without turning one's eyes away from the screen) to avoid being interrupted. One may read, type, and interact with the computer for quite some time before further acknowledging the other's presence (of course, he or she is reciprocally free to leave without a word). The understanding is that you might be in hack mode with a lot of delicate state (sense 2) in your head, and you dare not swap that context out until you have reached a good point to pause (from *The On-Line Hacker Jargon File*, V. 4).

kluge — A clever programming trick intended to solve a particular nasty case in an expedient, if not clear, manner. Often used to repair bugs. "I've kluged this routine to get around that weird bug, but there's probably a better way" (from *The On-Line Hacker Jargon File*, V. 4).

OS — Computer Operating System.

rm — Unix command to delete one or more files.

root — On Unix systems, a privileged account (`UID 0`) with unrestricted access to all files and commands.

social engineering — Term used among crackers for cracking techniques that rely on weaknesses in wetware rather than software; the aim is to trick people into revealing passwords or other information that compromises a target system's security (from *The On-Line Hacker Jargon File*, V. 4).

strong AI problem — The synthesis of a human-level intelligence (from *The On-Line Hacker Jargon File*, V. 4).

su — On Unix systems, become `root` or another user. Using the command '`/bin/su -`' (without the quotes) will open a `root shell`. The privileges of this shell remain in effect until the shell terminates.

SUID — Set user ID. In Unix, `SUID` is used to enable unprivileged users or processes to run programs owned by a privileged user (often `root`) under restricted

	conditions. A common example of `SUID` access, found on all Unix systems, is the executable image of the `passwd` command, `/bin/passwd`.
Trojan horse	A malicious, security-breaking program that is disguised as something benign (from *The On-Line Hacker Jargon File*, V. 4).
Type Enforcement	A containment technology used in advanced military-grade firewalls that prevents the use of certain commands while the operational kernel is running.
UID	User ID. The method the operating system uses to identify users.
wetware	The human nervous system, as opposed to computer hardware or software (from *The On-Line Hacker Jargon File*, V. 4).
write-only memory	The obvious antonym to 'read-only memory.' Out of frustration with the long and seemingly useless chain of approvals required of component specifications, during which no actual checking seemed to occur, an engineer at Signetics once created a specification for a write-only memory and included it with a bunch of other specifications to be approved. This inclusion came to the attention of Signetics management only when regular customers started calling and asking for pricing information. Signetics published a corrected edition of the data book and requested the return of the 'erroneous' ones. Later, around 1974, Signetics bought a double-page spread in the April issue of *Electronics* magazine and used the spec as an April Fools' Day joke (from *The On-Line Hacker Jargon File*, V. 4).

PDU-1 terminology

an'tala	The Donda name for the unique mental state of a warrior while in telepathic communication with her diak.
bray	An individual who has ubiquitous net/device access, both public and commercial, through their credit ID bracelet, and therefore has the rights of a Class C or higher citizen.
comp	Portable, wireless, high-security net access device with a verbal user interface.
credit ID bracelet	Bracelet containing both credit and ID information unique to its owner, which permits net/device access to both public and commercial networks, depending on credit and/or security authorizations. Only issued to Class C or higher citizens.

da'ahta	The Donda name for the withdrawal symptoms that result when an'tala is broken.
diak	Donda war animal. An evolutionary offshoot of the cat family that grew large enough so warriors could ride them. Female diak cubs, if obtained prior to weaning, will imprint with certain female humans, establishing a strong telepathic relationship. This relationship, over time, creates a physical addiction on both sides, and when broken by either distance (around twenty kilometers) or death, serious withdrawal symptoms result. These withdrawal symptoms can be blocked by a drug found in the roots of the desert plant sy'ahta, at least temporarily, but tolerance begins to build if used for extended periods. The only long-term remedy is, if separated by distance, to rejoin one's partner; if separated by death, for the warrior to bond with a new cub. An adult diak whose warrior has died will usually refuse all help and go into the desert to die in solitude.
Donda	The female warrior clan that controls the land between the Da'Kal River and the Unexplored Region, often called the Central Desert.
Donda throwing daggers	The Donda have long favored weapons that employed skill over brute strength, such as the bow and throwing daggers (whose use they have developed into an art form). Their daggers, beautifully balanced and exquisitely made out of steel with a simple riveted wooden hilt, can be, and often are, used in the manner of traditional daggers, as well as for hunting and other tasks. Usually worn in sets of two to a side in molded quick-draw sheaths, they are the Donda weapon of choice in close quarters or hand-to-hand combat.
electrosteel	A material used on Earth after the riots of 2632 to protect important government installations, power plants, corporate office buildings, and military aircraft. It was also used in space for the outer surface of HQ and PDU-1 as a protection against radiation, space debris, and terrorist attacks. A one decimeter thickness is capable, once its field has been energized, of withstanding direct exposure to a five-megaton nuclear device.
First Moon	The site of planetary and corporate government. An artificial satellite 815 kilometers in diameter stationed sixty degrees in front of Earth's natural moon. Also known as *HQ*.
HQ	See *First Moon*.
Ka'Don	Hereditary ruler of Port Da'Kal.

klooch	A native woman (Indian or Inuit) in the northern part of NA Sector. Considered highly derogatory.
nobray	An individual who does not have ubiquitous net/device access, either public or commercial, through a credit ID bracelet, and therefore lacks the rights of a Class C or higher citizen.
passage	A somewhat indefinite measure of distance, generally considered how far one can travel by tahn in one day.
sy'ahta	See *diak*.
tahn	A long-necked, foul-tempered desert animal with a large hump on its back, used by merchants for pulling wagons or carrying merchandise, and by the soldiers of Eos and Port Da'Kal for riding. In the Central Desert, large herds of wild tahn roam, constantly migrating from one area to another in search of food as the seasons change.
Toh'a	Head Priest of Eos.
tonga	A large, herbivorous, marsupial animal with a small head, large ears, long, powerful hind legs, small forelegs, and a long thick tail with a hard, horny plate on its end used as a weapon, for support while standing, and for balance while in motion. Tonga travel in packs and can move rapidly by both running and hopping on their hind legs when threatened. Because of the heavy, claw-like nails on each hind foot and the power of their hind legs and tail, they can be dangerous fighters in close quarters and are, even by the diaks, treated with respect. Tonga, along with tahn, are the primary dietary staples of both the warriors and diaks of the Central Desert, and, because tonga compete for the same food sources as do tahn, can often be found in the same areas. Their hide is widely admired for its lightness, flexibility, and toughness, and finds many uses among both the Donda and, when they can get it, the leather craftsmen of Torac.
Z'Hann	The female warrior clan that controls the land between the Da'Kal River and the Endos Mountains.

SGML terminology

DTD	Document Type Definition.

SGML	Standard Generalized Markup Language. A powerful technology for structuring documents. Popular members of the SGML family include both HTML and XML.
inclusions	Inclusions/exclusions are allowed exceptions to an element's content model. A powerful feature of certain Industrial-Grade DTDs such as ISO 12083:1994, they are generally considered too difficult for use by nonspecialists.

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Characters

admin	Sage, female. Administration, employee of RJR. Rank unknown.
En'Tah	Slave dealer in Torac, male.
Hi'Kon	Merchant and owner of a fleet of ships based in A'Lan, male.
Jorgensen	Sage, male. Hardware, employee of Boeing's Defense & Space Group.
Ka'Don	Hereditary ruler of Port Da'Kal.
Lookie	Javelina, female.
Ly'is	Diak, female. Ryahda's war partner.
McCain	Junior programmer, male. Software, employee of Sun Microsystems.
Morgan	Sage, male. Software, employee of Sun Microsystems. Lead programmer, PDU-1 project.
O'Leary	See *admin*.
Peters	Sage, male. Software, employee of Sun Microsystems.
Ra'Kel	Donda warrior, female.
Ryahda	Donda warrior, female. Leader of the Donda.
Singh	Junior programmer, male. Software, employee of Sun Microsystems.
Split-Ear	Javelina, male.
Toh'a	Head Priest of Eos, male.

V-Kay	Sage, male. Administration, employee of RJR. Project head.
Viggen	Sage, male. Administration, employee of RJR. Project historian.
Wong	Sage, female. Biometrics, employee of Consolidated Pharmaceuticals, Special Projects division.
Y'Tan of Eos	Musician, male. Composer for the Court of Eos.

About the Author

A deep interest in Baroque music, literature, and aviation, combined with a taste for frontiers (both physical and mental), led F. E. Potts to travel widely in his youth, mostly in North Africa, the Middle East, and India. In 1962, out of curiosity, he visited Alaska, where he spent the next 22 years working as a bush pilot.

In 1985 he moved to the Sonoran Desert, where he still lives. He has been using the Internet since 1987 (in its early days also a frontier), and is especially fond of the Linux flavor of Unix. He was an early adopter of SGML, and his web site (`http://www.fepco.com/`) was one of the first 800 on the web.

He has written many magazine articles over the years, both technical and nontechnical, and his highly-acclaimed book on flying in the North, *F. E. Potts' Guide to Bush Flying: Concepts and Techniques for the Pro*, has, besides winning the Aviation/Space Writers Association's 1994 Award of Excellence, become the standard text in its field. *PDU-1* is his first novella and reflects his many-faceted nature, interests, and background.