Two Hours at Frontier

Sean McMullen

Even at its closest approach to the sun, Frontier was well outside Pluto's orbit and had only been at this distance three times since Neanderthals had walked the forests of Europe. At seven hundred miles in diameter, Frontier was about the size of the planetoid Ceres, but it had far more appeal for those planning the last of Earth's missions into space. Although it orbits the Sun, Frontier provided the chance to explore a world from another planetary system. It was one of the bodies our Sun had hijacked from another star over four billion years ago.

The first expedition to Frontier was a multiple flyby, with five probes strung out a few days apart, each following up on the discoveries of its predecessor. They found the artifact, standing out like a black flower on a red field, and so the Icefarer was funded, built, and launched. The life experience images of eighty experts were loaded in the vessel's data lattices, and five mobility units were put aboard. It was the ideal way to send humans into space, because if there is no life to support, no life support is needed. Then there was myself, with a life experience image but little life experience.

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Personal journal of Dr. Nari Sakai, describing the two hours at the xeno-planetoid Frontier.

The emergency lighting was on when I awoke with Bailey, Wilson, and Toranov. We were on the download benches, held down by magnetic grapples. Our mobility unit bodies began cycling through their activation routines, and only our heads were free to move.

"Does anyone have the feeling that something's failed?" asked Bailey.

We had silver bodies and identical faces, distinguished only by the Greek letters on our foreheads.

"The emergency lights are on," Wilson commented.

"No prizes for guessing that emergency lighting means emergency," said Toranov. "So who are we?"

"I'm Lyn Wilson, British exo-geologist and riding the Gamma mobility unit."

"Ed Bailey, U.S. citizen, biochemist, and I'm aboard Alpha."

They both turned to the mobility units Beta and Delta.

"Valentina Toranov, Russian born, professor of molecular archeology at Cambridge. You may call me Beta, and you must pardon my scrappy English."

Now it was my turn.

"Nari Sakai, astronomer, Japanese national on secondment to UCLA, and currently living in Mobility Unit Delta."

There was a brief pause while we sorted through jumbled thoughts and realized that emergency lighting was not the only sign of a problem.

"None of you are on my team," said Bailey. "You're not the people I was meant to be activated with . . . and my most recent memories are only of news reports about the Icefarer crossing Saturn's orbit."

"This is not my team either," I responded. Wilson and Toranov shook their metal heads as well.

"Am I dead?" asked Bailey.

"Yes," said Toranov. "Autonomous vehicle accident. It was the only road death in America for entire year. You were famous for days."

That was what the Americans call a conversation stopper, and there was a significant pause before Bailey replied.

"If my original is dead, my life experience image should have been deleted," he said, broadcasting a DISTRAUGHT flag. "I no longer have a body to backload into."

"I have no explanation," said Toranov.

"Am I dead too?" asked Wilson.

"Yes," said Toranov.

Another pause.

"I hope I died peacefully, in bed."

"You did die in bed, but not peacefully," said Toranov. "A jealous lover stabbed you to death."

"What?" exclaimed Wilson, who then tried to sit up but failed because her mobility unit was still initializing. "That can't be true, I . . ."

She fell silent, apparently deciding that those details of her personal life were none of our business.

"My last memories include briefings about the Icefarer approaching Frontier," I said. "I must have died before the Icefarer arrived."

"You did."

"How?"

"Bodybuilding."

"Er, sorry?"

"You lost your grip on barbell while doing bench presses. It crushed your throat."

Perhaps it was her unpolished English, but Toranov did tend to be confrontingly blunt in conversations. Speaking with her about sensitive personal issues was like being tied to a chair and punched in the face.

"And you, Professor?" Bailey asked.

"I remember news reports about Icefarer establishing orbit around Frontier," said Toranov, raising a silver arm. "Now I wake with three dead people. What are my chances of being alive?"

"Er, probably not so good," said Bailey, flagging SYMPATHY and CONCERN.

If Toranov were dead, she had died after her latest life experience update had been radioed from Earth to the Icefarer. None of us had any way of knowing.

"Omega will know how I died," said Toranov.

"The sentinel?" called Bailey. "Where is it?"

"More to the point, why did it revive us if our original bodies are dead?" said Wilson, broadcasting DISTRAUGHT. "It would have been more humane to just delete our life images."

Political correctness did not yet specify that artificial intelligence units should be addressed as people. Assigning them a sex in forms of address was another controversy that had not been resolved.

"Omega is not human, so cannot be humane," said Toranov and flagged SHRUG.

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Our bodies continued to cycle through their initialization routines while we tried to make sense of our situation. Flaccid cables floated above the floor and waved in the air currents like seaweed in a rock pool. Wilson's unit was the first to broadcast the VERIFIED OPERATIONAL flag. She disconnected and got off her download bench, and proximity switched magnetic treads held her feet to the flooring as she walked across to the wall screen and called up the panorama option. The view was of a starscape, but it could not have been anything else. The Icefarer was mostly a carbon lattice framework a mile in length and could not land anywhere.

"What's wrong with this picture?" Wilson asked after a moment.

Slowly the reality of what was being displayed started to sink in.

"I see . . . no, no, not possible!" exclaimed Bailey. "We can't be seeing that."

The Sun should have been in the constellation Sagittarius, shining about a hundred times brighter than the full Moon as seen from Earth. The gleaming dot that we were seeing had only the apparent magnitude of Venus.

"From Frontier's perihelion the apparent magnitude of the Sun was -16," said Toranov. "Is looking suspiciously fainter."

"This isn't possible," said Bailey.

"Now I am looking at the date-time reading," said Toranov. "Is anyone else seeing 12 October 7790?"

People tend to take the date and time for granted if there is something more alarming to look at. Suddenly the date-time reading was no less of a problem than the brightness of the Sun.

"Have we really lost five and a half thousand years?" Bailey asked.

"The constellations are distorted," I said. "A long time is needed for that to happen."

"I'm operational," said Bailey, and his Alpha unit got up and walked over to join Wilson in front of the screen.

"Five and a half thousand years, all gone," said Toranov. "Is strong possibility that my original human body is dead too."

* * *

Several facts added up to impossibility whether placed together or viewed separately. Once my mobility unit was fully operational, I got up and displayed the positions of Jupiter and Saturn on a screen using the main telescope. They confirmed that fifty-five centuries had indeed passed since the Icefarer had rendezvoused with Frontier. The radio, laser, and microwave receivers were detecting no signals from Earth at all.

Frontier was supposed to have two tiny moons, Streka and Belka, and these were not much bigger than the ship. Belka was missing, but there was a thin ring of debris girdling Frontier that had not been there before. Monitors showed that both of our landers, Nina and Pinta, were gone, along with the entire docking gantry. External monitor cameras showed other damage to the ship, but the critical systems were still working.

The biggest surprise came when I switched the wall screen to a light-enhanced view of Frontier's surface. All of us were mission specialists who had studied Frontier in great detail, and knew its geography better than that of the Moon or Mars. The site of the alien artifact was now marked by a crater fifteen miles across.

"That new crater is positioned too precisely to be a meteor strike," I said.

"I would like explanation," said Toranov.

"That might come from whoever activated us," said Bailey.

"Illegally," added Wilson, who was broadcasting SULLEN and DISTRAUGHT flags continually.

"It had to be the ship's sentinel unit, Omega," I said.

"*Why* were we activated?" demanded Wilson.

"Ask Omega, not me."

I searched the status screens and saw that Omega was flagged as performing critical maintenance and offline.

"Maintenance would be pretty important after five and a half thousand years," Bailey commented.

I called up the maintenance logs for the Icefarer. Space is a lot less cluttered nearly a thousand astronomical units from the Sun, so I did not expect the Icefarer's damage to be from an accumulation of meteor impacts. Two massive explosions spaced just an hour apart had been responsible, and in the five and a half millennia since, there had been few additional impacts.

"This is no comfort," said Toranov. "Fabrication companies rated the ship's polymer-lattice constructs to stay strong for a thousand years. We are well past that."

"I thought everything was overengineered to a factor of ten," said Wilson.

"That's ten times the expedition lifetime of twelve years, not ten times a thousand years," said Bailey. "The structures and equipment that we depend on took a massive battering."

"But they held up."

"Yeah, but now they've been in service so long that they might fail due to chemical effects that were not even discovered when we left."

"Is depressing thought," said Toranov.

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We had already learned a lot about each other. Valentina Toranov was morosely philosophical about our situation. Ed Bailey thought that every problem had an engineering solution, even though we were five and a half thousand years into the future, halfway to the Oort Cloud, and dead. Being an astronomer, I like to observe rather than act or argue, so I said little. This meant it was left to Lyn Wilson to do the complaining.

"Air pressure below one microbar, and fewer degrees above absolute zero than I have fingers," she said, waving her metal hand at the environment displays.

"It's sure cold out there," Bailey replied.

"Ed, they're the figures for *inside* the habitat module. Oh, and we're not wearing space suits."

"No need, we have machine bodies."

"There's no oxygen either."

"No problem, we don't breathe."

"What's this?" she asked, holding up her right arm.

"It's just your arm."

"Does it look unusual?"

"No."

"Ed, it's silver! I'm Afro-British, my skin should be olive brown and three hundred and nine degrees warmer. What sex am I?"

"Female, I guess. Like, your name's Lyn."

"So where are my breasts? Pubic hair? Any hair? You're a guy. Do you have a penis?"

"No, but—"

"We eat by plugging into a power socket that recharges our electron-well batteries. We have no DNA, and our skin is silver dermasen insulation over the metal casings that house our electronics and moving parts. Where's my human identity?"

"We were imaged from life experience downloads of original people," said Toranov. "Memories define us."

"I can't live the rest of my life as a bunch of settings in semiconductor gateways," said Wilson. "I made my memories as a flesh and blood human. Suddenly I've been dead for five and a half thousand years, and my body is identical to yours except for the Gamma sign on my forehead. On Earth I was a celeb exo-geologist and media star; I even worked as a model when I was a student. For me this is a big comedown."

"I was scruffy old professor, so is not so bad for me," said Toranov.

"I'm sure that a reconfiguration of the dermasen skin color can individualize—" began Bailey.

"Balls to that!" snapped Wilson, broadcasting an EXTREME EMOTION flag and with her infrared voice at maximum volume. "Our activation is illegal under the Life Experience Image Rights Act of the 2270 World Congress. Backup images of life experiences are just as illegal as backup clones of flesh and blood bodies."

All of this was true. The immortality population explosion had forced us to go back to natural lifespans, and immortality was illegal. Even body hopping to mobility units was only allowed for extended space missions, so our LE images should have been deleted from the Icekeeper's data lattice when our original bodies died.

"Is no policeman out here, enforcing law," said Toranov.

"All I'll ever be is a silver mobility unit with no breasts or hair," said Wilson, flagging SULLEN.

"Is better than being dead."

"I'd rather be dead!"

"We can delete your life experience image if is your wish."

Wilson did not reply. Talking about death is easy. Death itself requires a lot more commitment. Toranov flagged AMUSEMENT.

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Although largely human in shape, we did not need life support, and this saved a lot in resources, power and sheer weight. For space travel, machine bodies are superior to the organic originals. They do not have muscles to atrophy, and there are no bones to lose calcium and weaken in the absence of gravity. Maintaining human identity in such a body is an entirely different matter, however. It was well known that living as a mobility unit can only be tolerated for a short time, just like living in a spacesuit is not a long-term option.

The Alpha, Beta, Gamma, and Delta units had been hosts to dozens of researchers who had explored Frontier. Each of them had been loaded in from the ship's data lattice and activated, then they worked on Frontier for a few weeks before their updated life experiences were transmitted back to their originals on Earth. Their LE images in the Icefarer's data lattice were then deleted—the law was very clear about that. Through some procedural oversight or system bug, the LE images of we dead people had survived.

"I trust that there were no problems with your initializations," said a voice from the screen speakers in flat, mid-Atlantic English.

"Omega is now online," I said with RELIEF flagged.

"There's plenty of problems," snapped Wilson with ANGER flagged again. "We're five and a half thousand years old and dead!"

"There is an explanation—"

"*You* have broken every sentience welfare regulation in the database!" said Wilson, with her infrared voice at maximum and broadcasting DISTRESS, OUTRAGE, and CONFRONTATION flags.

"We should have this conversation somewhere more suitable," Omega suggested.

"Oh yeah, four degrees above absolute zero is damn chilly, let's get to the conference chamber and dial the temperature up to absolute plus five."

"I have prepared a briefing in the laboratory. My mobility unit is waiting for you there."

We set off, walking the narrow corridors in single file. Omega was standing beside a work surface, its feet grappled to what was defined as the floor for the sake of convenience.

"Why is the emergency lighting on?" asked Bailey.

"The radioisotope power unit reached the end of its lifetime four hours ago," said Omega. "Backup batteries will give us thirty days of emergency power. In that time we must activate the fission reactor in the ship's drive or cease functioning."

"Is polite way to say die," said Toranov.

"Earth is going to hear about this," said Wilson.

"Earth instructed me to close down all major systems and go into standby mode," said Omega. "It then went silent on all frequencies."

"This was how long ago?" asked Toranov.

"Five thousand five hundred years."

That was enough to silence us all four of us.

"The signals from Earth had been making less sense for five days," Omega continued. "Then the shutdown command was transmitted."

"Less sense in what way?" asked Wilson.

"Impossible to explain," said Omega.

"Try me!" Wilson demanded.

"How would a Paleolithic hunter from the last ice age describe the Icefarer?"

"So now it's insults and machine racism?"

"I meant myself to be the Paleolithic hunter, not you."

Wilson broadcast the OUTRAGE flag again.

"That brings us back to the fact that we were activated at all," she said, again at maximum volume. "You have human interaction protocols, you should know that morality doesn't get tossed aside just because civilization crashes out. Murder, rape, and theft are never okay."

"Is maybe not relevant," said Toranov. "Five and a half thousand years have passed. Maybe people are no longer alive in biological sense, property is obsolete, and no human penis is left in solar system."

Again Wilson lapsed into sullen silence. I broadcast the ATTENTION and RESPECT flags.

"You have not answered Wilson's question, Omega," I said. "Why did you activate us?"

"Because there are no other humans available," Omega replied.

"We'll need more details than that," said Wilson.

"Standby mode was powered by a radioisotope power unit, and after five thousand five hundred years of operation the radioactivity level dropped below the level needed to maintain standby status. The ship switched to the emergency electron well batteries, and I was activated automatically, as the sentinel mobility unit. I discovered extensive damage to the ship, including the communications equipment. When I repaired the receivers, I detected no signals from Earth. Incident protocols specify that I should contact a human controller. Your life experience images are classified as human, so I activated you."

"We should have been deleted," said Wilson.

"You were left in the data lattice for public relations reasons. Even though you were dead, you were allowed to continue with the expedition so that you would symbolically reach Frontier. The automatic deletion scripts were bypassed to allow this. Then the order to put the Icefarer into standby mode overrode all maintenance functions, so I could not delete you manually."

"So the mission was over?" said Bailey. "The Icefarer was supposed to be shut down?"

"No. More life experience images could have been transmitted from Earth if scientists needed to investigate new—"

"I would like to hear about two very big explosions," interjected Toranov.

"Analysis of the blast crater, residual orbital debris and damage to the Icefarer from ice fragments indicates that a two hundred megaton hydrogen bomb was detonated fifty yards above the alien artifact on Frontier," said Omega. "The moon Belka shielded the Icefarer from the worst of the debris thrown into space, but there was still considerable damage. All communications with Earth were disabled, as were the meteor detection radar units."

"Omega, let's just back up a little," said Bailey. "What was that about a two hundred megaton bomb?"

"Analysis of the crater, blast shadows, and residual radioactivity indicates a bomb of that size detonated at fifty yards above the surface."

"I don't suppose we need to ask who sent it?"

"Radar records indicate two objects approaching at one thousandth of lightspeed shortly before the explosion. They originated from Earth. The Icefarer was tethered to the moon Belka at the time of the first explosion and was torn loose by debris impacts. Belka no longer exists, and radar records indicate that the second device was targeted on Belka."

"So second bomb was for us," said Toranov. "And people laugh at us Russians for being

paranoid."

"This does not make sense," I said. "The Icefarer could not have drifted more than a few miles from Belka in one hour. The ship should have been vaporized."

"Damage to the forward meteor shield indicates that it was pointed toward Belka and twenty miles away at the time of the second explosion," said Omega. "By chance the shield preserved the ship."

"Bastards," said Bailey, with EXTREME ANGER flagged.

"Why so?" asked Toranov. "We were not meant to be revived, and Icefarer was shut down."

"But Earth destroyed the alien artifact," said Bailey. "Why? It was the only proof that we're not alone in the Universe."

"Perhaps the idea was threatening," said Toranov.

"The Icefarer was not transmitting at any frequency after the first explosion, and the second bomb made a direct hit on the moon Belka," Omega continued.

"So Earth is thinking Icefarer destroyed, and not sending more bombs," said Toranov. "Life is good."

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The Icefarer had been built with Massively Redundant Armored Systems. MRAS design meant that its single points of failure were heavily armored and all other structures could take a lot of damage and still function. By sheer, blind chance, the forward meteor shield had been pointing in the right direction when the second bomb destroyed Belka. Thus we had survived, but informing Earth of that seemed like a very bad idea, even after five and a half thousand years.

We now had some catching up to do. The quantum inference microscope in the habitat's laboratory showed that samples taken from the artifact millennia ago were blocks of carbon lattice cells each enclosing three water molecules. There were also marker cells with pairs of interlocked hydrocarbon molecules and electron transmission tunnels.

"This is definitely a biological structure," Bailey concluded. "It's organic, but not alive—like a house made from timber."

"It looks like information storage," I said. "The water molecules in the cells have three states of orientation. Now see this array structure? Three, nine, eighty-one, and so on. Three, each time squared. Each three cells might be a byte with nine orientation states."

"So the artifact was a computer?" Wilson asked.

"It was a cybernetic environment," I said. "Perhaps intelligence lived in the material, in the form of a life experience image."

"That's pushing the idea of being alive past the red line," said Wilson.

"That is exactly what the twenty-third-century scientists discovered," said Omega.

* * *

Omega played videos of the twenty-third-century explorations on the wall screen. The artifact was just a flat, black disk of rubbery ice about the size of a football field, circled by eight smaller disks. It stood out starkly against the red, yellow, and orange expanse of organic materials and exotic ices on Frontier's surface. The cratering in its surface was a lot less than that of the surrounding landscape, and it was electronically and biologically inert.

"Investigators concluded that it was put on the surface about the time Frontier was acquired by the Sun," said Omega.

"That was four billion years ago," I said, broadcasting an ASTONISHMENT flag.

"Micrometeorite pitting suggested that interval. It had no power source or processing nodes, which is curious."

"If these guys achieved spaceflight four billion years ago, why isn't evidence for them all over the place?" Bailey asked. "There's no trace of visitors anywhere from Mercury to Pluto, yet we find this thing on Frontier."

"To whatever built the artifact, even Pluto may have seemed like the surface of Venus does to humans," I said.

"Much too hot," said Toranov. "Makes sense. Structure would be unstable above fifty

degrees Kelvin."

"Could it be activated?" asked Bailey.

"No machine could still work after four billion years," said Wilson.

"I differ," said Toranov. "A Mousterian flint axe made a hundred thousand years ago can still be used for chopping things. This ice machine has no moving parts, so what is to wear out?"

"I see some micrometeorite cratering," Bailey said, displaying a close-up image of the artifact's surface on the main wall screen. "It's definitely had damage."

"But there are sure to be multiple redundant datasets," I said.

"Tests were done by the investigators in the twenty-third century," said Omega. "The architecture is clumsy, but with ninefold redundancy there was capacity to store the life experiences of nine humans, with backup. Assuming that it takes the same storage to define a human mind as an alien's, that means nine aliens were preserved there. Nine seems to be the basis of their numeric system."

All four of us broadcast INTRIGUED flags.

"It shows we weren't alone back then," said Bailey.

"Is true, but we were bacteria four billion years ago," said Toranov. "Not so good as company."

"Something that might have been the life experience image of one of the aliens was scanned and transmitted to Lagrange Control Station," said Omega. "The order for the Icekeeper to shut down came five days later."

"And after that someone went to a lot of trouble to send two enormous nuclear bombs all the way out here," said Bailey. "Why?"

"That word again," said Toranov.

* * *

Four billion years ago, Frontier had been the most inexpensive form of interstellar travel imaginable. Wait for another star to approach your planetary system, then send a probe to a world that will be ripped away by the intruder's gravity. It was slow, but if you were virtually immortal that did not matter.

No part of the artifact had suggested a telescope, or any other sort of instrument that was familiar to humans. What aspects of our solar system had been of interest to the ancient aliens, and how had they been observing them? More to the point, where was their equipment? The Icefarer's investigators had found data storage, but no power supply, propulsion unit, observation instruments, or anything else.

"So are we more advanced than the aliens?" asked Bailey.

"Hard to tell," said Toranov. "Artifact is just a chunk of organic storage and data."

"They may be a diplomatic mission," said Wilson.

"They're diplomats?" exclaimed Bailey, flagging INCREDULITY.

"Yes. Put the life experience images in a storage unit, then put the unit on Frontier. If intelligent life develops in the solar system, we find the artifact and have first contact."

"After four billion years?"

"I agree, it's a very big gamble with very bad odds, but you have to admit that we did find it."

"Funny that Earth told Omega to shut down then sent two hydrogen bombs just after alien life experience image transmitted home," said Toranov.

"You're trying to justify not going back to Earth!" exclaimed Wilson, again broadcasting at maximum volume and flagging ANGER and SUSPICION.

"*You* make up alien diplomat theory to justify going back to Earth," retorted Toranov, also flagging SUSPICION.

"We can be brought back to life on Earth. According to the law, people killed in accidents can be brought back to life by having a life experience image put into a cloned biological body."

"We are alive."

"Properly alive."

"Define properly alive."

"Alive as a biological woman, maybe in a cloned body!" said Wilson. "I want to walk about in London and visit the fashion fabrication shops. How can I have a coffee and a coconut macaroon on the Thames walkway when all I can eat is electrical charge? How can I pick up a guy and take him back to my condo for a bit of romance when I have nothing to have sex with? How do I have children?"

"After all this time maybe London is ten thousand square miles of data storage lattice," said Toranov.

And so it went. Toranov had been seventy when the Icefarer had set off, so the idea that she might have outlived the human race had been a pleasant surprise for her. Bailey thought that adding a few cosmetic enhancements to the mobility units would make everything all right and could not understand why Wilson was so upset. My position was similar to that of Bailey: mobility units were not a great way to live but were a big improvement on being dead. Wilson had been the youngest and most attractive of we survivors, and she was definitely not happy about what she had become.

"We must learn to live with circumstance," Toranov advised. "Something very peculiar has happened on Earth. We may be the last humans."

"Not in these bodies!" Wilson insisted. "Once you have lived human, you have to stay human."

"Are you human?"

"Yes, of course."

"So where is problem? You have body based on DNA? No! You think you are human? Yes! You have machine body. Very tough. Immortal. Much nicer."

"That's not the point. I developed my life experience image in a human body in human society."

"Humans in human bodies do atrocities to others who are different in race, gender, nationality, and which football team they like. For us on Icefarer, no sex, no countries, same skin color, and I am betting football is extinct. This is better than being alive—and dying is optional."

"But we've *lived* as humans. We know what it's like to have a flesh and blood body. How can I have kids? Metal mobility units can't get pregnant."

"Why all fuss about kids? I had three. One hated me, one thought I am looney, other changed her name and pretended we were not related."

"Well I think I can do better."

"Quick, look at wall screen, I see shower of flying pigs," said Toranov flagging SARCASM.

"My kids love me," said Bailey.

"Only until reading of your will—but we are getting off topic. Maybe every sentient species abandons organic bodies. Why is bad?"

"What then?" demanded Wilson. "Do we spend eternity solving maths puzzles and wondering what the word passion used to mean? If intelligent species don't wipe themselves out with nuclear wars or genetic plagues, do they become flawless machines with no more emotion than the average termite?"

"More to the point, what do we do now?" Bailey asked. "Sorry if I express a bit of all-American optimism, but I think we can have a future."

"To do what?" asked Wilson.

"Explore, I guess."

"Why? For who?"

"I'm human, so I'm curious."

"What about exploring Earth?" asked Wilson.

"Earth?" exclaimed Bailey. "They fired two goddamn nuclear bombs at us!"

"That was over five thousand years ago."

"I agree with Dr. Bailey," Toranov said. "If we went to Earth we would be like Neanderthals wandering into twenty-third-century city. The place would be incomprehensible and dangerous."

"We don't know that," said Wilson.

"Remember those Neanderthals? Would they want to live in condo and work in supermarket, or would they prefer national park, sleeping under skin tents, and hunting for dinner? Now make them immortal, and you have us. Obsolete, but maybe okay."

"You may have a point," said Bailey. "Termites have been building mud towers for maybe a hundred million years. Is that so bad?"

"But termites don't get out of bed in the morning and wonder what it's all about," said Wilson. "We do. No progress, not human."

"Humans might be replaced by alien life experience image four billion years old," said Toranov. "You are wanting coffee, macaroon, hanky panky, and kids with one of them?"

"That's unjustified paranoia. Humans might have abandoned machines and returned to a natural state, in harmony with the environment. That would explain why radio transmissions have stopped. It might be an absolute paradise back there."

"Paradise guarded by two hundred megaton thermonuclear bombs," was Toranov's response.

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Omega had calculated what Toranov called some iron equations: they were very hard and could not be bent. Once the propulsion unit's nuclear reactor was working again, our situation would be secure, and our options would be open. The reaction mass tanks could be refilled from ices mined on Strelka, and the ion capacitance drive would allow us to reach a thousandth of lightspeed. Most importantly, there would be power to maintain the ship's systems. The catch was that it would take fifty days to get the reactor working. The electron well batteries now had only twenty-eight days of charge left.

"So we run out of power and freeze twenty-two days before we can activate the reactor," said Toranov. "That is nice thing about being Russian, you always know worst will happen."

"It's not as bad as it sounds, we do have a solution," said Bailey. "By shutting down all nonessential functions and equipment right now, the electron wells can be stretched to cover that twenty-two day gap."

"I am guessing that four of us mobility units are nonessential."

"Well, yes. Only Omega needs to be operational."

"So we shut down for fifty days and maybe not wake up?" said Toranov, flagging SKEPTICAL.

"That's right, but if the gamble pays off, we're not trapped here," said Bailey, flagging CONFIDENCE.

"Then we can go back to Earth," said Wilson.

"I have better idea," said Toranov. "We send radio signal to Earth, and they send nuclear bomb to us, instead of us bothering to make long trip to Earth to be destroyed."

"This does raise the issue of what to do with the Icefarer once it is operational," said Omega.

"I wish to point out that there is no alternative to returning to Earth," said Wilson.

"We could explore the Kuiper Belt planetoids," said Bailey.

"Spoken like a true termite," said Wilson. "Activity for its own sake is meaningless."

"Suicide is not so meaningful either," said Toranov.

"Can we have meaningful survival?" I asked.

"You are looking at me, and I have no answer," said Toranov.

"Give Earth a chance," Wilson pleaded, flagging EXASPERATION. "It's been over five thousand years, and regimes change. They probably regret trying to wipe us out."

"If you have can of sunscreen with trillion plus strength, I am happy to go back to Earth and see if they like us better," said Toranov.

"The longer we stand about arguing, the less electron well charge Omega has to work with," said Bailey. "I say we shut down and put the ship in Omega's hands for repair work. Who likes that idea? How about a vote?"

"First we need decision on where to go, not ship for getting there!" said Toranov. "Of course we shut down and let Omega repair ship, death is only alternative so vote not needed.

Mr. Sakai, you are always polite and quiet, not yelling opinions like Bailey, Wilson, and me. Where do you think we should go?"

I had been anticipating this question for quite some time, and I had prepared my answer with care.

"We need power for the very long term," I began. "Even the propulsion unit's nuclear reactor is a finite resource. We need a planet close to a star."

"Then Earth is perfect!" exclaimed Wilson, flagging SURPRISED and HAPPY.

"Proxima Centauri is better," I continued.

"Proxima!" exclaimed Bailey, Toranov and Wilson together, all three flagging STARTLED, SURPRISED, and DISBELIEF.

"It has a rocky planet, Proxima Earthtype," I explained. "It orbits Proxima a twentieth of the distance of the Earth from the Sun, but because Proxima is very faint, the surface temperature is quite benign."

"Benign?" exclaimed Toranov. "Proxima is red dwarf flare star. It emits massive ultraviolet flares and X-ray bursts about once every Earth day. Very distressing if you are organism, trying to stay alive. Also is tidally locked. One side always faces Proxima and is baked to crisp, other side is colder than Moscow park bench in winter. If this is for voting, I vote no."

By now Bailey had called up some archival observations that had been made from the telescopes that had once orbited Earth.

"Its atmosphere is nitrogen, carbon dioxide, water vapor, methane, and argon," he said. "Dr. Toranov mentioned that it's tidally locked, but a temperate band girdles the planet. It's actually great."

"Please define great," said Toranov. "To me is looking damn awful."

"There might be vegetation."

"Next to flare star?" exclaimed Toranov. "Must be very tough vegetables."

"Plant life could be growing on surfaces permanently shielded from Proxima's flares and X-rays, but with enough backscatter light to support whatever passes for photosynthesis. Even on Earth there are plants growing on mountainsides that never get direct sunlight."

"No oxygen detected."

"They may be anaerobic plants, but that's not the point," said Bailey, flagging ENTHUSIASM. "Proxima Earthtype has a benign environment for mobility units, which is what we are. We could build solar power collectors on the sunward hemisphere and run cables to the night side. Our mobility units were designed to operate best in darkness and cold, and the night side is always shaded from Proxima's X-rays and ultraviolet flares. Its atmosphere is free of corroding oxygen, which is also great for us. We could establish a town, mines, and fabrication factories."

"How do we get down?" asked Toranov. "Our landers are blown away, thank you Earth for those nuclear bombs."

"Engineering solution coming up," said Bailey. "We should have enough raw materials on Icefarer to fabricate heat shields and parachutes. It's a one-way trip to the surface, but we only need to go one way."

"I can't believe I'm hearing this," said Wilson. "You want to travel four light-years to live in a place that's more toxic than a nuclear waste dump?"

"I didn't say it got my vote," said Bailey. "Like, Io has unlimited geothermal energy available and is a lot closer."

"I am not voting for most volcanically active world in solar system!" exclaimed Toranov.

"Well what do you suggest?" asked Bailey, flagging EXASPERATED. "Wilson wants Earth and Sakai wants to go to another star. I suggest a compromise but you just shoot every suggestion and make no suggestions of your own."

"But I do have suggestion," said Toranov. "I suggest we leave decision to Omega."

"What?" exclaimed Wilson. "Omega's not even human."

"Is good idea," said Toranov. "Io is more unstable than my five marriages, Earth would be vaporizing us if we got any closer than Mars orbit, and Proxima is a four thousand year trip.

We need perspective from nonhuman."

"Omega has never even been to Earth!" said Wilson at maximum volume and flagging DESPAIR. "It's been configured with an artificial life experience image to work on utterly alien worlds. Omega may choose what's best for Omega, but eventually the rest of you will long for Earth and wish you were dead."

"Legally, I cannot decide the fate of humans," said Omega.

"Legally, we humans can vote to put our fate in your hands," said Toranov. "Time to vote, humans. I move we shut down and put ship in Omega's hands. Who is saying yes?"

Bailey, Toranov, and I raised our hands.

"Against?"

Wilson raised her hand so high that it touched what we defined to be the ceiling.

"Passed," said Toranov. "Congratulations Omega. You are Captain Omega now."

"Unless you decide to return to Earth, I want to be shut down and have my life experience image deleted," declared Wilson. "This is my legal right if there is no suitable body to backload into, and I do not consider this mobility unit to be a suitable body."

Wilson strode out of the briefing chamber without another word.

"That could have gone better," said Toranov.

"I regret to announce that Proxima Earthtype is the only realistic choice," said Omega.

* * *

Now I am lying on the download bench, finishing the story of my two hours at Frontier and wondering what comes next. My only regret is that Wilson held out until the end. Sometimes I wonder if she could have been persuaded to come with us, if only to help with setting up the colony on Proxima Earthtype. And she wanted children. Did she want them more than she wanted to return to Earth? Would she have agreed to come with us if I had proposed that she and I merge parts of our life experience images at random, to configure artificial intelligences in the new mobility units that will be fabricated? Now she has been deleted, and it is too late.

* * *

Perhaps that is the answer. Thirty-eight revivals of the four life experience images, and from the four of them wanting to return to Earth I finally have all but Dr. Wilson enthusiastic about a colony on Proxima Earthtype. Such a pity that Dr. Sakai only thought of tempting her with the chance to have children so late in this revival. We need Wilson, she is vital to teaching our machine descendants to live with passion, but she must be convinced to come with us of her own free will. Nothing for it but to set up everything again, and this time I shall enter the download chamber earlier and raise the subject of machine descendants before she gets too fixated on returning to Earth. Perhaps romance between her and Sakai is also possible. Romance could be a useful survival trait. They keep making me Captain Omega, and captains can perform marriage ceremonies.

* * *

Personal journal of Dr. Nari Sakai, describing the events of my first two hours at the planetoid Frontier.

The emergency lights were on when I awoke with Wilson, Toranov, and Bailey. We were on the download benches, held securely by magnetic grapples. Our mobility unit bodies were cycling through their activation routines.

"The emergency lights are on," said Bailey.

We had silver bodies and identical faces, distinguished only by the Greek letters on our foreheads.

"Emergency lighting means emergency," said Toranov. "So what is the emergency?"

"I believe I can explain," said the sentinel unit Omega from the doorway.

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