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HAUMEA

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Captain Karl Krull glared at his second in command——not me, thank goodness. Krull made the Lieutenant, John Ellison, sit because the two-meter first officer would otherwise tower over him. Ellison ignored the glare, smiled and presented his case as smoothly as any lawyer or Martian real estate agent would.

"Karl, we've traveled beyond Pluto and it's only one more astronomical unit to Haumea. We are getting some well-earned relief at Samios."

Relief was an understatement, as I well knew. The memory of Thera's legs wrapped around me was still fresh. I'd said goodbye, but not wanted to.

"We have a mission," Captain Krull said, tonelessly. "We will get to Haumea before the Cislunar Republic."

"We will," Lieutenant Ellison said. "Captain Duluth is months behind us, if coming at all. It's just a rumor. The documentary crew would like to stay here a few more days as well."

Captain Krull drummed his fingers on his faux-wood desk. "We serve the International Space Authority. We are not the employees of the supercargo..."

That was a fine point, I thought. They *were* paying for the mission, after all.

Ellison smiled. "The ISA is a long way from here."

Captain Krull scowled even more. "We *are* the ISA. We break seals at ten-hundred tomorrow."

"Karl, the days of that kind of autocracy are past. Leadership..."

"Don't lecture me about leadership, Lieutenant." Krull's voice had a shrill, nasal quality that was especially irritating when he raised it. "Ten hundred hours. Any crew not aboard can apply for Samiosan residency. Understand?"

"Karl..."

"Captain Krull!"

He pronounced it "kruhl," not "kroo-el.' Born in Garmisch, his astronomical English still held a hint of German in it. That was perhaps unfortunate.

Ellison shrugged. "I will let them know, then. May I tell them that we will stop at Samios on the return trip?"

"Are you all that horny? Have your brains migrated to some southern part of your anatomy? We will return on the planned trajectory on the planned schedule. That is all."

"Karl..., Captain..."

"THAT. IS. ALL."

Ellison shrugged again and left the wardroom.

Captain Krull then noticed my existence. Departure prep was in my department.

"And Tony..."

"Yes?"

"Delegate. Lieutenant deWalt can watch the AI. I'll assist, if needed. I see no reason why you can't attend to personal business, do you?"

"No, Captain." Lieutenant Kari deWalt was my second; a very disciplined and competent woman who got along better with machines than people, with Capt. Krull as the odd exception.

"That is all."

I messaged Thera before the wardroom doors hissed closed.

She didn't have the evening free when I called. Ten minutes later, she called back and said she'd arranged for someone to take her shift at the Samios Protective Services watch desk.

#

A warm tropical sea circled Samios inside its belly. Thera and I basked on its shore, our bare bodies soaking up the last rays from the interior reflector as it retreated toward its evening nest in the north polar hills.

"We can still tan out here!" I remarked.

"Aluminized graphene reflectors can do wonders."

I smiled. Samios had 30,000 square kilometers of them: a huge silvery flower. "A lot of work to be so far away..."

She laughed. "Why do you think we are so far out?"

I gave a safe answer. "Nitrogen?"

Ice Chip was a hundred-kilometerish Kuiper Belt object tumbling near Samios, full of water and ammonia. A space colony is an almost closed system, but nothing is perfect.

"Hmm, interesting, but easier to ship the nitrogen in, I think. No, we don't want to be overwhelmed by bluenosed missionaries and sexual tourists."

I ran my finger along her firm, tan, breast. "Overwhelmed?"

She repaid the favor. "Even me, I think." She went on for several minutes about the problems of sexual tourism, ending with, "So, it is your job to bring our culture inward."

I smiled. "Let's see. Partnership is not ownership. Let the robots do the work; that's what they are for. If the lower needs are satisfied, the higher needs rise to the fore. Very idealistic. Do people here actually spend that much time on engineering and science?"

"And writing and music and all the arts. We make more patents per capita than Germany."

I touched the local net. Okay, they did, by maybe about a tenth of a percent.

"We have more fun, too." She flowed around me and assumed a position that precluded further conversation.

The problem with exporting their culture, I thought, was that most people would just rather stay here than fight another culture war on Earth.

#

The *Dag Hammarskjold* looked like a 200-meter-wide spinning dragonfly with pods at the end of its radiator wings. It flew 'backward'; the reactors and engines were in the dragonfly's head, and the segmented, despun 'tail' was a train of reaction mass modules surrounding the long access tunnel that kept the rotating part clear of any obstructions when we docked.

Surprisingly, the entire crew made the ten-hundred departure deadline. Two documentary techs stayed in lotus land, but the supercargo were overstaffed, anyway.

I told *Dag* to undock as soon as the access tube was clear.

"Mind the exhaust clears the solar collector," I said, unnecessarily. It did get a nod of approval from Captain Krull, however, who could go on at length regarding how human beings should still be able to fly spacecraft.

The *Dag* reported readiness, Krull got clearance, and I gave the ship the execute order. We backed out to ten kilometers on the steam jets, while the reactors came back up to flight power. Our wings began to glow cherry red and the floors of our life support spheres adjusted to the gentle thrust of our plasma exhaust.

As we pulled away, Ice Chip caught the Sun just right, a wink that reminded us of what we'd left behind.

#

Two weeks before Haumea orbit, documentary team leader Tehn Wan Do addressed his audience in English with a carefully cultivated British accent. The audience was pretty much everyone in the solar system.

Behind him, an image of our destination tumbled ponderously end over end. Time lapse of course; Haumea's four hour rotation rate held the record for planets, but that's still less motion than people can perceive as such, four times slower than the minute hand of an old analog clock.

"It is extreme: extremely small, barely enough mass to achieve hydrostatic equilibrium and planethood; dwarf planethood to be

precise. It's extremely elongated; like a rugby ball. It's covered by an ocean of ice, but only a few hundred meters deep; above solid rock. Robots can only see what they are built to see. We shall now find what the human eye and mind can accomplish on the scene."

As someone who has built and maintained robots, including the spacecraft we were on, I shook my head. The robotic exploration of Haumea had been far deeper than anything people could accomplish. But Earth had been playing second fiddle to the Cislunar Republic in space exploration lately. So we were on an ISA flag and footprints publicity mission: it was almost the year 2100 and no person had yet bothered to place a boot on Haumea. It was an opportunity to point out that in the modern era of orbital towers, a gravity well was not the handicap it used to be.

"Who will be the first human to set foot on Haumea?" Tehn asked. "If that has been decided, we have not been told. There are only sixteen planets around the Sun and only three that have not felt the presence of the human foot. This will be an historic moment. The entire solar system wants to know."

My earchip buzzed. "Wardroom oh-eight-twenty sharp. Disciplinary board."

Chaos! Who was Captain Krull going to alienate now?

Dr. Tehn addressed the Captain formally and only when necessary. Lieutenant Ellison was the only person who made any pretense of camaraderie with the Captain, and everyone knew it was a pretense.

I chafed under his paternalism myself, but kept calm so as not to add to the general malaise. Kari deWalt, on the other hand, seemed to be of a similar mind to the Captain when it came to shipboard things. Formalities could be a defense against dealing with the messiness of relationships and neither had ever gotten anywhere near marriage to anyone, to the best of my knowledge.

I had half an hour to freshen up and slip into a formal uniform and do some research.

#

Captain Krull's victim this time was Biotech Linda Rodrigues. She'd made a still. As chief engineer, I got to sit on one side of the wardroom with Captain Krull and Lieutenant Ellison. Second Officer Lieutenant Leena Diel read the charges.

"Biological Technician Rodrigues constructed a still in her quarters and with said still did produce at least ten ccs of alcoholic beverage in violation of ISA Regulation 2035-143857-B.3.c banning the unauthorized production of alcoholic beverages on ISA spacecraft."

"For the record, how do we know this?"

"You discovered the still on an unannounced inspection on the third of February, 1400 UT."

"Has the output of the still been analyzed and the results recorded?"

"Yes."

"Enter it into the record. Is there any disputation with respect to the facts of the case?"

Rodrigues shook her head.

"Ms Rodrigues?" Captain Krull asked.

"My lawyer has a statement."

"Lawyer?"

"He's on Samios."

Krull sighed. "Let's hear it."

The image on the wall introduced himself and explained that the regulation was intended to keep astronauts safe from amateur distillation efforts which could be poisonous and endanger their health. Since Rodrigues was a Biotech and had made wine and beer before and knew what she was doing, the regulation should not be applied to her.

"Do you have anything more to say on your own behalf?" Captain Krull asked when the lawyer was done.

"I'm from Hawai'i. It would be very good public relations if I continue to be part of the Haumea expedition." She pronounced it Ha-oo-MAY-eh, not HOW me ah.

"Noted. Wait outside while we discuss this. That will be all."

Once the others left, Captain Krull looked at each of us, then asked, "Does anyone have anything to say before I start recording?"

Lieutenant Ellison responded quickly. "Clearly, the harm to the expedition's reputation and morale of carrying this on greatly exceeds any benefit of terminating Tech Rodrigues' experiments, let alone punishing her for them. This is an embarrassment. Since the board has been convened, I suppose we have to do something. Maybe we can create a local licensing board?"

"Noted," Captain Krull said. He then looked at me.

I liked Linda. I'd spent a couple of very sweet nights with her, as had many of the ship's company, men and women. She had a wild streak to her; nobody would ever own her. If she obeyed rules, it was because she thought they were good rules, not because of authority. She'd had lots of cautions from Captain Krull, but she'd never hurt anyone. Now we had to decide whether we could allow her judgment to replace the codified 'wisdom' of decades of spaceflight. No, I realized, that actually wasn't the question, yet; at this point, we simply verified the facts.

"Sir, the facts show that Tech Rodrigues violated the ISAR."

"Yes. I agree. Lieutenant Ellison, do you dispute that she made the still? She doesn't."

Ellison shot him an angry look. "Okay. She made a still. But I don't think the spirit of the regulation was violated."

Captain Krull nodded, expressionless. "Very well, for the record the vote is two to one on the facts."

"Lieutenant Diel, given the finding what is the range of corrective action?"

Diel sighed. "It's a class three violation, with a maximum punishment of dismissal from duties and transportation to the nearest appropriate ISA facility by most expedient means. The minimum is forfeiture of one week's pay, which may be suspended by convening authority."

"Thank you, Lieutenant Diel." Captain Krull was silent for a few moments, then pronounced, "I'm inclined to forfeiture of one month's pay, confinement to quarters for one week, *with no visitation*, and confiscation of all elements of the still. I think that covers us should there be an investigation. I'm not going to put her aground at Samios. She'd take that as a reward. Any comments?"

He stared at each of us in turn. It was clear he didn't want any comments.

Lieutenant Ellison stared back. "On the record, I think that is unnecessarily harsh and detrimental to morale. I recommend the minimum, suspension of the sentence, and ignoring such activities hereafter."

"Noted," Capt. Krull said. He looked at me.

"I might drop confinement, suggest a counseling course on the philosophy of regulation and discipline aboard ISA spacecraft, and suspend the fine retroactively if there is no subsequent violation."

"Probation, in other words. For a first time violation, I might be inclined to agree. But this one has a history and needs to be brought up short."

He looked at both of us. "I need to take your views into account, and so will suspend the forfeiture of pay at the end of the mission given no further violations. I will also take your suggestion," he nodded to me, "concerning the course. It will give her something to do in quarters. We are done, gentlemen."

And that was that.

Linda's jaw dropped as Captain Krull pronounced the sentence, and she walked to her quarters alone, with tears in her eyes.

#

We took station over Haumea's prime meridian one hundred and ten kilometers above the furthest point on Haumea's surface from its center. The landers would go down to the north pole, now in continuous sunlight, a convenience for the documentary team; over much of the dwarf planet, the Sun set every two hours.

You could cut the tension aboard with a knife. The rumor mill about who would be first to set foot on the Solar System's tenth, twelfth, or fourteenth planet, depending on who counts, ground away and Tammy Kling of the documentary crew started a pool. The lead of the documentary team had the best odds, followed by our staff planetologist, then the lander pilot (someone has to check things out first), and even Linda Rodrigues, because she was from Hawai'i and female; the only woman to be first on a planet so far was Ingrid Karinsdottir of Mars. But Linda's recent misadventure lowered her odds.

So we all gathered in the maintenance shop next to the small craft hanger. At precisely 1400, Captain Krull walked in, dressed in EVA gear.

"Quiet please, quiet please," he said and waited for the hubbub to die down. "As you know, this is an ISA mission. It has been decided that, as the senior ISA official present, it is my duty to be first off the lander platform and plant the UN flag." There were several groans and he looked around at everyone as if he expected some kind of challenge. There was none, unless one considered the cynical smirk on Lieutenant Ellison's face a challenge.

Krull nodded. "Landing party, we leave at 1420. Tony, you have the con."

"Yes sir," I said, surprised.

Lieutenant Ellison's mouth became a tight, grim line. We had the same rank and I was senior to him by a year in ISA service, but he was in a line slot while I was technically in a support billet. We both shared watch duty with the Captain; nine-hour shifts with an hour overlap. The Captain was leaving in the middle of his shift; Lieutenant Ellison would have the next one. Perhaps he was simply trying to manage the workload. But as the first officer, Lieutenant Ellison could take it as an affront, and blame it on me.

The first landing party entered the elevator up to the hanger in the zero-g core of the ship in near silence. At the last moment,

someone started clapping, and a couple of others joined in, including myself, for form. It was a feeble sendoff, all recorded for posterity by the documentary group's robocam—the last thing to scurry into the elevator.

I headed for the control room to finish off the remaining three hours of the Captain's shift. Leena Diel sat folded in a lotus position on the Captain's chair, watching the documentary feed on a main screen window and made no move to leave it. I shrugged and took my usual position at the engineering board.

"So Old Rude-and-Rule is going to get himself a planet," she said.

I shrugged. "Orders are orders."

She laughed. "What orders?"

She had a point. If there were any instructions nominating Captain Krull to be the first person on Haumea, we hadn't seen them. Then again, "We don't necessarily see everything. The UN should have made some public statement," I said, "to take him off the hook."

"Off the hook? He has Vesta, Amalthea, Chiron, and Nereid. But nothing big. So I think he wants this. Our captain has a compensatory ego inversely proportional to his stature." She sighed.

"He didn't look all that happy. Maybe he was taking *them* off the hook."

"Fat chance."

Kari deWalt joined us then. The women shared unsmiling glances. Kari thought Diel's area of greatest competence was Lieutenant Ellison's bed, but I'd not noticed either the technical shortcomings nor the sleeping arrangements.

"Best view of the main event," Kari said.

Lieutenant Diel got up. "I'll be taking the second lander down. Time to check it out." She sauntered out.

Not being Captain Krull, I simply said, "That will be all, Lieutenant" softly to her swaying derriere.

Kari stared at me with steel-blue eyes boring into me from

beneath a dome of short steel-gray hair. Her body said she was about thirty, her head said she was about fifty. But her language was of another era.

"You don't have to take that BS, Captain."

I shrugged.

"I'd just love to see Diel bust up an effing lander."

I wasn't sure Diel was out of earshot, so I didn't laugh.

We watched lander one depart. It was basically a cylinder with a bunch of boxes attached here and there, some of which sprouted thruster cones.

They'd been designed all-video; in the command seat, you'd think you were sitting out in open space, except for the windows Captain Krull had put in the lower front. We got the view from the documentary crew's camera bot.

Three hours later, Krull brought the first lander down. From a couple of momentary hesitations, I surmised that he was piloting manually.

The attention tone sounded. "Lieutenant Delgado, Captain Ellison needs to speak to you," *Dag* said. I looked at Kari and she looked back. I was 'Captain', and however 'acting' my status might be, there was only one Captain on a spacecraft at a time. This wasn't good.

Before panicking, though, I tried the simplest thing first. "*Dag*, I have the con."

"That status has just changed. Captain Ellison needs to see you immediately. He will explain the change in status."

"It's an effing mutiny," Kari said.

I held a finger to my lips, too late as it turned out.

#

We were escorted to the wardroom by Linda Rodrigues. She was holding a dart gun.

"Linda, this isn't right. You can't just take over a spaceship in this day and age."

"You can if it's being run by people like you and Captain Krull,"

she said.

"Me?"

"You're part of it. You voted to convict me for nothing. And I thought we were friends."

"I didn't have much choice. You built the still."

"You had a choice. You voted with *him*."

The way she said 'him' made me realize that Captain Krull's morale problem was much worse than I'd thought. But Lieutenant Ellison should have been trying to help hold things together instead of looking at it as an opportunity.

When we got to the wardroom, Lieutenant Ellison sat at the center of the wardroom. Linda took the seat to the left.

"What in the hell do you think you're doing?" I asked him.

"Sit down, Tony." He smiled. "By the way, you're officially relieved of watch."

"Under whose authority?"

"Mine. I have succeeded to the Captaincy under ISA regulation 1.0094-72."

"You can't do that. The Captain has to be found incompetent by a board of officers..." I looked at them. "Rodrigues isn't an officer."

"She is now. Lt. Diel participated as well."

I spread my arms. "He gets to defend himself, doesn't he?"

Linda smiled, very much enjoying this. "He didn't answer summons."

"If you have any questions," Ellison said, "ask *Dag*."

I thought furiously. The mutineers must have somehow compromised the ship's computer. But I shouldn't just assume this. I touched the net. But the *Dag* affirmed the change of command and its legality.

"Sit," Ellison said again, a bit more peremptorily. "You too, Kari."

Once we were seated, he began. "The situation is this. I have replaced Captain Krull under ISA 1.0094-72. Captain Krull was informed of this ten minutes ago by the crew of the lander. As he, unfortunately, did not accede to the regulations' implementation,

he has been detained on the surface."

"Lieutenant deWalt, you referred to this entirely legal and necessary action as a 'mutiny', did you not?"

Kari sat tense as a cat. If there were anything physical she could do about it, she would, but she knew, as we all did, that at the Captain's order, the *Dag* could quickly anesthetize anyone—and it thought Ellison was in charge.

"Lieutenant?"

"I was not fully aware of the circumstances at the time."

Ellison laughed. "And now that you are, you plan to lie low and try the same thing on me." He shook his head. "Give it up. I want your formal concurrence to the change of command."

"There's an 'or else'? What is the 'or else'?"

He smiled at her. "There's no coercion here. You know the former Captain's behavior as well as anyone. Do you, freely and of your own will, agree that his replacement was necessary? While you are thinking about that, I'll need Tony's answer to the same question. Perhaps he will set an example."

Choosing my words carefully, I said. "I know Captain Krull has his faults, but I don't know enough about this proceeding to validate it. There are a number of irregularities..."

Ellison cut me off. "Both of you fall far short of the standard of the complete support I need to run this ship. Wait outside."

"*Dag*," I asked aloud, "are Asimov's laws still in force?"

"Yes."

Ellison laughed. "No, I can't execute you. Now go to your quarters."

#

Ellison gave us and two other 'recalcitrant' crew, a choice. We could be confined to quarters until the *Dag* reached Samios and turned over to the authorities as, technically, mutineers, for failing to accede to Ellison's takeover. Or we could be put aground on Haumea, with supplies, to be picked up later. One of the crew, Commtech Jensen, chose confinement to quarters.

Besides myself and Kari, only Biotech Samuel Levi chose to stay with Captain Krull.

#

They left us with Captain Krull at the derelict robot base on the North Pole in the middle of a crater-pocked field of dusty ice as hard as rock. They took the lander, of course, and our personal comps, leaving us with no outgoing communications.

We had a standard emergency kit with a hemispherical six-person vacuum tent, a field printer-refiner, and a thirty-square-meter roll-up solar array rated at ten kilowatts—which out here would generate about five watts. At least, given Haumea's 287 year orbit, the arctic summer would last longer than any of us would live.

I looked up toward the departing lander, now a blue-violet pinprick with a ghostly tail against a jet-black sky. Distant as it was, the Sun reflecting off the surrounding ice field gave more light than would allow our eyes to see stars.

Sam started rummaging through our rations. "The schlemiel didn't leave us with enough to survive," he said. "Not in this place of no return, this land of darkness and the shadow of death."

I stared at him. The Sun wouldn't set at this latitude for years.

"It's a quote. Job. That guy came out of it okay."

"Well, we aren't effing intended to survive," Kari said. "Too inconvenient. There'll be some kind of exculpatory narrative, with doctored video."

"Kari, Tony, Sam," Captain Krull said, "we are going to do much more than survive. But we have much work to do."

We all turned to him. All kinds of questions went through my head. Was he still in charge? The spaceship was gone. He was Captain of nothing.

"There's 200-watt radiothermal generator at the east pole data node. That was thirty years ago, of course, but it should still be good for 100 watts or so."

We stared.

"Yah, yah, I studied lots of stuff about Haumea before we came here."

"The east pole is about 1200km away," I said. Haumea may be a 'dwarf' planet, but as someone said about Pluto, a Chihuahua is still a dog. "And the east pole is 500km higher than the north pole. We'd have to lift everything up five hundred kilometers!"

"Yah, yah. We have a big mountain to climb. Where I come from we have lots of mountains to climb. But Haumea gravity is only a few percent and it is smooth, yah? Two Charon-sized objects merged and the heat of that melted everything, drove off most of the water but not all. For a while there is an atmosphere and an ocean, which had time to freeze. So it is sea level all over, because of isostatic equilibrium."

Captain Krull continued. "So we build a sled. We build a platform for the vacuum tent, a mast and struts for the array. That," he pointed at the small robot base, "is our mine for stuff to build with. Then we move, while our bellies are still full from the ship. The gravity will get lower as we go."

On Earth, I weigh about a kilonewton. Here, I weighed a bit less than fifty Newtons, maybe sixty in my vacuum gear. The emergency gear was likely another twenty or thirty.

Sam perked up. "We do have to move. Except for the base, there's nothing but ice around here to feed the printer and not much power. We'd starve after the rations are gone."

That would be the big problem. Our skin-tight suits powered themselves from our motions moving fluid through their capillaries, as well as the temperature differential between our bodies and the 30 Kelvin or so radiative temperature of the surface. But our bodies had to be fed to power our suits.

"Yah. There's some bare rock at the east pole. So you'll be able to feed the printer some real regolith."

"If that field printer eats regolith," Kari said. "Okay, I'll check it out."

In spite of myself, I started thinking about the engineering

problems, too.

We explored. There was a generator; its hydrogen fuel supply was long gone, but maybe we could crank it by hand. Some of the batteries worked. There were some hollows and cracks in which some dust had collected, and the ice itself was slightly dusty.

That night, we slept in the vacuum tent, a hemispherical thing with a frame on the bottom to make it flat. One inflates the sides, goes in, seals the opening and pressurizes the rest; a quarter bar, mostly oxygen, some nitrogen. To get out, you need to pump it down, but complete vacuum is hard to achieve with the field pump; we lost some air on every cycle. Modesty consisted of sleeping bags, or looking at the wall. We had a glorified chamber pot.

#

The next day, Kari got the printer to eat dust. Its refining operation was partly exothermic, so it didn't use as much of our scarce power as it might have otherwise. But that power had to be split in a delicate balance of printing toilet paper and printing anything else. Speaking of the TP, I can tell you from personal experience that the difference between 5% and no gravity matters.

We built the *Ernest Shackleton* in six days. Its mast, yardarm and runners were salvaged from pallet supports. Haumea has one of the highest albedos in the solar system, and we doubled our effective collecting area by tilting the array down slightly. We salvaged some batteries. Every Earth day, we recycled oxygen, printed some sugar, protein, and some TP; supplies went down, but not too rapidly, Sam thought.

Captain Krull drove us hard, but there was a certain exhilaration to it. We made sixty or so kilometers every day.

Navigation was simple. The east and west pole stations had launched data tethers—strong fiber-optic lines—to the poles, which were out of view to the satellites. The data had flowed overland to the dishes on either end of Haumea. We followed the data tethers.

#

Grunt, pull. One's mind drifts while man-hauling a sledge. A few hundred kilometers below me might be a lake. I thought of fish and swimming East.

After six hundred kilometers south, we got short nights every four hours.

We came up against an exception to flatness. Pressure, apparently, tipped a huge hunk of the ice crust up about four meters, creating a wall that ran east and west to Haumea's horizon.

Captain Krull nodded. "That big impact near the east pole broke off the moons. That all happened, what, a billion years ago? Haumea continues to lose angular momentum to its moons, and the ice slips toward its center faster than the rock. So we get pressure ridges, like this."

The *Ernest Shackleton* massed maybe twenty tons—only a couple of kilonewtons.

It was my bright idea to lever up the front end to the top of the ridge and just push it on up and over. That would save time, and we were all tired. Captain Krull frowned and looked at Kari. Kari frowned and looked at me.

"If it doesn't go, we can always unload and lift it that way."

"Yah, yah, okay."

We stood two on a side, a bit forward. If we got the center up and dipped the back, the front runners ought to just clear the wall.

It worked just like that, and we were congratulating ourselves when Kari simply went limp and slid slowly to the ice, under the runner. The sled started to slip back. Captain Krull and I were on the other side of the sled and Sam was looking in the other direction at the lip of ice beginning to give way.

"Sam," Captain Krull said, calmly but urgently, "Kari has fallen. Get her out from under the runner."

Sam turned, and it was a race. I moved as fast as I could to the

back of the sled and tried to halt its slide, while Captain Krull ducked under the runners and tried to lift from below. Sam got Kari out while, in slow motion, the sled made a mockery of the Captain's effort to clear two kilonewtons overhead.

The runners had some clearance, but I could not remember how much.

"I am okay, Tony," the Captain said. "It's tight and you will probably have to dig me out. But see to Kari first."

She was non-responsive. By virtue of his biological training, Sam was our doctor, but this was way out of his comfort zone. He stood frozen.

As a ship's officer, I had some EMT training, but in this era of robots, hand comps, and so on, I hadn't taken any of it too seriously.

"Where's the med kit?" I asked, thinking that a place to start.

"Is she breathing?" Captain Krull asked, in gasps, from under the sled.

I couldn't see any evidence that she was. Maybe...some slight fogging on her faceplate. Not enough, I thought.

CPR? I could do the 'C' part from outside the space suit. Then my eye caught her suit air controls. Maybe that could take care of the 'P' part; I turned the oxygen up to max. I spread her out and pushed down hard on her chest, I hoped not too hard, where I thought her heart was. A bit faster than once a second, I remembered. I did this for about twenty seconds and was rewarded by more fogging of the face plate. Her eyes opened, but she didn't look good.

"My gut, I want to puke. My back is killing me."

In 5% gravity? Sam showed up with the med kit. It wasn't sealed and its comp had been removed. Among other things, it was a long range communications device, of course. But it was also the brains of the kit. I looked at its contents; right near the top were smart caps of aspirin and cardiol.

Heart attack? She didn't complain about chest pain, but when all

you have is a hammer, everything looks like a nail. The space suits have a passive oral lock built into them. I put the cardiol and aspirin in, closed the cover, and continued compressing as the tube found its way into her mouth.

That was everything I could think of or remember to treat a heart attack.

For whatever reason, after a few anxious minutes, she began to breathe easier.

"Hang in there, kid," I said. "I'll be right back. Sam?"

Sam came alive and followed me to the back end of the sled.

"Captain, if we lift up the back, can you wriggle out?"

"You'll need to hold it up about five seconds, Lieutenant," he said.

I looked at Sam. He seemed puzzled for a moment, then nodded.

"Okay. One...two...three." Up the back end went. Easily at first and then my muscles started to burn.

Captain Krull shot out from under the rear in much less than five seconds.

We all got back to Kari, now sitting up.

"Geeze, what hit me?"

"We don't know," Sam said, "but we treated you for a heart attack, and you're still with us."

"Heart attack?"

"We're guessing. They vanished the kit's med comp. What did they think they were doing?"

Captain Krull interrupted. "To the problem at hand. Women having different symptoms for heart attacks, yes?"

"Oh, of course. How old are you, Kari?"

"I'm sixty-three. I know... I guess I can't fool Mother Nature forever."

Sixty-three, and she'd been through three weeks of backbreaking labor on short rations with inadequate sleep in not enough gravity for circulatory health.

"My sincere apologies, Lieutenant," Captain Krull said. But, in contrast to the formal words, he knelt down by her and took her hand and held his helmet next to hers. What he said, off radio, I will never know.

The Captain stood and gestured to the *Ernest Shackleton* with its nose against the four-meter ice wall. "The three of us will have to take care of this the hard way. In an hour, it will be night. We should have all the cargo above the wall by then. Then we rest, then heave the frame over when again it is light."

We managed, just barely. The pinprick sun vanished from the near airless sky as if cut off by a shutter. Then, more slowly, our eyes let us see the stars.

#

The ice wall was but the first hint of the much rougher terrain leading to the meridional pole. But the gravity was much lower. After another day of sledging, we discarded all the ballast, rails, mast and solar yardarm. That left about a ton of mass—two-hundred newtons of weight. We simply lifted the remaining framework, with Kari on it, and carried it the remaining hundred and twenty kilometers to the pole.

The last fifty kilometers were more rock than ice, and jagged, fractured rock at that, showing little of the expected space weathering.

"It's been uncovered in the last million years, maybe," Captain Krull said. "Maybe our time scale is wrong. Or the moons have found new games to play. Chaos is like that."

"Life is like that," Sam said. "Long periods of steady, sane, stability, and then it all goes to hell."

Later, when by chance, we were alone in the tent, making a minor repair, Captain Krull touched my arm. "I do not pry into crew files. I know their qualifications and assignments. The rest I left to others whose job that is. I now regret that I had not looked deeply into Lieutenant Ellison's file; there may be nothing there, but I did not look. And I did not look into Lieutenant deWalt's file."

"You had visions of a relationship?"

"Yah, yah, something like that. I am forty-eight years old. She is sixty-three. God laughs at our visions."

I did not share my own visions of Kari, and I was thirty-two.

#

The next day we reached the east pole station and found it had been vandalized. That wasn't totally unexpected; the lack of communications meant that some thought had gone toward our demise, and there was a bright new crater next to where the big telemetry dish had been. There was another impact near the site of the radio thermal generator, which was also missing.

Two storage sheds at the South end of the facility seemed intact, however.

Captain Krull pointed to them. "Let us see what we find. Since this base had no people to maintain it, and robots were primitive, they relied much on simple redundancy."

The result brought the first grin I ever remember seeing on Captain Krull's face. "My enemies do not research well. We have an intact backup radiothermal generator—150 watts. We can stay here a while."

#

Sam enlisted my help in collecting regolith and organic salvage for the printer. It drew about a kilowatt. With a lash-up of batteries and power conditioning, he could run an hour for every ten that the RTG was on, with an allowance for other power needs.

Keeping us warm was not one of them. There was only a trace of nitrogen and argon around us.

"Think of living in the world's biggest thermos bottle. As long as we keep our floor above the rock or ice, our problem is not getting warm, it is in losing warmth by radiation at the same rate we generate it," Sam said. "But, we're still in trouble. 150 watts still isn't enough and I can't print all the food we need."

"How much power do we need?"

"We burn about 100 watts each from food and air. Even with the

most efficient technology, we'd have to gather about twice that from the Sun or nuclear sources. We need better than a kilowatt, probably two. And that doesn't even address the nutrition problems. I can do sugars, simple proteins, some vitamins...but in a year we'll start falling apart. We're toast"

"So we just give up? We're toast so why bother?"

Sam shrugged. "Eh? Not yet. I just need to kvetch a bit."

Tiredness and fatigue kicked in for me. "Sam, I am getting a little tired of being everybody's kvetching board! Do I have a sign on my head that says 'tell me all your troubles?' Do I look like a shrink?"

"Actually, you and my uncle Benjamin could..." He must have seen my face. "Sorry."

"It's okay, Sam. Just not now."

#

A week later, we all met in the pressure tent. It stank, but it was good to be out of our airtight space underwear.

"We can't survive on 160 watts," Captain Krull said.

Kari nodded. "But how about 310 watts? I'll bet there's another one of these on the west pole."

Kari was returning to her old spunky self, as long as she didn't push herself. Back in civilization, she'd be fixed up good as new in a fortnight. Here, she might drop dead tomorrow.

Sam shrugged his shoulders. "It wouldn't do it."

Captain Krull nodded. "We need to call for help. There's enough metal around that we can build a big dish, and we can use the batteries to provide the power for a brief burst."

That sounded good to me, but Kari spoke up. "Sir, Ellison thinks he's finished us off. As soon as he finds out otherwise, he'll come back to finish the job. He has to. Either that or try to leave the solar system."

"His hatred is that much?" Captain Krull asked, softly, with what seemed a sense of wonder in his voice.

"It's beyond hatred now, Captain," Kari said. "He's burned the

bridges, he's staked himself out, he's painted himself into a corner, crossed the Republican."

"Rubicon," Sam said.

"Rubicon, okay, whatever. If he's found out now, he'll go to prison forever. They all will. So they will come back first and make sure we aren't talking."

"Yah, yah. So, we need to be elsewhere. For that we need more power."

"Can we convert the RTG's to actual reactors?" Sam asked.

I shook my head. "They use the wrong kind of fuel, plutonium 238. It won't sustain a chain reaction."

There was a long silence. "Maybe we have enough for one or two of us to make it," Kari said. "I've had a long life..."

"Quiet, Lieutenant!" Captain Krull snapped.

"Captain, we have to face..."

"I SAID QUIET!"

We sat in shocked silence. Kari's heart! I thought.

Captain Krull was oblivious; he had gotten his silence. "Now, we *all* make it through this or we all die. So, unless you propose a mutiny within a mutiny, that is the way it will be. My will is that we make it. Is that understood?"

There were tears in Kari's eyes, the one person in all my experience who had actually liked Captain Krull, or perhaps more than that. He had struck at her like a snake with perhaps as much forethought.

"Very good. Now, I know where there's a two-megawatt reactor," Captain Krull said.

"Huh?" we all said.

"Where?" I asked.

"Namaka."

Namaka was the inner satellite of Haumea.

"That is where the mother ship for everything on Haumea ended. It disassembled itself, of course, but its propulsion reactor should still be there."

"It may as well be on Earth's moon," Sam said

Captain Krull frowned coldly. "Not your field, is it, Sam?"

"No, uh, sir, but I know we'd need a rocket to get there."

"Oh?" Captain Krull stared at him in a way that made me very glad he was not staring at me. That would only be a matter of a minute or so, I realized, and I was thinking furiously.

"Oy vey. Captain, it would take months to make enough rocket fuel from the power we have, and by then we would be all dead. So unless you have some kind of Indian rope trick up your sleeve..."

"In a way," Captain Krull said with a glimmer of a smile. "That is very much what I have in mind."

Of course! The rope trick! Our position was ideal for an orbital elevator. Haumea rotated so rapidly that its synchronous orbit was only a little ways above the elongated poles. But how would we get something even a couple hundred kilometers up?

"The mission is very redundant. For almost everything, there is an unused backup. Look for spare data tether launchers."

#

A days search found two unexpended launchers. I pointed them straight up, and got one of them to work, giving us a twelve-hundred-kilometer orbital tower under tension. We printed out a tether climber—well, actually, a clothes wringer, from the emergency printer-refiner's eclectic library; the same machine might have ended up in an emergency somewhere in Earth's tropics.

"Remember always," Captain Krull said at being shown the device. "Once it is built, what a piece of equipment was *designed* to do matters not. What matters is what it can do."

We modified the *Ernest Shackleton* by adding pressure tanks to the frame, for crude cold gas maneuvering rockets.

All of an orbital tower, of course, rotates at the same rate as the planet to which it is attached. Beyond synchronous orbit, everything on the tower moves faster than orbital velocity for that

altitude. It took three excruciating days in shifts to crank ourselves by hand up out to where our velocity would get us to Namaka. That was at 394,661.42 meters above Haumea's east pole. I think I will remember that number the rest of my life. I had to work it out five times on my suit calculator before Captain Krull was satisfied.

We spent several days hanging at 1.3% of an Earth gravity, with Haumea overhead, getting our position on the tether exactly right and waiting for Namaka to be in just the right place to let go.

#

This leap of faith resulted, five days later, in a half-meter-per-second crash landing with dry gas tanks—but the harpoon on our underside stuck into Namaka's ice and caught us up before we bounced away.

We found the main reactor, pretty well exhausted.

We found its backup, essentially untapped.

Our last ration bars were consumed as a feast when we got it on line. The robot base station had a printer-refiner as well, much more capable than our emergency version. With Sam's help, it could print vitamins.

Kari, bless her, found a way to 'talk' to the base computer through our suit helmet displays. It was dumb in the ways of humans, but she could teach it some tricks.

I found the discarded base ship's engines. They were useless junk.

Sam found some plasma ice boring tools still attached to defunct construction robots. He thought they'd greatly reduce our ice-chopping labor.

"Those shoot out hot hydrogen plasma, with magnetic fields focusing it into a tight stream, right?" Captain Krull asked when shown the borers.

"Yes, sir, that's how they work."

"How fast is this plasma they shoot out?"

Nobody even thought to suggest to Captain Krull that they

weren't designed to be rockets. At this point, we were following him on faith and the force of his bullying personality.

After a couple of days of clever testing, we found their plasma exited at six to sixteen kilometers per second, depending on how fast we fed them water. They didn't make really great electric rockets; their efficiency was low. But they were much better than cold gas, and could get us to Samios in about six months, if we took enough ice.

So the *Ernest Shackleton* was reborn as an interplanetary spacecraft. Imagine a ladder spinning about its middle with its rungs parallel to its intended direction of motion. I lashed the reactor and generator from Namaka to one end of the ladder and our vacuum tent at the other and stuck a ball of ice, ice mining machine, and the torches in the middle. Radiator panels covered the ladder from the center to the reactor, and the solar array, all ten watts of it, filled in the rungs on the other side.

We could conceivably make Samios on short rations, but our plan was to fabricate a communications system and call for help once we were well away from Haumea.

None of us had ever made a radio, but we all knew in principle and had several low-power systems to cannibalize. We mainly needed an amplifier.

"There's probably a robot comm unit in the printing file, if I could find it," Kari said. "But the printer memory isn't designed to be searched..."

Captain Krull's head spun instantly.

"Maybe something else will work," Kari finished softly.

We could print Sam's organic molecules, because he knew where every atom in one of those things belonged. A radio amplifier was different.

I told them what I remembered of the subject, which wasn't much. The earliest such things used something called vacuum tubes.

"Okay, that sounds good," Captain Krull said. "We can print the parts. We'll have weeks in which to experiment. At least the vacuum part of a vacuum tube wouldn't be a problem."

Captain Krull laughed at his joke.

Sam and I laughed nervously too. Kari kind of smiled, but there was a tear in her eye.

Then something quite unlikely happened. Captain Krull apparently noticed the tear, and said very softly, "Yah, yah. Sometimes things, they get so tense one must laugh or cry. For me, I had better laugh." He looked around at all of us. "You must not see me cry, yah?"

#

We didn't quite have enough thrust to lift off of Namaka. With Kari handling the cold gas thruster valves, the three of us men got upside down below the ship and with our feet securely gecro'd to the girders, we pushed the little moon away from the *Ernest Shackleton* as hard as we could. That, we figured, should give us about ten meters per second up to start with.

Without radar or anything like it, it was hard to tell how successful our maneuver was and Kari kept her hand on the gas thruster controls. But once we were about four kilometers up, we seemed to draw away. At about three and a half hours, Captain Krull figured that we'd reached escape velocity. Judging by the change in size of a crater below.

Navigation was simple. We found Ice Chip, blinking brightly every three hours, with a salvaged robots' camera. This far out from the Sun, any interplanetary trajectory is close to a straight line, so we just pointed at it.

Which was almost our undoing.

"Up! Everyone! Keep the lights off!"

I groaned and opened my eyes. A few red equipment diodes provided enough light for my dark-adapted eyes to see Kari rapidly shove herself into her dirty spacesuit.

"What is this?" Captain Krull asked.

"They are coming to kill us, I think," Kari said, as if reporting the unchanging outside temperature.

Captain Krull abandoned the modesty of his sleepsack for the tent window.

"Toward Samios," Kari said, handing him the camera, "it's very, very faint, but it's blinking every forty-five seconds."

I sat up. The *Dag* normally rotated every ninety seconds, but it had two outboard hulls.

"Suits, everyone," Captain Krull said. He said it unhurriedly, but there was tension in his voice. "Tony, you will have to take down the reactor. Kari, kill the plasma thrusters, god help us they will start again. Then kill our spin and keep us pointed at that blinking thing, wings edge on. Sam, start pumping the tent down, then get your suit on."

"Oy vey, first things first," he complained but moved quickly to the tent controls.

Pumps soon started whirring. It would take about ten minutes to get the tent down to a millibar; we'd dump the rest of the air. I concentrated on getting into my suit; I can't breathe a millibar.

I didn't have to ask why to take down the reactor. The radiator was an infrared beacon. But it would take an hour or more to get everything down to merely room temperature. It would still be noticeable at 300 kelvins, but not a beacon. Our only real hope was that they wouldn't look in our direction, or at least wouldn't be expecting to see anything.

"You all know what you have to do," Captain Krull said. "Radio silence from now on." His voice was starting to get a bit tinny. He put his helmet on.

The reactor take-down required turning valves on the center end of the radiator. We hadn't taken time to automate that; except for Kari, we hadn't expected to have to go non-critical. One would not normally go outside alone, but this was decidedly un-normal. Despite the rush, I took extra care to keep my carabiners on the frame as I moved up to the center.

The ice-mining bots had done a pretty good job of hollowing out our fuel iceberg; we were very near the turn around, with only a third of the ice left.

The engines and the radiator controls and the power supplies all sat bolted to a metal grid salvaged from the floor of the utility shed on the east pole. The spin gravity was almost negligible this near the spin center. I brachiated over to the reactor controls and hit the scram button. At the end of the other wing, drums rotated, neutrons were absorbed, and the reaction went subcritical.

Now I had to cut the radiator flow off at just the right speed. Too fast and the reactor core would melt. Too slow and the working fluid would freeze up in the radiator pipes. There was no manual on this, but I knew it would take one point five rotations to close each valve. I settled for a quarter rotation every five minutes, and hoped.

Kari kept our 'nose' pointed at the *Dag*, minimizing the radiator exposure. This put me on the other side, unable to see our adversary for all the ice in between us. Turn the wheel.

Not moving, I started to get a bit chilly. I touched my toes about twenty times to build up some heat.

Turn the wheel.

The plasma torch...it would run for a few minutes on batteries. Long enough to cut the old *Dag* to shreds. It would take just a few minutes to unbolt them.

Turn the wheel.

The men and women aboard her had been coworkers, friends, and in a couple of cases lovers. All their lives, for mine? Could I do that?

I looked at the beast. It microwaved water into atomic ions and directed the exhaust with magnetic fields.

I nearly broke radio silence then and there.

Instead, I turned the wheel. Nuclear gods must be served.

In reality, I did not have to wait long. I was joined by Captain Krull and the others; we would wait out the closest approach in

the ice shell. We would not be able to see them, but they would not be able to see us. The deflated tent might make them think the best (for them) had happened.

I put my helmet against Captain Krull's. "The plasma is heated by microwaves..."

#

The *Dag Hammarskjold* missed us by no more than two hundred kilometers on its return to Haumea. For all we could tell, its remaining crew remained blissfully unaware of our existence.

We cobbled together a radio, modulating one of the torch microwave heaters and, about a hundred days out from Namaka, I called Thera.

"You get to call your girlfriend," Sam said. "I should be so lucky, I should be so lucky."

Captain Krull laughed for the first time that I remembered since his 'trial.'

"Sam," I said, "she's a cop."

Then Captain Krull reached over to touch Kari. "We will make it now, I think," he said.

After a long time, without smiling, but relaxing ever so slightly, Kari put her hand over his.

"Yah, yah, we will make it."

#

The relatively huge, beam-boosted Cislunar Republic Spaceship, CLRSS *Elizabeth Reynolds* came up behind our ramshackle vehicle. It was a sleek, tri-hulled, ring-winged construction, obviously able to use an atmosphere, if available. My mouth watered to see it.

"So, we are rescued by our enemies," Kari said. "We could have made it to Samios."

"Yah, yah. But this situation has its own definition of friends and enemies," Captain Krull said. "Politics aside, we are all spacefarers. We live by doing things right. Stow everything properly, as if we are to come back."

"I should live so long," Sam said. "I should live so long."

But he tidied up, tethered down, shut lids and closed valves just like the rest of us. Someone, Captain Krull must have thought, would come back to the *Ernest Shackleton* and judge him by what they saw. Whatever his faults, they would see Captain Karl Krull's determination in this ramshackle ship. They would see the discipline that held us together and alive for two months. I had no problem with that, but I hoped that a few years in vacuum would ensure that in some distant future, they would not judge us by what they smelled.

I powered the reactor down again, but our rescuers were still very careful. They came in from the front along our spin axis, matched our one-sixth-g spin rate and grabbed our 'ladders' with a couple of robot arms. Thus secured, they sent a pinnacle, which dropped lines down to our tent. We emerged, and allowed ourselves to be drawn up and aboard the small tubular craft.

Once aboard the '*Lisa*', we made use of the facilities in the locker room immediately next to the airlock. The joy on Kari's face lit up the whole room. Captain Krull had somehow managed to keep a clean, lightweight ISA coverall with him throughout the entire ordeal. The rest of us made do with ill-fitting CLR utility coveralls. Only then did we accede to meeting our rescuers.

Captain Duluth, a short, muscular woman of about seventy years, received us with full honors. Then she had a private meeting with Captain Krull while the rest of us enjoyed recounting our tale to the crew of the *Lisa* and getting caught up on the fate of the mutineers.

Which, to this day, is unknown. Their stay at *Samios* was brief; Thera hadn't been fooled by Krull's trial and scheduled their big interferometer to check out the site of the 'crash,' that had supposedly killed us. Before she could, Ellison had dumped the documentary crew and headed out again on a 'rescue' mission. The *Dag* is still out there, somewhere.

And needs to stay there for the rest of their lives. Tech Jensen was not on the ship when it arrived at *Samios*.

Captain Krull asked Captain Duluth if he and Kari could take the *Ernest Shackleton* on into Samios, after suitable repairs. Saner heads prevailed, however; fix it up as one might, the *Ernie* was not to be considered spaceworthy by any reasonable standard. Kari actually seemed more disappointed than Captain Krull.

We had our final meeting on Samios, after all the interviews, the trial—some of the documentary crew had participated in the mutiny—and the wedding. I kissed the bride, for the first and only time in our two year long and all-too-intimate relationship. We had shared a chamber pot in a vacuum tent, a circumstance that did not encourage any other kind of nether sharing.

Unless, of course, one is hopelessly smitten. In a rare example of diplomatic ice-thawing, Captain Duluth married Kari deWalt and Karl Krull. They headed inward; him to take charge of a prison in the Earth-Sun L1 orbit, she to be its chief engineer. Media hero or not, Karl Krull had lost a very expensive spaceship, and the ISA did not want any unlucky Captains. He would never command an ISA spaceship again. But no terrestrial before the merger of the CLRSS and the ISA into the Interplanetary Administration would ever come close to his legendary career.

I stayed on Samios, recording this, and waiting for an opportunity, perchance, to salvage the *Ernest Shackleton* when it bullets by the big space colony.

Sam decided to stay with me a while. He dreams about building an even more remote space colony around Proxima Centauri, a new promised land too far from terrorists and tourists to worry anybody. At a tavern on a river leading to the equatorial sea of Samios, he hoisted a glass to Thera and me.

"To Captain Krull, who saved our lives and our honor. Nobody else could have got us off that planet, made us make that spaceship, and gotten us back to civilization alive. And I should live so long as to ever be within an astronomical unit of him again."

I had to laugh and raise my glass to that.

-- end --