



Illustrated by Vincent DiFate

Europa's Survivors

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Cassie stared out the tiny portal of her space capsule, awed by the ever-changing view of Jupiter's banded clouds. The stripes, static in photos, slid past each other in opposite directions, spinning hurricanes between them.

The storm ovals, like the eyes of wicked children, pretended innocence by coloring themselves baby blue and soft pink. Only the ancient red spot boasted of its power, thrusting its caustic ammonia and acetylene fist a full twelve miles up into the face of heaven.

The fiery Io fled past below Cassie's ship on its speedy inner track around Jupiter. Though some called it the "pizza" moon, Cassie thought it was more like a rebellious teen wearing garish colors and spitting sulfurous kisses to shock her royal father.

In a slightly higher orbit than Io was her smaller, younger sister moon and Cassie's destination: Europa. In contrast to Io's pimply, blotchy looks, Europa's "face" was breathlessly white and smoother than any surface in the entire Solar System. Gold-colored arteries appeared to pulse beneath her pale skin, not that different in color from Cassie's own. And like Cassie, Europa appeared frozen in a timeless struggle for survival, for recognition, for her existence to have meaning.

"Neep, neep," a caution alarm sounded. Text and a timer appeared on her heads-up display. A

robotic voice announced, “Powered descent initiation maneuver in 5, 4, 3, 2 . . .”

Cassie barely felt the spacecraft flip end over end, placing the engines toward Europa and firing to slow her down. The gel that encased her, like Jell-O hugging a piece of fruit, absorbed the motion. The gel had also absorbed most of the deadly protons trapped in Jupiter’s magnetic grasp during her long fall from higher orbit. An IV had provided nutrition and kept her safely sedated until this last half hour.

“Maneuver complete,” the ship announced. “Arrival in twelve minutes.”

After the months-long journey on the high-speed cycler from Earth, Cassie was anxious to finally reach Europa. Her research on radiation’s effects on bacteria had interested one of the world’s leading space biologists: Dr. Lee. He’d discovered a unique bacterial colony under Europa’s ice and asked her to join him in studying it. But part way through the application process, her juvenile cancer had returned. After her terminal diagnosis, Dr. Lee convinced the International Science Institute that sending a cancer patient to Europa actually made economic sense since she only cost them a one-way trip and no expensive life insurance policy. So here she was.

As she descended, the white arc of Europa’s horizon came into view. She followed the data on her heads-up display. The computer announced, “Radar contact with Europa Base. Altitude 39,200 feet, velocity minus eighty-nine feet per second. Arrival in seven minutes thirty-eight seconds.”

Cassie scanned for the “power” towers that provided Europa’s electricity. The towers acted like giant lightning rods harvesting the abundance of charged particles trapped by Jupiter’s magnetic field. Some of those same charged particles now sped through her body wreaking havoc on her DNA, despite the gel. She’d had to sign a waiver saying she accepted that this journey increased her risk of developing cancer by 5 percent. What, she’d joked, to 105 percent?!

The “lightning” in her eyeballs caused by energetic protons was somewhat distracting, though. Like the afterimages of camera flashes, she saw their “jet” trails in the fluid of her eyes. She closed her eyes and imagined the lights as fireflies winking in the woods behind her grandparents’ farm in Michigan. Her only real concern was that those energetic ions might be creating more work for her already overworked immune system.

With Europa on the sun side of Jupiter currently, the near side glowed with its reflected light, creating a lovely golden cast to the surface.

“High gate, altitude 7,515 feet, velocity negative 145 feet per second. Surface impact in three minutes thirty-eight seconds.”

From the training sims, Cassie remembered that high gate meant final approach. Surface gate meant punching through the thin layer of ice that grew over the well shaft that led to the underwater base. If the ship’s targeting were off and missed the hole, she’d crash on the surface. She’d probably get a lethal dose of radiation before a robot could be sent to rescue her.

“Low gate. Altitude 668 feet.” Cassie could hear the thrumming of the engines fighting to slow her down, though the acceleration was damped out by the gel. “Velocity slowed to negative twenty-two feet per second. Impact in one minute forty-eight seconds.”

She saw on her display that the navigation had let her fall faster than in the sims. She’d hit at five feet per second instead of three. Radar must have determined that the ice covering the shaft was thicker than expected: probably because the ice miners hadn’t launched a shipment recently. She’d brace herself except that she couldn’t move. During the final flip over maneuver to point her feet-first at the target, she glimpsed the spike of a power tower and the bulbous shape of its utility building.

“Impact in five, four, fist deployed, two, one.”

Wham! The “fist” penetrator hit the thin ice on top of the drill hole, punching its way through to the black water of the shaft. Water shot past her window in a white froth, boiling into the vacuum of space. Soon she was engulfed in blackness darker than a moonless night.

Even through the gel, Cassie felt the high-speed impact. Then a siren blared as the ship rocked violently sideways.

“Alert! Stress limits violated. Compensation maneuver initiated,” the computer announced. Cassie heard the jets pulsing to straighten out her descent. She must have entered the shaft off

center, or else the ice cap had been thicker on one side. She hoped the damage to the ship wasn't significant. It was supposed to be someone's ride out. "Impact alert!"

Though Cassie felt only vibrations, encased as she was in gel, her heads-up display lit up with hull stress warnings. Apparently, her entry had been too far off center and she'd hit one of the pumps mounted along the vertical sides of the shaft. The base needed these pumps to circulate the water and keep the shaft from freezing shut. "Contact with Europa Station established," the computer said.

"Europa Control to *Tà xi 34*," a male voice stated. "We show you coming in hot, trailing some debris. Do you need docking assistance?"

"Europa Control," Cassie replied and identified herself, "*Tà xi 34* here. Got some stress warnings, but auto systems still green. I think I hit one of your pumps."

"Roger, *Tà xi 34*, pump 3 is offline. Standby for docking instructions. Oh, and welcome to Europa! Control, out."

Cassie smiled, wondering who was behind the friendly voice of Europa Control. A trajectory map appeared on her heads-up display. The station was tucked quite a distance away from the vertical shaft to protect it from chunks of ice thrust down by rockets like hers breaking in. She noted the lights marking the pumps that circulated water in the shaft were now changing status from red to green as she passed them.

"Docking initiated," the computer announced. The blackness outside her window changed to a murky green from the docking lights that helped guide her ship to a pressure lock at Europa Station.

A few moments later, the computer announced that docking was complete.

As part of the post-docking process, the gel encasing her was heated, melted, and sucked into a holding tank for reuse. The IVs disconnected from portals on the wet suit that covered her from neck to toes. Her body now rested lightly in the low gravity on a solid foam "bed." She pointed her toes and flexed her fingers, all the movement she could do in the confined space.

"Equalizing pressure," the computer said.

Her body ached at the slight acceleration as her "coffin" slid into the airlock chamber and jerked to a halt. "Pressures equalized." Cassie called Europa Control for permission to open the hatch.

"*Tà xi 34*, you're cleared to disembark," the operator said. "Name's Olsen. I assume you're our new postdoc, Cassiopeia McGarity?"

"Yes, sir," Cassie replied. She remembered from the roster that Greg Olsen was assistant chief engineer, a graduate of University of Alabama, and about her age. "But you can call me Cassie. It's good to finally get here!"

"Yes ma'am, this place is paradise compared to a cyclor—and Doc Lee says y'all's bringin' us some hot peppers for the greenhouse?"

Cassie smiled as the man let his Southern accent really come through. Dr. Lee had said the best gift she could bring the miners was a new food they could grow, and she wasn't about to live the rest of her life without her favorite TexMex! "Yes, sir, I brought maroon hot peppers, compliments of the Texas Aggies!"

She heard laughter over the loop. "Only Aggies would grow maroon peppers. But maybe you can mutate them to a nice Alabama red for me?" the man replied.

Now it was Cassie's turn to laugh. "Shouldn't be too hard since maroon and crimson are pretty darn close."

"That'd be real sweet," he said. "Doc Lee will be waiting for you just outside the airlock hatch. Wish I could join him, but unfortunately, I've got to track that debris your ship went and stirred up. But do come by Ops and say howdy soon as you can. There's a little kitty waiting for you to come claim it."

Cassie had worked with Engineer Korkin to customize her animated friend, or "mate" as their Australian inventor called them. Because there was no full-time physician on Europa Station, animates were programmed as medical monitors and caregivers.

"Thank you, Chief Olsen, I look forward to meeting you and my animate," Cassie replied. She'd

already chosen a name for her robotic kitty.

Cassie voiced the commands to open her container. A slit of light appeared to her left as the cylindrical door popped up and then slid to the right, hugging the outer shell of the coffin. Cassie pushed a control near her right hand that raised her to a sitting position. A sharp pain shot down her spine to her tailbone, and she inhaled a shallow breath. At least she wasn't nauseous, the first sign of radiation poisoning. She actually felt pretty good, considering.

She reached up and twisted her helmet, unlatching it from the neck ring. She wrinkled her nose at the smell of sulfur in the air. The water here contained a fairly high concentration of sulfuric acid, and Dr. Lee said the filters weren't able to remove it all from the water the divers tracked in. He assured her the air was safe to breathe, and she'd no longer notice the smell after a day or so. Yuck! She hoped that was true!

She planned to surprise Dr. Lee with a greeting in his native Chinese. She'd rehearsed how to say, "Hello, how are you," whispering, "*Ni hao, ni hao ma.*"

Moving slowly and carefully in the low gravity, Cassie remained seated while she peeled off the wet suit and put it back into the coffin. She pulled a duffel bag from a compartment by her feet. Most of the bag was filled with her precious pepper seeds and a special nutrient mix for them. But she also had a few clothes, toiletries, and art supplies. She put on underwear and a sports bra, though she hardly needed a bra in this low gravity. Then she slipped a dark green long-sleeved shirt over her head, and pulled on some navy blue pants. She wrapped her comm "bracelet" around her left wrist and tapped the screen so it would automatically synch up with Europa's network.

She nabbed her comb and fluffed her red hair. She then dug out her collapsible cane. She didn't want to risk falling even in the low gravity. The cancer had done enough damage to her bones already. She threaded her arms through the duffel straps so it rested lightly on her back, then she shook the fiberglass cane out to its full length and wrapped the strap around her right wrist. Holding onto the side of the coffin, she let her bare feet slide to the floor.

The floor was pleasantly warm. When she stood up, all the blood ran from her face, and she nearly fainted. Seeing herself in the wall mirror, she thought she looked like a fair imitation of a zombie, bloodshot eyes and all. She smiled, wondering how to say, "I want to eat your brain!" in Mandarin.

She walked a bit stiffly to the hatch. She pressed the button to open the hatch to the hallway that would lead to the main chamber of Europa Station.

Dr. Lee was waiting for her. Only a little gray hair on his temples betrayed that her mentor was over fifty. He had an orange pressure suit draped over his arm. A small black poodle sat quietly beside him.

Cassie said, "*Ni hao, ni hao ma!*"

Dr. Lee smiled back and replied, "*Wo hen hao, xie xie ni,*" which Cassie translated as "I am very well, thank you."

"But," he added, taking one of her hands in his, "I am not your mother!"

Cassie bobbed her head in respect then met his gaze. "Didn't I say, 'hello, how are you?'"

He smiled, his eyes sparkling. "*Ni hao ma* is what you want to say, but you say *ni hao maah*," he said, holding out the last syllable. "Ma with long flat tone means mother. So you say, 'Hello, Hello, Mother!'" They both laughed as he released her hands.

"But I am most sorry. I must say hello and good-bye. Chief Olsen just tell me that your ship hit pump 3. Most of the unit was smashed into the shaft wall and remains there. But the current will loosen it soon and push it to the surface in the next few hours. I must save it." His dark eyes met her green ones. "The pump 3 filter is the home of our special microbes! They may be unique in the whole Solar System. You understand. I must save them." He indicated the orange suit and the airlock that Cassie had just vacated.

Cassie thought of the rough ride she had just experienced. "But the water is jostling with jagged blocks of ice and water boiling into space!" She met Dr. Lee's gaze. "Shouldn't you let the maintenance bots go after it?"

Dr. Lee shook his head no. "The drones are too slow! We must stop the filter going to the sur-

face. Radiation and vacuum will kill the microbes.” He bent down and picked up his animate poodle. “It could take a year or more for the colony to regrow.”

Cassie stared down at her pale hands. She might still be alive in a year. Hopefully. Probably. The docs gave her two to five more years depending how quickly the cancer spread. “Dr. Lee, I should be the one to go after the filter. I’m fully trained in deep sea piloting, and . . .”

“No no,” he said, interrupting her. “You have already a high dose today. I be fine, right Gee?” He addressed this last comment to his little dog. The robot surprised her with a yip yip. He patted the dog on the head and then said, “Gee will watch over me. But the dive pod is safe. Water soaks up radiation. I come back soon.”

Cassie sensed that nothing she said was going to change Dr. Lee’s mind about her going in his place. She didn’t want to point out that a few more rads weren’t going to make much difference to her since she already had cancer. But adding to her dosage now before her weakened system had time to rebound might indeed significantly reduce the time she had left. “I understand,” she said.

“Good. Then I must go.” He paused at the hatch door and turned back to her. “Chief Olsen is expecting you. Please to help him understand how vital this particular filter is to our research.”

Cassie nodded and felt herself bobbing up and down a bit in the low gravity. “I’ll try.”

He tapped his wrist comm. “Ops Control, Lee here. I am entering the airlock. Dr. McGarity is on her way.”

“Roger, Lee. The popcorn is almost ready!”

“Popcorn?” Cassie said. “Really? Where did he get that?” She never expected to have popcorn again.

Dr. Lee chuckled. “His *maah*,” he said, drawing out the Chinese word for mother. “It’s how she makes sure he writes to her.”

“I heard that!” Olsen protested. “I’ll have you know I always write to my mamma. She sends me popcorn ’cause I’m her favorite son. ’Course, I’m her only son. . . .”

Dr. Lee rolled his eyes. “Mr. Olsen is quite the comedian, but he can’t ‘hep’ it if he’s from Alabama! See you later.” He headed toward the airlock, his little dog’s tail poking out from under his arm.

“*Zai jian!*” Cassie said in Mandarin, literally “again see.” He turned and repeated it back to her with a grin.

Her cane made a tap-tapping sound as she started down the hallway. She smiled at the mural on the blue wall: Each current and former member of Europa Station had their portrait turned into the face of some alien sea creature. Dr. Lee was a brain coral with glasses. She wondered what they’d turn her into—a redheaded jellyfish?

Cassie followed the map in her head, down the corridor to another hatch that easily opened. She stepped over the threshold, a carryover from the design of submarines, in case of water leaks.

* * *

Cassie skirted past “Central Park.” She thought it looked more like a tropical garden than a park, complete with lemon trees. She followed the outer hull path to the Ops Control room. She knocked on the hatch door. Chief Olsen hollered, “Come on in, the game’s just started!”

She punched the automatic door release. She could open it manually if necessary, but right now, just standing was tiring. She stepped over the threshold and found Chief Olsen lounging on a crimson-colored inflatable chair that seemed out of place in what looked very much like the bridge of a modern spaceship—which it was before it became the underwater Europa Station. The smell of popcorn made her mouth water. “Hello?” she said.

A young man with a wild mop of brown hair turned toward her and said, “Hi ya!” He tilted his head toward a white ball about two feet in diameter. “Have a seat. Y’all’s animate is in the wet bar to the left next to the popcorn.” He turned back to his display. “Your ship made quite a mess . . . I’m . . . oh got it! Nice move, Nick! . . . I’m using maintenance bots to keep the ice from causing any more damage. Oh yea! About time, Quincy!”

Cassie turned to her left and saw what looked like a stuffed black and white “tuxedo” cat sitting beside a bag of popcorn and a clear glass window that Cassie thought might be a built-in mi-

crowave. She ran her hands over the cat's soft fur searching for an "on" switch.

Olsen said, "It's voice activated. Just say your name!" He continued talking to the maintenance bots as if they were part of some sports team interspersed with talking to Dr. Lee. She heard Dr. Lee's transmissions through a speaker asking for permission to engage some sequence to test the robotic claws that are used for taking samples and moving equipment. "Come on Quincy, you can move faster than that! Score another point for Nick! Roger, *Dive Pod 4*, you are cleared to engage auto sequence Charlie 23. Kirby, incoming!"

"Cassiopeia McGarity," she said. The cat's eyes opened, and the head turned to look at her. Then, just like a real cat, the animate rubbed its head against her hand. A scratchy pink tongue licked her! "You are so cute!" Cassie said.

"Me-ow," the cat announced, sounding almost like "Me know." She half expected the cat to speak, but then remembered that the psychologists said talking would interfere with the psychological bond between person and pet that was so important for stress relief. But the mates made sounds, like purring or growling, to show approval or disapproval, as appropriate to their animal type and their monitoring of their "owner's" needs.

"I'm going to call you Maia after a star in the Pleiades," Cassie said. Had it understood? Speech recognition took some time. She spoke more clearly. "Your name is Maia, May-ah. Meow when I say, 'Maia.' Okay?" The cat meowed and nodded its head. Cassie laughed. If real cats were this trainable, everyone would have one, assuming they could afford the outrageous price. Fortunately, their use on Europa was part of a long-term study funded by a software giant.

Cassie's wrist comm flashed. A cat icon had appeared on it. She pressed it, and a message came up. "Welcome to Europa, Cassiopeia McGarity. Press this icon to view your health status and to edit your medical reminders." She saw that it was almost time for her injection of colony-stimulating growth factor. This drug helped her damaged bones produce more white blood cells to combat infections. She also needed to get more liquids in her system.

"How do I get a drink around here?" Cassie asked, expecting Olsen to answer. Instead the cat meowed twice and turned to face the window Cassie thought was a microwave door.

When Cassie heard the whoosh sound of compressed air, she knew what it was: the European Station's pneumatic (p)-tube system. The miners used compressed air for all sorts of things, so she shouldn't have been surprised they'd built a transport system using it. The whooshing sound was followed by a clunk as a cylinder arrived. A light flashed, and a tone sounded.

Maia sat in front of the door—probably communicating with it wirelessly until it opened. With jaws much more powerful than a real cat, strong enough to drag Cassie to safety in an emergency, she grabbed the container by a small handle and pulled it out. The glass door slid shut automatically behind her. She looked at Cassie and then unceremoniously dropped the container like a dead mouse.

"Thank you, Maia," Cassie said, opening the container and removing a glass bottle full of some amber liquid. She laid the p-tube container on the counter for reuse later. Then she grabbed the bag of popcorn and sat down slowly on the white ball so as not to bounce off of it in the low gravity. It indented like an old-fashioned beanbag chair and was quite comfortable. She opened the bottle and discovered it was ginger ale. Obviously the programmer had copied her drink preferences from the cyclist's database. Ginger ale was one of her favorites!

Maia jumped onto her lap. Because of the batteries, this cat weighed more than Cassie's backpack, though in the low g it hardly mattered. She rubbed her soft head against Cassie's chin, tickling her with its whiskers. Cassie almost expected the cat to beg for some popcorn, not that she was going to let one kernel go. But Maia just curled up on her lap, warming her. Cassie immediately relaxed. Intellectually, she knew it was a robot, but already she thought of Maia as her pet kitty.

Now that she was seated, she noted a similar ball of gray fur curled up on Olsen's lap. When Olsen hollered, "Kirby! Nooo!" The furball's head jerked up, and it stood up on its hind feet facing Olsen.

"A raccoon!" Cassie said, recognizing the black band across its eyes.

But it ignored her and started rubbing Olsen's neck. "Oh thanks, Rocky." Olsen took a few

deep breaths. He turned toward Cassie. "Sorry, I know it looks weird, but when I get upset that's what my animate does to calm me down." He closed his eyes and sighed while the raccoon dug his black paws into the engineer's neck. "Works ev'ry time, too." He reopened his eyes, which Cassie noticed were very blue.

"Oh no! Doc Lee is headed right into that debris field!" Olsen's fingers flew over the touch pad that crossed the arms of his chair like a highchair tray. The screen showed a 3-D model of the shaft with the water going up in blue and coming down in red, the shade indicating the speed with faster being lighter and black being stationary. The center of the column was currently pink, still showing the effects of her rocket's passage. "*Pod 4*, I recommend you return to Dock Charlie and hold position. I just lost a bot to an iceberg, and you are on the same trajectory."

He gently pulled Rocky, busy kneading the engineer's neck, off his chest and put him/it on the floor. "Sorry, Rocky. That's enough. I got to think how to keep Doc from killing himself."

"Europa Control, this is *Pod 4*. I am sorry Chief Olsen, but I am not coming back until I lock down the filter. Ask Dr. McGarity to explain."

Olsen turned to her. "I don't care what his reason is. No science experiment is worth risking his life! The debris should clear in an hour."

Cassie sat her empty beverage container on the floor. "I don't think it is up to you to decide what is and isn't worth risking your life for," she said softly.

He furrowed his brows at her. "Look, I know you care enough about this project of his to spend the rest of your life on it, but you don't understand. This is just not necessary! I can get the filter with a drone tomorrow after the turbulence has damped out. Our dive pods are tough, but some of those bergs are huge and moving fast." Olsen pointed to a dot labeled Kirby with a red X over it. "Here's where the bot was when it got hit. The currents are sending shards out in all directions. I can switch pumps on and off and from forward to back flow to force the debris up to the surface, but it takes time. He's got to turn around!"

"He's not going to turn around," Cassie said. "From what I understand, by tomorrow the pump and filter will be pulled to the surface and become part of the new ice cap. The radiation and pressure changes will destroy the bacterial colony that I came here to study with him." She shifted on the inflatable ball. "The best thing we can do is help him secure the filter and get back as quickly as possible."

Olsen pulled his hands off the touch pad and shook his head side to side, his thick hair waving in the low gravity. He met her eyes. "I want you to know that I think Doc Lee is one of the finest human beings in this Solar System, and I'm going to do everything I can to bring him back safely. But the quickest way to do that is for him to turn around now. You sure you won't help me persuade him to come back?"

"Sorry," Cassie said, remembering what he said before heading out in the pod. "That bacterial colony may be unique in the entire Solar System. He can't let what may be the first alien life discovered be sterilized by the radiation at the surface, or be exposed to vacuum."

"Alien life?" Olsen turned wide eyes to Cassie. "I thought this bacteria was some mutated Earth microbes that rode along on our equipment?"

"You know what they say about extraordinary claims requiring extraordinary evidence?" Cassie asked.

Olsen nodded.

Cassie continued. "People won't believe that the bacteria he harvested from the filters are of European origin without overwhelming evidence. They argue that like the simple life found in Lake Vostok under the Antarctic ice, it's possible the filters already harbored Earth bacteria when they were installed, or they were contaminated by Earth bacteria brought to Europa since then. Bacteria *are* hardly little things. Some have been exposed to vacuum and radiation on the Moon and on space stations and have not only survived, but reproduced once they'd returned to an amenable environment. Scientists have even revived bacteria found trapped in salt crystals in Carlsbad, New Mexico for 250 million years."

"Yea, I heard about that," Olsen said.

Cassie stroked Maia on her lap. "Also, the critics note that these so-called European bacteria

have the same cell ‘machinery’ as Earth cells, so who could say for sure that they aren’t from Earth? But Dr. Lee and I think that it is more likely that all bacteria originated on some distant body and hitchhiked to Europa and Earth from outside the Solar System.

“But either way, this colony is unique because it has adapted to survive in a high radiation, low light, high pressure environment with a mix of nutrients not found anywhere else. If it came from Earth, we’d be hard pressed to find its original source and could never recreate the conditions that were experienced during its trip here and the creation of the shaft. And if native to Europa, this is the only subsurface pocket lake this close to the surface—and this might be all that remains after we churned up the ecosystem by sinking our station here.”

Olsen sighed. “I wish I’d known how important this filter was before your ship smashed through the ice. We could have put some protection around it, saved us all a lot of headaches.”

Olsen clicked on his radio. “Europa Station to *Pod 4*, over.”

“*Pod 4*, go ahead,” Lee replied.

“Dr. McGarity has explained to me that you’re bound and determined to go up and rescue that filter. I’m probably gonna lose my job when my boss finds out I didn’t make you wait for a drone. But to increase my chances of staying employed, please hand over guidance functions to your animate. I’ll use the station navigation software to plot the fastest and safest course and provide debris position map updates every few minutes so Gee can at least avoid the big stuff.”

“Roger, Europa Control. Handing over guidance to Gee now. And thanks.”

“You can thank me by winning that chess match with Korkin. I have a lot of money riding on you.”

Cassie heard laughter over the loop. She smiled. The animates weren’t the only ones trained to keep people calm in seriously stressful situations.

Olsen pointed to a dark blue area on the display. “Doc Lee’s dive pod is entering the bottom of the shaft, here,” Olsen said. “He’ll go up the west side of the shaft to get to pump 3 where the filter broke off.”

Cassie noted that the odd-numbered pumps started with 1 on the west side, and even-numbered pumps started with 2 on the east side. Each pump was about five hundred feet lower than the previous one, all the way down to 13, more than a mile below the surface.

“We need the water moving pretty fast to keep the shaft from freezing shut,” Olsen explained. He pointed to the center that was still mostly pink. “Where the up and down currents meet there’s a lot of turbulence like them hurricanes on Jupiter on a teeny tiny scale.”

“Does the tug from Ganymede add much to the turbulence?” Cassie asked. She sat her empty drink bottle on the floor.

“Oh yea!” Olsen said. “When we’re between Jupiter and Ganymede, we get stretched between them into a sort of football shape,” he said, gesturing with his hands. Rocky took advantage of the moment to climb back onto his lap. “Then as big brother Ganymede swings to the side, we flatten out. When Ganymede is on the opposite side of Jupiter, which happens every seven days, they are both pulling on our near side. The ice tides rise 110 feet on the surface, causing fissures to open up all over the place. The quakes make the station bob like a buoy in the surf. Since we can’t do any reliable engineering work under them conditions, it’s our Sunday day off. Today’s Thursday, so it’s not too bad now.”

“That’s good,” Cassie said. Still, she hoped Dr. Lee would soon have their prize filter securely back in place.

A dotted green line appeared on the display from Lee’s pod to a dot that Olsen had identified as the filter box. “*Dive Pod 4*, your course is plotted. Your ETA to your target is eighteen minutes.” Olsen’s raccoon started turning in circles on his lap bumping the tray with the touch pad built in. “Okay, Rocky, I get the message!” Olsen said. He turned the tray to the side. Rocky hopped to the floor as Olsen stood up.

Cassie was surprised to discover the former football jockey was wearing skin-tight bike shorts—and that he had a very nice package. . . . In embarrassment, she lowered her gaze and saw that the chief was also barefoot, just like her.

“Rocky decided I’ve been sitting too long!” he declared. He twisted his head side to side, caus-

ing his longish chestnut hair to swirl in the low gravity as if he were under water. Then he surprised her by jumping up, pushing off the ceiling and doing a flip in the air while slowly coming back down. “Yessiree Bob, don’tcha just love low g!”

Cassie laughed, nearly choking on her last bite of popcorn.

He landed softly, his hair still sticking up from being upside down. “You okay?” he asked, with a very serious look on his face.

“Yes, yes, I’m fine,” Cassie insisted, thinking how long it had been since she’d been around any men her age who weren’t sticking needles in her. As he bent down to pick up her empty drink bottle, she reached out to smooth his hair, but used too much force, and rose off the chair and collided with him. She rebounded backward, and her feet came up as Olsen reached the bottle. Maia then leaped up and Rocky slipped to the side so all four of them ended up tumbling around not unlike rag dolls in a dryer. Cassie slowly settled on the floor with Olsen across her lap, Rocky on his back, and Maia eyeing them from her perch upside down on the ceiling. All they could do was laugh.

Olsen sheepishly lifted himself off of Cassie, holding the empty bottle up in triumph with a silly look on his face.

“I’m so sorry,” she stuttered. “I only meant to smooth down your hair, and um, well, I obviously didn’t account for the low gravity!” Maia floated down from the ceiling, landing very precisely on her lap.

He stood up, slowly, and placed the bottle into the p-tube container. Cassie heard the whoosh of the p-tube as the bottle was whisked away to be washed. Olsen returned to his chair. “It’s okay,” he said, settling back in. She tried not to notice his well-muscled body and the curly brown hair on his legs. She hadn’t dared think about men that way since her diagnosis. It would be totally unethical for her to get involved with anyone and then die and break their heart! What was the matter with her?

He ran a hand through his mop of brown hair, which only mussed it up even more. Was that what had triggered her response? The “bedroom” hair?

He noticed her staring at him, and she lowered her eyes and focused on petting Maia. “I’m sorry, Mr. Olsen, I don’t know what came over me.” She looked up and saw him smiling at her. “What?”

“It’s been a long time since a pretty lady took an interest in my hair!” he said. “And please, call me Greg or just Olsen, none of that mister stuff. We’re all family here.”

Cassie opened her mouth to apologize again when the speaker clicked on.

“Europa Control, *Dive Pod 4*, over. Olsen? You guys okay?”

“*Dive Pod 4*, this is Olsen. Sorry, we took a drink break,” he said, winking at Cassie.

She pursed her lips to stifle a very unprofessional giggle. Maia purred warmly on her lap.

“Okay. I wondered when I got the auto-response,” Lee said. “I have sonar contact with the filter, but I can’t see a thing in this murk. I think the headlight has ice on it. Should I release some ballast water to melt it?”

Olsen ran a hand through his hair, causing it to stand up again. “*Dive Pod 4*, I don’t think that will do much good. Advise you slow approach to one foot per second.”

“Roger, Europa Control. Slowing approach speed to one foot per second.”

Cassie thought she could crawl faster than that. But she was glad they were being cautious.

Olsen typed in some commands and a new display appeared from the point of view of a camera mounted on pump 3. In the greenish light, Cassie saw the edge of a boxy shape that she assumed was the pump mount. Numerous dark shapes slowly rotated in and out of the beam of light like fish food caught in an aquarium pump. Ice? Sediment? Debris? The red beacon flashed on then off. “*Dive Pod 4*, report when you have the beacon in sight.”

A few minutes later, Lee reported, “Europa Control, I have 3’s beacon in sight. But sonar shows a lot of debris in the water here.”

“Roger that,” Olsen said. “Just go slow. Proceed to 3’s grapple station.”

Cassie and Olsen watched as Lee’s pod crept closer and then overwhelmed the camera’s view. The pod would shoot out a grapple hook on a line that would wrap around the pump’s structur-

al arm.

“Europa Control, grapple successful.”

Cassie let out a breath she hadn’t realized she’d been holding. Now all Dr. Lee had to do was secure the filter in place with cables. Then he would take a sample and come back.

Maia stood up on her lap and placed her front paws on Cassie’s chest. “What?”

The cat meowed three times. Cassie checked her wrist comm. It was time for her injection, and also another drink. A menu was attached to the message for her to order what she wanted. She decided to go with Tang. Soon she heard the p-tube whoosh.

Cassie stood up, slowly, feeling a little dizzy, and made her way to the wet bar while Olsen and Dr. Lee continued to chat about grappling and securing the filter screen. They were going to be a while. She retrieved a bottle of orange liquid from the container and drank it down. She then checked the map for the nearest “head” as they called the toilets on ships. She told Olsen where she was headed and stepped out, Maia following.

The head had a little sink and mirror like those found in jets on Earth, and a place for her to inject herself with her meds, which she pulled from her pack. That chore taken care of, Cassie freshened up with a wet wipe, and pulled her comb from her bag to fix her bubble of red hair. She wondered if Olsen found her attractive and then tamped down those thoughts. A man like that deserved a family. Even though she’d had her eggs frozen before she’d started chemo, she’d given up all hope of ever being a mother. Her body wouldn’t take the strain, and who would raise her child after she died? She took some comfort in knowing that her eggs might help some other women have children. Her legacy would be her scientific “offspring” via her contributions to Dr. Lee’s research. Assuming he was successful at rescuing the filter.

* * *

As Cassie made her way back to Ops, the floor seemed to drop out from under her. She lost her balance and fell. Maia slid to the side of the corridor. An alarm sounded and yellow lights flashed. A quake! Rather than stand and risk falling again, Cassie crawled to the Ops door. Maia scurried over. For safety, hatches could not be opened during quakes, in case the shaking caused a leak somewhere. The corridor tipped again, and Cassie held fast to the lip of the hatchway. She worried what the quake might be doing to Dr. Lee. Maia jumped onto her lap, reminding her to calm down. As soon as the lights quit flashing in the corridor, Cassie opened the door into Ops.

She found Olsen pounding frantically at his touch pad with so much force that he was bumping up and down against the tray on his chair. His raccoon was stretched almost comically across his lap, helping to damp out the motion. “*Dive Pod 4*, this is Europa Station, disengage autopilot! Do you read?”

“What’s going on?” Cassie asked quietly, sinking into her air bag chair with Maia.

“He was trying to secure the filter screen when the quake hit. The whole fracking pump assembly broke off the wall and slammed him,” he said. “His hull cracked. Water sprayed him right in the face! Damn near lost him, but Gee fetched his helmet and got him sealed in his suit before the salt water shut her down. But the impact sent him straight for the surface!”

Cassie suddenly felt as if she couldn’t breathe. She reminded herself that Dr. Lee was in a dive pod surrounded by water. Nothing stopped radiation better than water. He’d be okay if he didn’t stay near the surface long. Maia rubbed her head against Cassie’s chin. She hugged the furry little robot against her, absorbing her comforting warmth. “Won’t the current sweep him under the hole and then down the east side of the shaft?” she asked.

“*Dive Pod 4*, disengage autopilot!” Olsen repeated. He turned to Cassie and answered her question. “Yes, it would. But his emergency autopilot is trying to follow the preset course down the west side to bring him home. In other words, it’s fighting the current. So instead of zipping past the hole, he’s likely to be going so slowly that he’ll get stuck in the forming ice cap!” Rocky made a high-pitched whine kind of like a baby crying. Olsen instinctively patted the animate on the head, calming himself down. Cassie thought of Dr. Lee’s little dog sacrificing itself to save him and hugged Maia harder.

“Europa Control . . . *Dive Pod 4*,” Dr. Lee said rather breathlessly.

Cassie was relieved to hear her professor’s voice. She found herself leaning forward even

though it wouldn't make it any easier to hear through the noise on the radio.

"Jets overheating," Dr. Lee said. As he spoke, a loud alarm blared. A red light blinked on the command station panel. Then another. All the pod jets were overheating and shutting down to cool off.

Olsen repeated, "*Dive Pod 4*, disengage autopilot."

"Europa Control, say again," Dr. Lee said. "Lots of static." Cassie thought she also heard a dog barking. Was Gee still active?

"Crap," Olsen cursed. "*Dive Pod 4*, disengage autopilot. Go to free drift. Repeat, disengage autopilot. Go to free drift. Current will bring you down east side. You'll cross the zone at the bottom. Do you copy?"

"Zzztt, pop, jets shut dd . . . zzzt," the radio crackled.

Olsen repeated his message.

"Pfft, zzt, stopped, zptt," was all Cassie heard in reply.

Lights lit up all over Olsen's console. "Damnation!" he cursed, then apologized and continued tapping commands. "We've lost contact." He looked up at the map. "That puts him here, in the dead zone." He pointed to a red area that went to black: the hole she'd punched with her rocket just a few hours ago that was still exposed to vacuum. The radiation there was enough to block communications . . . and pelt Dr. Lee with high-energy ions blasting out from Jupiter.

"Will the current pull him out onto the surface?" Cassie asked. If he stayed in the water, he'd get some protection.

"I dunno," Olsen said. "I revved up pump 2 to suck him east." He nodded toward the red lights on his console. "His pod jets overheated and shut down just as we lost contact, so they won't be fighting the current now. But it might be too late. The hole hadn't formed much of a cap yet—the pod might have slammed it, melted it, and stuck."

"Can you send a drone to dig him out?"

"Yeah, but the only ones equipped for that kind of work are on the surface. I already have one trawling over, but it will take most of a day to reach the hole, and then who knows how long to locate him and dig him out. One of the repair drones might be able to tow a pod, but I've never tried it." He took a deep breath and exhaled. "God, I just hope he bounces off the underside of the ice . . . otherwise, he's going to be walking dead before we can rescue him." Olsen closed his eyes and held Rocky against his chest.

Cassie knew what she had to do. She scooped up Maia and stood. "You have another dive pod, don't you?"

Olsen's eyes flew open. He reached out a hand and took one of hers, holding her back. "Look, no way I'm letting you or anyone else go after him in another pod."

Cassie pulled her hand away and felt herself falling backwards. She caught herself on the wet bar. "Mr. Olsen, I know that you can't approve for me to go after him. But I don't actually work for you. I work for the Interplanetary Science Foundation—as does Dr. Lee. And I'm going after him."

Olsen shoved his tray sideways and stood up. "No, please Cassie, Dr. McGarity, don't do this." He pointed back at the map. "He might jiggle himself loose yet—shoot another quake might do that, too. Chief Engineer Korkin is on his way here. He's sure to come up with an action plan."

Cassie wavered. She should listen. He was making good sense. These guys were all engineers, miners, the best-trained astronauts in space. But she and Dr. Lee alone understood the importance of the bacterial colony—an alien life that Dr. Lee had convinced her was important enough for her to spend the last years of her life studying it with him. He had given her a reason to keep living, and she wasn't going to let him die.

She took a deep breath and exhaled slowly. "Tell you what, I'll go prep the pod. Even if he does break free, he's going to need help crossing the bottom of the shaft—especially if Gee shut down. I'll be there to grab him. And if he doesn't break free, then I'll go after him while you and Chief Korkin work out the best way for me to do that."

Olsen shook his head, his hair waving around again. "I guess you're as stubborn as Lee is," he said.

"Yeah, well, when you're 'dead girl walking,' there's not much people can threaten you with,

you know?"

He surprised her with a quick hug. "Well you look pretty alive to me. So please don't do anything crazy out there, okay? I haven't even had time to work up my courage to ask you out for a beer yet!" he joked.

"You have beer here, too?" Cassie asked, extending her cane.

Olsen laughed. "Naw, just root beer—though if you get desperate, Korkin has some home-brewed vodka." He shivered. "Nasty stuff. I'd rather drink aftershave!"

Cassie laughed. "Is Korkin desperate then?" A vague picture of the blonde engineer who designed her animate popped up in her mind.

"No, he's just Russian," Olsen said, holding the door open for her. "Far as I can tell, Russians drink vodka like other people drink water. Though I must say, the water here is about as yella as a swimming pool in July."

Cassie felt the Tang rising in her throat.

He saw her expression and laughed. "Now don't you worry yourself! The yella is from the sulfa, and the docs say it's safe. But it tastes god awful! My mamma, bless her heart, sent me the root beer flavoring. It wasn't much trouble for me to rig up a carbonated water machine. Still working on how to make Mountain Dew using the lemon from our garden, though. Maybe you can help me with that."

She stepped out into the hall and flashed a shy smile at him. "I'd like that," she said.

"At least do me one favor, okay?" Olsen called after her.

"What's that?"

"Don't run into any more of my pumps."

* * *

Twenty minutes later, Cassie was inside a dive pod, wearing a pressure suit and diaper. The view out the lower part of her helmet was blocked because Maia had wrapped herself around her neck like a warm muff. She had to remind herself not to worry about Maia being comfortable.

Cassie notified Olsen that she was ready to launch. They hadn't heard anything more from Dr. Lee.

"Roger *Dive Pod 8*," he said. "Mission Monitor shows all systems green. Animate Maia reports flight plan loaded and latest water conditions onboard." There was a pause, then Olsen added less formally, "Korkin is here, says he has a pristine bottle of European vodka waiting for you."

"Tell Mr. Korkin thank you, and I look forward to sharing that gift in a few hours."

"Oh," Olsen added, "And we recommend you wear your helmet at all times, considering what happened to Dr. Lee."

"Roger, will do," she said.

She heard the motors kick in, sucking water in from the front to fill the ballast tank that wrapped all the way around her spherical pod. The water was vented to provide thrust and steering. The pod headlights illuminated the folded claws, but otherwise there was nothing to see outside except the port beacon, which flashed green then white then green.

Cassie backed away from the dock. The map display showed her course as a green line, and the pod as a little yellow icon sliding along it. Cassie watched the artificial horizon tip as the pod began ascending. The current from the pumps pulled her upwards with almost no thrust, but the jets pulsed constantly to keep her on course. Cassie felt as if she were in a kayak being rocked back and forth crossing the wake of a passing speedboat.

The display said her ETA to Dr. Lee's last known position was thirty-eight minutes. She wished she had some oars to help push her along faster. Dr. Lee had already been at or near the surface for an hour. How long before he was exposed to a lethal dose of high energy ions?

To distract herself from worrying and not waste any of the time she had left, she got to work. She called up the latest draft of Lee's next paper. It included a close-up image of the reddish brown residue formed by the European sulfur bacteria.

Because of radiation, Lee expected that bacteria on Europa would have more mutations than similar bacteria on Earth. His experiments, however, did not support this hypothesis.

In a previous paper, he'd mapped the average number of DNA differences between sulfur-lov-

ing Earth bacteria and European bacteria. He hoped by nailing down the rate of mutation, he could then determine how long the bacteria had been here, and thus prove it was native to Europa. He'd imported some similar sulfur-loving bacteria from Earth and had compared their mutation rate with that of the bacteria harvested from the European filter. In his data analysis section, he reported a rate of one to two mutations for every generation of Earth bacteria with five million DNA bases. He noted that these mutations didn't often get passed on to the next generation because bacteria have proteins that repair DNA mistakes. But with so many replications happening so quickly, some mistakes still get through. These mutations usually resulted in death of the cell but could also lead to new traits, such as heat or acid resistance.

The European bacteria had far fewer mutations. One sample batch, from pump 3, the one he'd gone to rescue, actually had none that got passed on. He'd concluded that European bacteria either were more resistant to mutation, more efficient at repairing mistakes, or both, compared to Earth bacteria. Cassie thought it more likely they'd found a way to repair damage than that they didn't suffer as many mutations—but how? That was the question that this colony of bacteria from pump 3 might answer for them—if the exposure to the surface didn't kill the whole colony.

The pod jerked up and down and sideways like a snow globe being shaken madly by some little child. The simulator she'd trained on hadn't prepared her for all this bouncing around. The quake had really churned up the water. She was actually starting to feel a little queasy. "Europa Control, this is *Pod 8*."

"*Pod 8*, go ahead," Olsen said.

"I'm experiencing some turbulence. Is there a route that would be easier on my stomach but still get me there in about the same time?"

"Roger, *Dive Pod 8*. Have Maia open the dead band to ten degrees."

"Meow meow," the animate confirmed from her perch on Cassie's shoulders.

The little icon representing the pod now followed their straight line course in a wider sine wave instead of zigzagging back and forth across it. The ETA increased only a few minutes. "Thanks, Control. That helped."

Cassie sipped some water to keep her stomach down. She was sweating inside the pressure suit despite the underwear-cooling garment. Though the chance of a rupture was extremely rare, considering what had happened to Dr. Lee and that there was still debris in the water, she didn't dare take off her helmet or gloves to cool off. The ETA was now eleven minutes.

"*Pod 8*, Europa Control," Olsen said. "Korkin's uploaded some procedures for breaking Lee out of the ice and towing him back. Check your display. Be quick with any questions 'cause you're entering the dead zone in ten."

"Roger, Europa Control," Cassie said, seeing an icon pop up on her display. She played the video of Korkin using two model pods to demonstrate her approach. The basic plan was to grab Dr. Lee's pod with her claws and yank it free using her jets. She would then tow it back to the station. They had robots deployed near the station to take Lee's pod from her and dock it.

"Only one question," Cassie said, "How am I supposed to steer with that filter sticking out? I assume it is still attached to his starboard claw."

Olsen said if the filter was still attached, she should clip off that arm and leave it and the filter in the ice. The robots would retrieve it later.

Cassie was about to tell Olsen that she would not sacrifice the filter—that was the whole reason Dr. Lee had risked his life. But did she really have time for an argument? Instead she just said she had no more questions and thanked Korkin for his help.

As she continued up the shaft, Olsen sent updates on debris locations, and Maia adjusted their course. She knew when they approached pump 1 because the pod accelerated. She saw its blinking red beacon when she was a lot farther away than she'd spotted pump 5's light down lower. Was the water more clear up here? With each pump filtering out more of the particulates, it made sense that the rising water would be less alkaline closer to the surface. The radiation and light level would be higher though. Were the alkaline and radiation levels what made pump 3 the "sweet" spot for bacteria? The other pump filters had almost none.

A few smaller chunks of ice banged into the pod and spun it around until the jets could slow

the motion. Just as Cassie got her stomach settled, alarms rang out. “Wee-oo, wee-oo! Collision alert!” Red lights flashed inside the pod. Cassie was thrown against her straps as the ship jerked hard to port to avoid some ice that hadn’t shown up on the radar.

She was almost to Lee’s last known location. Finally, the message she’d been waiting for, “Target acquired.” The pod was indeed at the surface. An ice collar had formed around it, but some water was still boiling out to the surface through cracks, which Cassie hoped would make extraction easier. It appeared that the docking port side of his pod was up, exposed to vacuum or covered in ice, she couldn’t tell from her vantage point. The prime antenna was on that side, and likely damaged. She was relieved to see that the heavy claws hung down into the water, with the filter in the grasp of the starboard, right claw.

She reported this to Europa Control, but the map showed her still in the communications’ dead zone.

She fired the jets to move her to the front of Lee’s pod, her central headlamp shining on it. No light was visible through the portal, probably shut down to save power. The filter frame loomed darkly to her left, silhouetted against the frothy ice.

Following the procedure Korkin had sent, she shoved her hands into the sleeves that controlled the claws. She rotated to “face” Lee’s pod. Then she clamped her right claw to his left. “Maia, see if you can establish a connection through the contact sensors in the claw.”

“Meow, meow,” the cat responded.

“Route data to my helmet,” Cassie added.

A series of medical readouts marched across her visor display. His heart rate was slow but steady. Was he unconscious or sleeping? She didn’t have the training to understand what all the acronyms and units meant, but being a cancer patient, his low white blood cell count shouted a warning at her. His bone marrow was under attack by radiation. If he’d been on the surface unprotected for a mere three minutes, he’d have received a lethal dose already. But inside a pod with its thick hull and water/ice for insulation, she estimated he could survive much longer before accumulating a dose of more than six hundred rads, which with modern treatments, was lethal for 50 percent of people. But as long as he was still alive, he had a chance, and she was going to give it to him. The “lightning bug” particle trails in her eyes winked regularly now, reminding her to hurry.

Grabbing his right claw that was attached to the filter was tricky. She tried three times and then went for a clumsy but quick solution: She just clamped onto the frame, putting the filter to her left, sticking out between the two pods like lettuce poking out of a bun. The jets on her front left side would be blocked by the filter now. She didn’t want to add insult to injury, so to speak, by blasting the bacterial colony with her jets. Could she steer with top, bottom, and rear jets only? Korkin had assumed she’d cut the filter loose, so she was on her own.

As she backed away, chunks of ice broke free around Lee’s pod. Water rushed from below to fill the gap, boiling as it reached for the surface. The reduced pressure sucked all sorts of debris toward it, which pelted the back of her pod and impeded her progress. Olsen had planned for her to back away and return the way she had come, down the western side, while most of the debris headed east with the current. If she released the filter, it would plug the hole to the surface and allow her to do that. But she wasn’t going to sacrifice the colony if she could avoid it.

The problem was that the filter was acting like a giant rudder to spin her around and push her east. The jets trying to stabilize her and take her west were overheating, like Lee’s had done.

Alarms blared. She remembered Olsen telling him to shut them off and go to free drift, letting the current carry her east. That meant she’d have to descend down the eastern side and cross the turbulent center. She didn’t see any other option. She knew Olsen would be watching. Once out of the dead zone, he’d guess what happened and hopefully cycle the pumps to keep her from being slammed into the side of the shaft. Maybe his “Crimson Tide” bots would clear a path for her.

Another alarm blinked: her radiation dosimeter. Her need to dive finalized her decision to go the fastest way: east. “Maia, reset course back to the station assuming we’re going down the eastern side.” In a few moments, a new green line appeared on the display. She reactivated a few jets to help speed her toward the eastern “waterfall.”

"Maia, time is important. Go ahead and tighten the dead band."

The green flight path narrowed, and the conjoined pods bumped along under the newly formed ice cap, knocking pieces free with each impact.

Over the alarms, Cassie heard a voice! "Hello? Olsen, is that you?" she called.

"Cassie? This is Lee . . . what's going on?"

"Doctor Lee!" Cassie's joy at hearing her mentor's voice was overshadowed by another violent set of bumps, like the pods were being dragged over a bed of boulders. "I pulled you out of the ice." Wham! "We're . . . heading down."

"You're here? No, no! You should have left me!"

"You know I couldn't do that," she said. She gripped the armrests of her seat as the pod shook.

"But I'm already, as you say, 'walking dead' from radiation. You've thrown your life away!"

"How can you say such a thing! You're the one who insisted that I owe it my family and my profession to carry on with my work . . . as long as I possibly can!" The pod shook, and Maia pressed herself against Cassie's chest.

"I'm sorry," Dr. Lee said softly. "You are right. But how do you do it?" She heard him gasping.

"How can I work when . . . when my body is failing?"

Cassie sipped some water and forced herself to swallow. "You focus on what you can do and not what is hurting. Right now, we need to focus on getting deep fast to stop exposure. Sip water so you stay hydrated."

"I will," he said. "But my dosimeter maxed out. And I am nauseous. *Bu hao!* Not good."

Cassie knew that nausea was one of the first symptoms of a lethal dose, but some people responded that way to lower doses, too. "You are still alive, and with treatment, you might stay that way." She sipped more water as the pod jostled, and her stomach rose up in her throat. "Remember when I complained that I only had five years at most? You said Stephen Hawking was only given two years, yet he kept working and lived a full life. You may have two days, two weeks, or twenty years. So hang on. We're about to go over the 'waterfall!'"

* * *

The water jets were no match for the force of the "waterfall." The joined pods rocked back and forth, up and down. Her remaining side jets fired constantly to balance the rudder effect of the frame poking out between them. Alarms sounded, "Collision alert!"

The shaft was cluttered with debris and more was coming from the damage she'd done to the "scab" at the surface. They were skidding into an ice wall and would rebound into a shooting gallery! This is why Olsen hadn't wanted her to go this way. Another impact threw Cassie against her harness, and then flipped her upside down. Her stomach rebelled as they spun around again and smacked into something else.

Alarms blaring, Cassie tore off her helmet and barfed into it. Maia jumped free of her shoulders. The animate pulled a suction hose from its socket: the urine collection device, and held it with her mouth beside Cassie's gloved hand. Cassie took the tube and ran it through her helmet, sucking the smelly liquid and lumps of popcorn into the waste tank. Then, bouncing up and down, Cassie cleaned her face and wiped the helmet as well as she could with a lemon-scented wet wipe.

Cassie felt the urge to throw up again, but thankfully there was nothing left in her stomach. Maia brought the First Aid kit to her. "Thanks, Maia," she whispered as she fumbled out the motion sickness pills. Another jerk to the side almost dumped the whole kit to the floor. She chewed the mint-flavored green pills while clicking her helmet back into its collar.

"Dr. Lee, you still there?" Cassie asked.

"Yes, I'm okay. But I've lost Gee. She was attached to my seat, but must have been shaken loose."

"I'm sorry to hear that," Cassie said, while hugging Maia like a heating pad to warm her aching stomach. "We still have a while until we get back, and I don't know about you, but I need help staying alert. So let's talk about your latest analysis. What do I need to know to start work when we get back?"

"Well, the pump 3 bacteria had a lot more of a certain protein than pump 5," he said. "Pump

13 had none of these proteins.”

“So this protein might be responsible for the different mutation rates?” Cassie asked.

“Yes,” he said. “But could be something else. Can’t tell without more data on the protein.” He coughed and sputtered. “Sorry, I sucked some water and it went up my nose! What was I saying?”

Cassie had forgotten he had water in his suit. If the suit fan shorted out, he might die from carbon dioxide poisoning. To prevent that, he had to suck up the water and swallow it. Her stomach roiled at the thought of drinking that sulfurous brine. “You need more data on the function of the protein. Maybe it has something to do with cell repair,” Cassie suggested.

“Possibly. All cells have repair capability,” Dr. Lee noted. “Maybe pump 3 cells have a more efficient method. Then mutations get corrected before being reproduced?”

Cassie contemplated how this might come about. Had the bacteria with the best repair method survived longer and out-reproduced the others? That made sense. “But if these bacteria are native to Europa, then it seems over the eons, all of them would have evolved this capability,” she said. Did this mean the bacteria were from Earth? Maia refilled her suit’s water container, and Cassie sipped some of the cold water.

“We must ask what is new and different at pump 3 than pump 13,” Dr. Lee said.

“Yes,” Cassie agreed. “What makes the sweet spot sweeter now than before we humans arrived?”

She saw on the display that they were about to enter the “pink” zone near the center of the shaft. “Time to brace yourself again, Dr. Lee. We’re beginning our crossing of the shaft where the turbulence is the worst.”

“*Xie xie ni*,” he said, which Cassie knew meant thank you. She intended to continue the conversation about the pump 3 conditions, but as they tumbled across the shaft, alarms blaring and jets overheating, it took all Cassie’s reserves just to stay conscious. She managed to convey to Maia to open the deadband as wide as possible, but it didn’t help much. Maia’s “claws” extruded into either side of the seat and acted as an additional brace around Cassie’s helmet. This action probably saved her from whiplash as the joined pods tumbled like barrels going over Niagara Falls. The artificial horizon blinked black then white.

The comm stuttered into service. “*Pod 8*, this is Europa Control, do you read?”

Hardly able to move in the shaking pod, Cassie clicked the comm twice to let Olsen know she heard him.

“Got that,” he said. “I see both pods on the sonar. Docking bots are standing by to pull you in,” Olsen continued. “Have Maia release the claw holding *Pod 4*. Korkin will be waiting at the airlock.”

Cassie smiled as she clicked the comm. She sipped some water and closed her eyes. Confident that Maia would bring her in safely, Cassie quit fighting the urge to sleep.

* * *

Cassie felt the scratchy tongue of a cat licking her cheek. She blinked and opened her eyes to find Maia perched on her chest, her golden eyes staring at her, unblinking. “Meow!” the animate said.

Cassie closed her eyes, wanting only to drift back into painless, thoughtless oblivion. Already unwanted aches intruded on her consciousness, demanding attention.

The licking continued. “Meow!” again even more loudly.

Cassie thought she sounded annoyingly like an alarm clock. “Go ’way,” she mumbled.

“Meow!”

“Ah, awakes the sleeping beauty!” a man said.

Cassie reluctantly opened her eyes. She ached all over like she’d been tumbled in a dryer. A man with a blonde crew cut wearing blue overalls and holding a handheld med unit leaned over her. His nametag read, “Korkin.”

“Mikhail Korkin?” she asked. Cassie struggled to a sitting position on a rolling cot just a few inches off the floor of the airlock. Her head throbbled. He had removed her pressure suit so that all she had on was the long underwear garment. Maia jumped off of her chest and bounded away.

He smiled. “Call me Mike, please!” He tucked the medical scanner into his breast pocket and

popped open a med kit.

Cassie looked around the airlock. Mike must have already put her pressure suit and helmet into the cleaning unit. "Where is Dr. Lee? Did his pod make it?"

Mike nodded and frowned. "*Da*, Lee is alive, but I think not long. Sharron, our geologist you meet later, took him to emergency treatment unit." While he spoke, a black bear cub animate with a cream-colored face padded into the airlock with a pouch in its mouth. "Ah, my baby Mishka is return!"

The bear nuzzled up to Mike. He took a drink pouch from the bear and was about to give it to Cassie, when Maia came bounding into the airlock, also carrying a container in her mouth. She dropped this on Cassie's lap. Cassie smiled as Maia then stared at the bear. The two animates were obviously exchanging data, but it looked for all the world like Maia was jealous of the bear. Mike shrugged and took the drink from Mishka. "Your cat decide you want warm drink with your pain pills."

"Yes, I do, though I don't know how she knew."

Mike smiled, crinkling his brown eyes. "I program her real good!" He handed her a small packet of pills.

She returned his smile and said, "Yes, you did." She fumbled with the med packet. Her fingers ached—she wondered if she'd left marks in the armrests of the pod.

"I help you," Mike said. He took the packet from her and opened it. He poured them onto her palm. She popped the pills into her mouth and chased them down with what tasted like chamomile tea. Yes indeed, he'd programmed Maia well.

"*Spasibo*," Cassie said, one of the few words she knew in Russian.

"Is okay." He patted the medical scanner in his pocket. "I know you have cancer. Radiation very dangerous for you! Olsen, he say may kill you?" He lowered his eyes. "He blame himself. Say should have stopped you."

"He tried, but I had to go after Dr. Lee," she said. "I knew the risk, and it's certainly not his fault I have cancer."

"You brave lady," Mike said. His bear nuzzled him, making a sound that reminded her of a pig snorting. "*Da*, Mishka. I drink the Tang."

As they emptied their drinks, she wondered if the radiation really was destined to kill her. She felt wretched, but not worse than after some chemo sessions she'd endured. She struggled to her feet. Maia could push her to the lab on the stretcher, but she needed to walk. It always helped her think. Feeling dizzy and nauseous, she leaned heavily against the wall. "Maia, could you get my cane, please?"

"Meow!" she responded and scampered to the locker where she'd left Cassie's clothes.

"Did the filter from pump 3 make it back, too?"

"*Da*," Mike said, swallowing some of his own drink. "Argun and Nikki are working on repairs. I assume you want bio sample?"

"Yes," she said. "And also a sample from the water in his pod and suit."

Mike used his bear like a stool and stood up, too. "His suit went to clean already, but I get water from his pod for you." He nodded toward the open hatch of Lee's pod. "I send samples to Doc Lee's lab." He tapped his wrist comm. "Watch for message."

"Yes. Thank you, *spa cebo*." Maia returned carrying Cassie's cane in her mouth. Maia stood on her hind legs so Cassie didn't have to stoop to get it. "Thanks, Maia," she said.

"Meow!"

"Oh, and Mike, did you recover Gee?"

"Not yet. Soon as done here," he said, patting Mishka on the head.

Cassie said, "Dr. Lee may only have a week or two at most. I suggest you do whatever you can to fix Gee quickly."

The engineer ran a hand over his blonde scalp. "I understand," he said. "Radiation and Europa's water not good for people or animates." He eyed Cassie and added, "I do what I can to get Gee working, and you do same for yourself and Doc, okay?"

"Yes, okay," Cassie said. She wasn't sure how long she could keep working, but having come

all this way, she was certainly going to try.

Mike chattered something in Russian to Mishka and then waved goodbye as he went to oversee the pod repairs and cleaning.

Cassie used her cane to follow Maia down a short hall to a room just large enough to hold a state-of-the-art emergency robo-doc unit. A tall black woman in a pressure suit with the helmet off had just finished pulling a blanket over Dr. Lee.

Cassie introduced herself to Sharron Smith, who immediately offered to help Cassie with the med unit. But Cassie didn't want Dr. Lee to possibly overhear any discussion of her condition and increase any sense of guilt he may have for making it that much worse. So she said she'd be fine and to please go on with whatever else she was supposed to be doing.

"Please call me Sharron, and by the way, welcome to Europa," she said, scooping up her monkey animate. "If you need anything, have your animate page mine—her name is SeeDo, as in monkey see, monkey do?"

Cassie smiled. She'd heard from Dr. Lee that Sharron had a good sense of humor and also "spoke" sign language. So the SeeDo moniker fit her animate especially well.

"Anyway, I'll be in the airlock helping Mike secure the pods if you need anything."

"Okay, and thank you," Cassie said, turning to check on her mentor.

"*Ni hao*," she whispered to the unconscious man whose bare feet protruded from the blanket. The robo-doc was finishing up its diagnosis and preparing injections of a cocktail of drugs used to treat radiation poisoning. She knew that the drugs were most effective if given within the first half hour after exposure, but still of use if administered within twenty-four hours. Regardless of the drugs, his life was probably measured in days now, maybe a week. No one had ever survived the radiation dosage he'd received. But the drugs would at least make his last days more comfortable. She would do her best to also make them meaningful by encouraging him to work with her.

Cassie attached her left index finger into another of the diagnostic units. It began an analysis of her blood. She withdrew her finger and watched as the results were plotted, automatically comparing her data now with records from her arrival—had it just been six hours ago? Not surprisingly, the radiation exposure had lowered her already low white blood cell count to dangerous levels. It took time for the damage to accumulate, so she was probably seeing the effects of her passage through Jupiter's radiation belts. She doubted she'd gotten a lethal dose rescuing Dr. Lee. But, as he'd noted earlier, in her weakened state, it still might kill her. If the pain in her stomach and head and every nerve in her back didn't ease up soon, she'd be useless for work anyway. The two pills Korkin had given her should kick in soon. She decided what she really needed was a good night's sleep.

She sent Maia to get her clothes. She'd change and make her way to her quarters. While she waited for Maia to return, she rolled a stool over to Dr. Lee's monitor and called up his data on the display. His white blood cell count was lower than before, but still higher than hers.

Maia returned, dragging Cassie's backpack. While Cassie dressed, she told Maia to do a diagnostic on herself. Once dressed, Cassie laid down on an inflatable cot that had an option to be filled with warm water. That would soothe her aching muscles! She turned it on, and let herself relax. She ordered Maia to wake her when Dr. Lee was conscious.

* * *

Dr. Lee slept twenty-three hours, and so did Cassie. Olsen came to check on them both and was there when she'd awakened. He said that his boss, one of the military brass back on Earth, had suspended mining operations until one of the pods was fully recharged and ready for use in the event of any more accidents. He and Korkin were taking turns using the drones to repair the damage done to pump 3. He reminded her that tomorrow was their Sunday day off and offered to get her peppers planted while she was busy with Dr. Lee. She happily handed over her seed and nutrient packs and instructions. He then helped her and Dr. Lee set up medical equipment in his lab so they could work on the samples Korkin had obtained for them while continuing treatment.

As they entered, the lab's dome lit with the pastel colors of a sunrise lighting the ceiling. The view seemed to be from atop a tall building, with a 360-degree view of a large city, its tallest skyscrapers tipped with sunlight. Mountains glowed in the distance.

"Wow," Cassie whispered, absorbing the virtual scene. "Is that Taiwan?"

"Yes," Dr. Lee said. Olsen helped him onto an inflatable recliner. Cassie made sure his IV drip lines didn't get tangled. She hardly gave her own a second thought. She was, unfortunately, rather used to "being on a leash."

Dr. Lee added, "I set up the video feed so my day starts with yesterday's sunrise. The view is from Taipei 101, the tallest building in Taiwan, where I was born."

Olsen stepped back and joined them in looking up. "Nice," he said simply. "I've got mine looking at Jupiter." He shrugged. "I guess you like being reminded of where you're from, and I like being reminded of where I am!"

Cassie looked at the two men, her mentor and her newest friend. "We are lucky to be able to do both while we work on making the future better." She settled into an inflatable "bean-bag" chair like the one in the Ops room. Olsen unloaded their laptops from a cart Rocky and Maia had pulled into the room. He busied himself getting Dr. Lee's tray the right height for him.

Dr. Lee smiled at Cassie. "That's what I like about you," he said. "Always thinking about the future." He accepted his laptop from Olsen, arranging it on his tray. "Even if our time together is short, we will add at least a few new answers to the question of what life is all about."

Olsen quipped, "But don't we already know the answer: It's 42, right?" He grinned.

Cassie laughed, recognizing the reference. She turned to Dr. Lee, who had a puzzled look on his face. "It's from a classic science fiction book, *The Hitchhikers Guide to the Galaxy*. The character searched the Universe to find the answer to the question of why we are born to suffer and die. The ultimate computer replied, '42.'"

Dr. Lee shrugged. "I suppose that 42 is as good an answer as any. I imagine that humans are as likely to understand the real answer as a cat would understand calculus."

Maia meowed, and all three of them laughed. Cassie said, "I think this cat *does* understand calculus!"

After a chuckle, Olsen excused himself, saying he'd be back to check on them after he finished his chores in the garden.

"Time for us to get busy," Cassie said. As the virtual sky slowly brightened above them, she zoomed in on the electron scan of pump 3's sample. "The filter went to the surface with you," she said. "The radiation should have killed the cells. But this sample, which was also frozen, then melted and rehydrated on its journey here, still has living bacteria!"

"These tiny lifeforms are like you, survivors against great odds."

She met his gaze. "Yes, and now we need to unlock their secrets and share them with the world. This is the job the Universe has given us."

Dr. Lee's eyes filled with tears. "I consider myself most fortunate to share this journey of life with you, even for a short time. People need to know that life can survive even in extreme conditions. You deserve to tell that story more than anyone."

Cassie placed her hand on his. "We deserve to tell it together." She pulled her hand back and smiled at Dr. Lee. "I suggest we focus on the differences between the water sample from pump 3 that got into your pod versus water near 13."

Dr. Lee wiped his eyes and nodded. "I will tag that protein I identified with quantum dots and track it."

"Sounds good," Cassie said. "Together we will discover what makes pump 3 the sweet spot."

* * *

As the days wore on into a week, and then almost two weeks, Cassie had a harder and harder time focusing her attention on work. The pounding migraine from the radiation poisoning, and the constant pain in her gut made her cancer a mere nuisance in comparison. But she forced herself to avoid the narcotics she was allowed in order to stay awake and clear-headed enough to do the work, knowing both she and Dr. Lee had precious little time.

His white cell count and hers had stabilized at a very low level, indicating that their bone marrow had sustained severe damage from the radiation. If either of them were to survive, the count had to start ticking up again soon, showing that enough marrow survived to replace the cells killed by the radiation. They had both also lost much of their gut bacteria. They were eating spe-

cial yogurt to replace the microbes. Almost miraculously, Dr. Lee's weight had stabilized. Olsen joked that Europa's "mineral" water had coated his stomach, and soon the miners would be selling it wholesale and getting rich.

Cassie suspected Dr. Lee just had a healthy gut to start with. Hers, however, was very fragile. And she continued to lose weight. But knowing how vital it was to remain optimistic, she maintained a pretense of recovery for Dr. Lee's sake. But there was no hiding the hair loss that both of them suffered from the radiation.

Olsen dubbed them the "egghead" team and said their new social media account had a zillion followers. He then surprised them with caps that he knit himself, a black one for Dr. Lee, and a crimson red one for her. He said his mama had taught him to knit.

She looked up from her latest data plot to admire the way Greg's shorts clung to his backside. The typical engineer, he seemed oblivious to the way he looked—just wore what was comfortable while he worked on yet another recipe for Mountain Dew. Dr. Lee had loaned him his Bunsen burner, the closest thing the station had to a stove, to cook up a new batch of syrup. She didn't have the heart to tell him she didn't even like Mountain Dew.

Dr. Lee was not quiet about his opinion, though. About a half hour ago, he'd loudly announced that Olsen's cooking smelled worse than European water tasted, and he excused himself to take Gee for a walk in the garden. She suspected that Dr. Lee wanted to give the two of them some time together, maybe thinking that they could help each other cope with his pending death. It was actually very sweet of him and made Cassie push herself even more to get some results while Dr. Lee was still alive. She thought it ironic that her terminal diagnosis had sped up his work, and now his condition was speeding up hers. As her Earth friends had noted, being around someone who is dying does make most people reconsider their priorities and spend less time on frivolous pursuits. But, stealing another glance at Greg, Cassie longed for that surfeit of time to waste.

Cassie sighed and focused on her data. So far she'd ruled out alkalinity as the reasons why pump 3's bacteria were more robust than those of pumps closer to, or farther from, the surface.

The radiation level was the most likely reason that the bacteria thrived: They got just enough to spur growth. She suspected water temperature was important, too, but she couldn't easily adjust the temperature and maintain the intense pressure in the lab. Korkin was building a temperature and pressure sensor package for her that Greg would install with a remote in the next few days. She hoped both she and Dr. Lee would be around to see the results.

The water that had flooded into Dr. Lee's pod had been warmed by being inside the pod. She had hypothesized that higher temperature would kill the bacteria, but the pod water actually contained more live bacteria than the filter out in the cold. She interpreted this to mean that warmer water increased reproduction. Realizing Dr. Lee had ingested a lot of this water, and the human body would warm it even more, she had checked his blood for traces of the bacteria and found that protein he'd been tracking! This was a very surprising result because no one expected that a bacteria evolved to survive in cold salty water should survive being ingested by a human. It actually made it seem more likely that the bacteria had originated on Earth.

The water in the pod, and that Dr. Lee had ingested, included salts and minerals such as sulfur, plus it contained more of an oval-shaped protovirus that was bigger than a salt crystal and smaller than the bacteria. Maia stirred on Cassie's lap as she zoomed in for a closer look at the protovirus. Dr. Lee had identified these proto-virus as native to Europa. Could this be the reason why pump 3's colony was different? "A protovirus bacteria interaction?"

"What's that you said?" Olsen asked from his position hovering over his latest lemony concoction. Cassie hoped this batch would taste better than his last, which was a good imitation of furniture polish.

"There's an abundance of a certain proto-virus in the water recovered from the pod," she repeated. "I'm wondering if it has something to do with why pump 3's bacterial colony is different from the rest."

He raised a bottle of his latest yellow brew and eyed it suspiciously. "A virus, huh? So we're all going to die of the Andromeda Strain now?"

Cassie shook her head. He was always making references to classic science fiction. She re-

membered that story. “But first we will raise our IQs to super genius level and unlock the keys to immortality.”

He grinned and handed her a bottle of his brew. He clinked his bottle against hers. “I’ll drink to that!”

She took a swallow and gagged. He snatched her bottle and handed her a napkin. She coughed some more and blotted her eyes. Her chest hurt. Her stomach hurt. Everything hurt. But she refused to dwell on it. She needed to keep working.

Greg knelt down in front of her, his blue eyes searching her face. “You okay? I didn’t mean to make it so sour. Guess I need to add me some sugar?”

Maia had thoughtfully brought her some tea. She sipped it to clear her throat. “I just swallowed wrong,” she said, patting his hand.

“Right,” Olsen said, winking at her. He nabbed another ball chair and rolled it next to hers. “So, show me this virus thing you’ve discovered.”

Grateful for the distraction from those perfect blue eyes, she loaded another sample and zoomed in again. “See these ring-shaped objects?”

Greg nodded.

“Those are what I suspect are primitive viruses. The thing about viruses is that they need a host cell to reproduce.”

“So the virus is using the bacteria to reproduce?” Greg asked. His animate Rocky jumped onto his lap.

“Yes,” Cassie said. “So it makes sense there are more virus particles in the samples that also have more bacteria.”

“What’s good for the goose, is good for the gander,” Greg said, stroking Rocky.

Cassie smiled at Greg’s Southern saying.

“But won’t the virus eventually kill off all the bacteria?” he asked.

Cassie sipped more tea. “It could kill off one particular strain and then move on to another kind of cell, or it could slip into a host cell and go dormant until that cell reproduced—viruses and bacteria often evolve together that way. Some viruses even contribute RNA to their host cell that causes them to be better able to survive environmental changes. . . .” Cassie startled Maia as she rose from her chair. “That’s it! If the protovirus shared some RNA with the bacteria, it would offer protection against radiation!” She ordered the computer to do a comparative analysis. A few moments later, the data appeared.

“Yes!” Cassie said, clapping her hands in joy.

“What?” Olsen asked.

“The bacteria has a micro DNA strand that exactly matches the viral RNA. I’ve found how the European bacteria protect themselves from radiation!” Cassie stood up. “I need to tell Dr. Lee!”

Greg dumped Rocky off his lap and hurried to help open the heavy hatch door for her.

When they arrived at the garden, they found Dr. Lee slumped over, leaning against a rock by the babbling waterfall.

“Dr. Lee,” Cassie said, kneeling down beside him. “*Ni hao ma?*” she asked, checking for a pulse.

Greg knelt down beside her and noted that Gee had shut down again. Korkin had only done temporary repairs so as not to deprive Dr. Lee of his “pet” during what might be his last week. Greg turned the animate off and back on again to reset it.

His pulse was slow and steady. “I think he just fell asleep,” Cassie said to Greg. “*Ni hao ma?*” she repeated. “How are you?”

Dr. Lee mumbled something in Chinese. His eyes fluttered open, and he offered a weak smile. “I am still not your mother,” he said softly.

She grinned. “Would you believe I said it wrong on purpose to see if you’d notice?”

“Maybe,” he said, straightening up. “But I hope your research has progress more than your Chinese.”

She returned his smile. “Yes, I believe it has. I found a protovirus.” She held out her data pad for him to see.

He looked puzzled. "I find these before."

"Yes, but I compared their RNA with our bacteria's DNA. And guess what? Our bacteria includes a micro DNA strand that exactly matches the viral RNA!"

Dr. Lee's face lit up. "Because the provirus and bacteria are symbiotic, they must both be native to Europa!"

"Yes!" Cassie said.

Olsen helped Dr. Lee to his feet. Cassie stood up, too, and the three of them joined in a three-way hug with the babbling of the waterfall sounding like people cheering from a distance. Cassie let the moment of joy fill her, washing out all the frustration at her cancer and radiation sickness.

"Yeehaw!" Greg hooted. "You two have confirmed life on Europa!"

Gee chose this moment to "wake up." The little dog yipped and began chasing its tail in a furious circle. They all laughed. Dr. Lee picked up his pet and tucked him under his arm. Cassie nabbled her ubiquitous cane.

"We must publish paper right now!" Dr. Lee said, heading for his lab. Greg steadied the professor as he and Gee shuffled down the corridor.

Greg glanced back at Cassie. She said she'd be along in a few minutes. "I want to enjoy the sunset." She didn't tell him it would be her last.

She slid to the grass and hugged Maia close to her. "I'm so tired, Maia. I'm tired of fighting. Tired of hurting." Maia purred.

"I did what I came here for, Maia. I helped Dr. Lee prove that life evolved here on Europa. That's something, isn't it?" Maia licked her chin. "I'll miss you," Cassie said, stroking her furry robotic companion. "You've been a perfect kitty. Your next owner will be very lucky to have you."

The robotic cat curled up on her lap and kept her warm while the sunlight, reflected from Jupiter and projected here, dipped below the horizon of the garden. The air smelled "green" with life brought from Earth. Her hot pepper seeds had sprouted, thanks to Greg's ministrations. Seeing the little buds reminded her that even as one life ended, others began: Nothing is created or destroyed, just changed from one form to another.

Even on a frozen world bombarded with radiation, life had found a way to survive. She accepted that Fate, or God or whatever the Creator called herself, had used her to reveal that Earth life was not alone in the Universe. She could die now, if not content, at least satisfied that she had not wasted her final days pining away in a hospital.

The soft sound of crickets permeated the garden as the now dark sky filled with stars. Just a few nights ago, Greg had told her how much he enjoyed the crickets. He said they reminded him of Alabama in the summer. Though they avoided the subject, she knew he'd fallen in love with her, and she with him, despite knowing the futility of it. Like life, love fights to survive. And more than having discovered life on Europa, Cassie was thankful for having found love, too. "Maia," she whispered, hugging the cat to her, "When I'm gone, please tell Greg that love is a whole lot better reason for putting up with suffering than '42.' I couldn't have lasted this long without him." After answering any last-minute questions Dr. Lee might have tonight, she'd take the drugs that would put her into a medical coma. She'd not feel any pain ever again. Eventually, her heart would stop, and that would be it.

She reached up and felt the red knit cap Greg had made for her, a tear slowly rolling down her cheek in the low gravity. She knew him well enough now to know he wouldn't be surprised by her decision. She'd been terminal when she'd arrived, and now she had at most another week. And that week would be hell for her, but especially for him because there was nothing he could do but watch her suffer. Rather than force him to go through that, Cassie thought it would be better to just find out she'd died in her sleep. Then he could move on with his life, and hopefully find his true love when he returned to Earth. She'd remain here, buried in the ice and immortalized in the hallway with Dr. Lee and the others who had lived here. Rather than the jellyfish she'd imagined, Sharron had chosen a catfish for her because she said Cassie and Maia were like one creature searching for life in the dark depths of the Universe. She'd started the painting before Cassie had lost her hair, and then humorously morphed the seaweed-ish hair into an unraveling beanie cap. Cassie thought that she couldn't ask for a more perfect memorial.

Cassie opened her eyes to a baby-blue sky punctuated with seagulls calling to one another. Ocean waves roared and ebbed, reminding her of her favorite beach in North Carolina. Was she in heaven? Dreaming? She turned her head and saw that she was in bed, an IV line attached to her bruised arm. What had happened?

A face appeared. "Dr. Lee?" she stuttered in shock. He was still pale, but his eyes were bright.

"*Ni hao!*" he said, handing her a drink container. He smiled a wide grin. His perfect white teeth nearly glowed in his round face. Short gray stubble crowned his head. He'd been bald when she'd induced the coma, so some time had passed.

She took the drink in shaking hands.

"Woof!"

A golden retriever puppy pawed at Lee's pant leg. "Okay, Barley dog. I will sit." He sat down on a stool beside her and patted the animate on the head. "Korkin is doing overhaul of Gee, so I borrow Barley. Barley will be Ryland Black's animate, but Ryland won't arrive for nine more months."

Questions tumbled out of her mind but the first was, "Why am I still here?" She struggled to sit up. The airbed adjusted to her movement, folding into a lounge chair shape. Maia began purring beside her.

"I will explain," Dr. Lee said. "But first, answer me, *ni hao ma?*"

She considered the question. How did she feel? She flexed her hands, shifted her legs. Took a drink from the bag. The blinding headache and nausea were gone. All that remained were the usual aches and some shakiness, probably from being bedridden for weeks. "Very good thank you, I mean *hen hao, xie, xie, ni,*" she said "But how is this possible?" She reached up and felt her head. "My hair is growing back?"

"Yes," Dr. Lee said. "But we are still the egghead team! Only now, the whole human race has joined us."

"What do you mean?" Maia licked her, and Cassie rubbed the robo cat she'd never expected to see again.

"I sent our research results to Earth the night you go to sleep on us. Chief Olsen very upset. He say you suffer so much, gave your life to rescue this life here on Europa. So now we know we are not alone in the Universe. He then ask the world to rescue you. To find a way to save you like you save me, and we save the first confirmed alien life. With so many great minds working together, looking at your cancer, our radiation sickness, and looking at our work—surely someone finds a treatment."

He paused and clasped her hand gently, "And they did!"

Cassie was too stunned to speak.

"As you know, viruses can co-opt all kinds of cells to be surrogate mothers and produce lots more baby virus," Lee continued. "Some very smart doctor figure out that water I swallow help me survive radiation. They show me European DNA can correct errors in my cells. Olsen and Korkin build incubator at pump 3. Make lots more bacteria. They harvest them and treat us. I recover from radiation! Now you do, too!"

"But I still have cancer?"

"Yes. But some think this bacteria might help that, too. Dr. Black tell me about an enzyme called thymidine kinase. . . ." He stopped and smiled. "Black is coming to help us study this. We have much work to do!"

"How long do I have?" she asked.

He winked at her. "Like you tell me, you may have two days, two weeks, or twenty years. They inject us with treatment just two weeks ago. We keep you in a coma until robo-doc say your blood count is good." He got a serious look on his face. "If pain too much. . ."

Was it? Cassie lifted her eyes to the ceiling as another sea gull passed overhead. She couldn't help but think of its shape as that of an arrow, pointing skyward. She'd been given the opportunity to find life on Europa, and she'd suffered to accomplish that task. Now that life offered treatment for radiation poisoning and possibly for her cancer. Could she live with her pain a while longer?

The hatch door flew open, and Greg bounded over to Cassie's side, carrying a bottle by the neck. Rocky and Mishka followed with Mike Korkin close behind carrying a tray of open glass jars and a metal bowl of ice chunks. She noticed Greg was wearing his characteristic tight shorts and a crimson jersey. His hair was as mussed up as usual.

"Well good mornin', Sunshine!" Greg proclaimed. He took her pale hand and kissed it, causing her face to flush hotter than the Aggie peppers she'd brought to Europa. Greg held up a brown glass bottle. "To celebrate you and Doc Lee's recovery, I have here the first batch of my newly formulated European Dew."

Mike held up his tablet display and spoke to it, "Sharron, Greg's about to make the toast. Tell Argun and Nikki to pause now and join us remotely, okay?"

"Will do," Sharron replied.

While they waited for the miners to join them remotely, Korkin invited Cassie to his and Lee's poker match. "Are you still betting on Dr. Lee?" she asked Greg.

"Yes ma'am!" he said.

"He always root for underdog," Korkin said, clunking some ice into each of the glass jars. He looked at Cassie and patted himself on the chest. "You can bet on top dog!"

"But you haven't fixed Gee yet!" Dr. Lee said. They all laughed thinking of Korkin losing a poker game with the animate he so proudly programmed.

"Ops is go!" Sharron reported.

Greg then proceeded to pour his reddish liquid "Dew" over the ice, the drink actually resembling the surface of Europa. Each of them took a glass. Greg held his glass up high and offered a toast, "May both European and Earth life live long and prosper!"

Cassie smiled at the *Star Trek* reference and clinked her glass with his and Dr. Lee's and Mike's, too. On the screen, she saw Sharron, Argun, and Nikki do the same. The four animates made their happy animal squeaks/barks/yips that reminded her of a dog park in Houston. She took a tentative sip, expecting a bitter taste, but was surprised when it tingled her tongue like hot sauce, yet had a sweet honey and lemon aftertaste.

Dr. Lee coughed and waved a hand in front of his mouth. "Too spicy!"

"Make stronger," Mike suggested. "Maybe add vodka?"

Greg shook his head, his hair waving side to side. Cassie emptied her jar, swishing the brew around in her mouth before swallowing. "Perfect," she said, meeting Greg's blue eyes.

He refilled her glass, grinning like a possum eating a sweet potato.

Marianne Dyson was inspired by science fiction and the Apollo Program to become one of NASA's first female flight controllers. After leaving NASA, she became an award-winning children's author promoting space and science education through writing and speaking. She recently published her Space Shuttle memoir, A Passion for Space, and coauthored Welcome to Mars with Apollo 11's Buzz Aldrin. Visit: <http://www.mdyson.com> to sign up for her free Science Snacks newsletter.