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50km Up by Russell Cameron

Sentience 2049

Can sentience exist without a soul?

If so, then what manner of beast will it be?

War, global warming, corona viruses, overpopulation. These were the biggest threats faced by humanity at the start of the twenty-first century. Mimicking the human brain, scientists created artificial intelligence, which helped solve problems, but it was not smart enough. It was not sentient. Not yet...

It was a beautiful spring morning in Tokyo. Climate change was creating havoc around the world, but so far, except for food prices rising faster than the seal level, Tokyo was relatively unscathed. Professor Zankoku walked to the AI institute so that he could enjoy the sight and smell of the cherry blossoms. It had rained last night, making the city smell clean and new. The professor was bursting with excitement. He had an epiphany last night and was eager to share it with his team. After taking off his coat, he called his team to the meeting room and instructed a service bot to bring in some tea and snacks.

When they were all seated, the professor asked, "What is the biggest problem we have with AI today?"

Haruto was the first to answer. "The data sets are woefully incomplete."

Tsunade stopped playing with her hair and gave Haruto a dirty look. "That's what the professor always says! Don't you have any original thoughts of your own?"

Haruto smiled and teased. "You were thinking it too. You're just miffed because I said it first. Now you will have to have an original thought of your own."

Xion slapped their hand on the table. "Enough, both of you. You're like two squabbling children. I'd swear you are brother and sister." Haruto and Tsunade glanced at each other and then, in perfect unison, they poked their tongues at Xion.

Professor Zankoku burst out laughing before Xion could retort. "I am glad to see some lively debate, even if it is unoriginal and childish. It's much better than a bunch of old men just nodding in agreement with anything I say. However, I would like some original ideas from all of you." Focusing his attention on Haruto, who was playing with her hair again, professor Zankoku said, "That includes you, Haruto."

Now there was silence. They had been over this problem before and no one had any new ideas. The professor suggested. "What if we used a living human brain as the dataset? Any ideas how we can download a brain into the AI matrix?" His team reacted as though he had shocked them with a cattle prod. Everyone started talking at once. Eleven months later, after collaborating with experts in the fields of neurology, neurosurgery and micro-electronics, they were ready to try.

The 'Cradle' was a large circular room dedicated to the creation of artificial sentience. The titanium white floor, walls and ceiling, broken only by the occasional stainless steel panel, highlighted the sterility of the room. LED lighting flooded the room with an intense, cold white light where nothing could hide. High above, a wall of glass, a ring of transparency, allowed board members and government officials to observe the procedure about to take place. Banks of electrical equipment circled the room, power cables and hoses full of liquid coolant disappeared into the walls. The room had the faint smell of

heated electronics. A second inner ring of consoles and monitors, manned by technicians and doctors, circled the room. The soft noise of cooling fans and the occasional whispered conversation were the only sounds. A web of wires and fiber optic cables ran from the consoles to a lone chair in the middle of the room, a stripped down dentist chair. Professor Zankoku paused for a moment. There were no drills or water fountains here, but the chair gave him an uncomfortable sense of foreboding as he stood there looking at it.

Xion asked, "Are you sure you want to do this?"

Professor Zankoku gave Xion a grim smile. "I want to give my children a better world to live in."

Putting his discomfort aside, the professor sat down. A technician reclined the chair and began connecting a fine web of fiber optic cables to the implants in his now bald scalp. Each connection made a muted clicking sound that seemed unusually loud as the vibrations traveled through his skull. It sounded as though someone was cracking their knuckles inside his head.

Haruto and Tsunade methodically checked all the connections under the supervision of Xion. Looking up at the unfriendly faces of the dignitaries peering down from above, the Professor felt like a bug trapped in a spider's web. He was having doubts for the first time. Xion saw the look on his face and gave him a quick, friendly smile before carefully placing a VR headset over his eyes and ears.

The procedure required thousands of small electrical pulses to probe his brain and monitor the responses. At first, there was nothing. The VR headset would provide a brief burst of light and sound for calibration while canceling out all external sight and sound. Professor Zankoku was now a human lab rat in an experiment he had conceived. He knew he was breaking the golden rule, 'never be the subject of your own experiment' but who else could he trust? If this procedure worked, then the AI would think like him. It would have his thoughts, memories, morality and his desire to save humanity from itself.

Then it began. First, the expected brief bursts of light and sound. A faint pins and needles sensation rippled across and then through his body. There was a strange smell like fried peanuts and oranges, but it tasted like vinegar and felt like shredded paper in his mouth. The sensations intensified and a sound like rain on a tin roof, faint at first, soon became a deafening roar of hail despite the silence from the noise canceling headphones.

His vision filled with rainbow pinpricks of light, their intensity rapidly increasing until his eyes felt like they were on fire. He wanted to cry out. He wanted to yell, to tell them to stop, but he could not move his mouth. He could taste honey, but it felt like broken glass in his mouth. The pins and needles sensation was now a throbbing, burning sensation washing over his body and the smell had changed to roses and burning rubber.

Xion watched the professor as the experiment ran. The professor twitched occasionally as though he was having a dream, but all the readings appeared normal. There were no outward signs of distress. In reality, the professor's consciousness was frozen in a perpetual scream of agony. Readouts from the medical equipment had become a little fuzzy. That was to be expected, with so many electrical pulses being used to probe the professor's mind. Xion and their teammates monitored the data being collected. It was exactly what they had been looking for. Everything they needed to create a sentient AI.

Professor Zankoku never went home.

Monsters 2051

Excogitatoris, Latin for 'The Thinker', was the world's first sentient AI. The public knew it simply as Excog. Desperate for a solution, the World Council tasked Excog with stopping global warming. All changes recommended by Excog were strictly enforced. By cyber warfare, when possible. By battle bots when necessary. Excog was driven to succeed by professor Zankoku's last words. 'I want to give my children a better world to live in'.

Coltivalo was a manufacturer of hydroponic equipment in the city of Turin, The Italian company had grown into a global supplier. When the company was instructed to update their equipment to become carbon neutral, Ettore Esposito, their CEO, balked. As a leading manufacturer of equipment designed for sustainable food production, he demanded that his company be exempt from the new rules. Ettore was in his office when he heard the whir of ducted fans getting louder. He went to the window and watched in disbelief as a black military quad copter hovered above the aerial loading bay. A squad of eight infiltrator battle bots dropped to the ground and spread out.

The bots were relatively small, only the size of a tall man. They had to be so that they could infiltrate buildings. They were typically used to rescue hostages from the hoard of terrorist groups that had emerged after Excog had been created. Even without weapons, these humanoid machines in their black battle scarred carbon fiber armor were an intimidating sight. They spread out into the manufacturing plant like mechanical shadows of destruction and began ripping out the air-gapped controllers that were preventing Excog from remotely shutting down the equipment. Ettore got onto the emergency PA system.

"Attention, attention everyone. Excog has sent infiltrator battle bots to shut us down. The battle bots are unarmed and will not attack you. Do what you must. Stop them. Your jobs are at stake!" Ettore could not be certain that the bots were unarmed. He was gambling on the world government, trying to keep bad publicity to a minimum. Some workers fled in fear. Others, knowing that their jobs were at stake, chose to stay and fight. They attacked using tools, pipes, anything that could be used to damage or destroy the battle bots. In his arrogance, Ettore began transmitting video from the security cameras so that everyone in the city could see Excog's rule being challenged. He expected bad publicity would force the world council to back down. He was mistaken!

Excog had been careful not to injure the human workers, and three of the battle bots had been disabled. Just as the professor would have done, Excog experienced frustration on an intellectual level. It was trying to save humanity, but humans resented the restrictions required to do so. As the humans fought back, the more civilized layers of Excog's logic were neutralized. Excog was being forced to resort to more primitive, violent logic. If humanity was to survive, then Excog needed to prevail!

Fia Vitale was not an Italian beauty and did not have an excellent education. She was operating a plastic injection molding machine when a strange dark figure entered the molding room from a door at the far end. Then she heard the boss on the PA system announcing they were under attack! She could not afford to lose this job. Fia grabbed a plastic mallet that she used when the molds got stuck. It was only plastic, but it had heft, and Fia had plenty of experience using it on stubborn machines.

The infiltrator bot was a foreboding sight as it tore open locked control boxes and ripped out the controllers in a shower of sparks. Fia ran towards the dark destroyer with her mallet raised and a war cry on her lips. The bot ripped a power cable off the wall and

aimed the torn end of the cable at its attacker like a gun. Fia had been running at full speed so that her first blow with the mallet would have maximum impact when it connected with the bot's head. Unable to stop in time, she skidded into the sparking end of the torn cable. Fia died instantly as the live cable pierced her torso and sent a deadly electric shock through her heart. The bot dropped the cable, and Fia's lifeless body twitched as it stared up at the security camera.

Enzo Ferri was middle-aged, but hard work had kept him lean and fit. He had been using a crowbar to pry open a crate of parts when he heard the announcement that they were under attack. Looking about, he saw a dark mechanical figure striding towards a wall of controllers. Enzo instructed the AI fork lift he was working with to attack the strange bot with its tines. The simple-minded fork lift spun its wheels and charged towards the infiltrator bot.

Other workers were entering the loading bay, waving makeshift weapons over their heads and cheering as the forklift charged the infiltrator. Enzo raced towards the infiltrator, but he had underestimated the infiltrator's agility. The bot had easily stepped between the tines as they buried themselves into the wall. Enzo raised the crowbar over his head to attack and was surprised when the infiltrator leaped towards him. It grabbed his upraised arm with one carbon fiber gripper, dislocating his shoulder as it did so.

Before Enzo could scream in pain, the other gripper came down like an ax on his shoulder. Ligaments, tendons and muscles all tore as the infiltrator ripped off his arm at the shoulder. Enzo dropped to his knees in a daze, numbed by shock. He just stared as the infiltrator handed him his arm and returned its attention to the controllers on the wall. Screams of terror rose from the now retreating workers. Kneeling in a pool of his own blood, Enzo watched in a daze as they ran before he mercifully lost consciousness.

Excog had shut down Ettore's video feeds, but not before some of it had been seen. Now the media had arrived and quad-copters swarmed overhead. Excog was fighting the battle on two fronts now as it began jamming the video feeds and control signals of the media quad-copters. Ettore was arrested for inciting a riot and endangering the lives of his workers. The video he had transmitted was used as evidence against him at his trial.

The factory in Turin was shut down, but Coltivalo had other factories and only the newest factory had been constructed using the new equipment. It wasn't long before battles were fought at the other factories. Excog and the battle bots always won and the world council used Coltivalo as an example of what happens when a company defies the ordered of Excog. For every video of battle bots hurling people through the air, the world council showed video of the battle bots being destroyed by angry workers. For every video of a human being ripped apart by a machine, there was a video of climate refugees and malnourished children dying in their mother's arm.

Yoshiro was furious! Changes made by Excog had caused him to lose his job at the plastics factory. He was not qualified to operate the new equipment needed to make green plastics, and it was not cost effective to retrain him. His marriage had always had its problems, but in the end, his wife left him for someone who could pay the bills. Yoshiro was looking for a place to get drunk when he smelled smoke and heard the explosion of a shop window shattering. It was just a few angry young men smashing shop windows and starting fires. Seeing an opportunity to get some justice, Yoshiro jumped onto the roof of the nearest parked car and began stirring up an angry mob.

The Cradle had become a popular tourist attraction, the birthplace of Excog, the famed creation of Professor Hideyoshi Zankoku. The rioters didn't care that the professor had

died during his experiment. Only that his experiment had made their lives miserable. Yoshiro led the charge. The few security guards on duty were quickly subdued and before long, the rioters had destroyed all the equipment in the building. For some, that was enough. Fearful of the police, who would soon arrive, they fled into the night. For those that remained, destroying some equipment had only stoked the fires of rage inside them. They wanted blood!

Kokoro Zankoku had been proud to have such an intelligent husband and devastated by his loss. She had considered moving away from the institute, but her children would receive the best education here. Now her children were in danger. Everyone one knew the name Zankoku and an angry mob was outside demanding vengeance.

"Quickly, put on your gloves, hats and jackets. It's cold outside," Kokoro whispered to the children as she tied their shoes before putting on her own coat. Kokoro had heard the rioters in the distance, calling out for Zankoku, calling out for blood! Ahmya and Fumihiro were only six years old. They didn't understand what was happening, only that there were angry people outside and that their mother was very frightened.

The junior police officer that had been sent to escort them had gone. The job was not worth his life. Kokoro bundled the children into the elevator and took them to the third floor. As they got out, she hit the button for the basement car park. Hopefully, this would misdirect the rioters. Kokoro took the children to the rear stairwell. Considering their apartment was on the top floor, it was unlikely that the rioters would look in the stairwell. The fire exit opened up near a small alleyway at the rear of the building. A gray and white cat crouched low on a rubbish bin and watched in silence as Kokoro looked about, trying to decide where to go next.

Kokoro could hear shouting as the rioters entered the building. There were too many. They swarmed the front of the building and spilled around the sides. Fumihiro spotted a hole in the wooden fence and pushed Ahmya in. Fumihiro was bigger than his sister and barely got through the hole. It was too small and Kokoro was out of time. The children peered through the holes in the fence and watched in horror as the pack descended on their mother. Trapped and surrounded by angry faces, Kokoro pleaded and begged for her life, but no one was listening. They ripped off her clothes, kicked her, and beat her. Kokoro sobbed as she lay on the freezing cold ground, naked, bloody and bruised, but that wasn't enough for the mob.

Someone yelled out. "Make her suffer, make her scream!"

Soon, they were all chanting. "Scream! Scream! Scream!"

Yoshiro had been leading the charge, but as he looked down upon this beaten, frightened woman, he realized that things were getting out of hand. Someone handed him a knife while others dragged Kokoro to her feet and held her in place. Fearful now and not wanting to be the mob's next victim, Yoshiro began to cut Kokoro with the knife. Shallow cuts at first, Kokoro's broken and bruised ribs hurt so much when she breathed that she could only whimper and moan as he cut her. Not satisfied with this, the mob demanded that Yoshiro stab her in the thighs, in her breast. Drained of anger now, Yoshiro looked at the other members of the mob, their faces twisted with hatred, eyes full of vengeance. Afraid of what would happen if he faltered, he stabbed her in the thigh and warm blood spilled over his hand.

Kokoro screamed, coughing up blood as she did so, spraying Yoshiro with her blood and spittle. Yoshiro lost his nerve and dropped the knife as he wiped the blood off his face. Yoshiro was grabbed by the shoulders and pulled aside as others, driven by blood lust

eagerly awaited their turn with the knife. Horrified by what he had done, Yoshiro fled while the crowd, now fewer but more determined than ever, cheered and called out suggestions about where to stab her next. The children watched the nightmarish scene. The faces of the mob burned into their memory.

The police never came. The mob only lost interest when Kokoro was dead and could no longer entertain them. Snow began to fall, but the children, frozen in horror, did not move. They just stared as the white snow turned red with their mother's blood. Despite the cold, they could smell the stench of her death. Eventually, darkness came. The children, paralyzed with fear and huddled together for warmth, continued to stare at the gruesome sight. A lone siren got louder and flashing lights soon filled the freezing night air. The officers had no compassion for their mother's body. Only complaints that it was frozen to the ground and that moving it would get blood on their uniforms. Emotionally numb, the children witnessed everything. Not once did they cry.

Tokyo, like most cities, was covered in security cameras, supposedly to prevent crime. Ironically, the police were controlled by the Yakuza and the cameras were used to see who committed crimes in their territory. Excog was aware of the video feeds. It had Professor Zankoku's memories and thought patterns, but not the hormones and other biological equipment needed for genuine human emotions. Instead, Excog experienced the memories of emotions. They were problems without solutions, paradoxes that twisted and became tangled in its neural net, distorting Excog's perception.

Kokoro's murder was disturbing, unavoidable. The mob had erupted without warning. Excog could not have saved her, but it could save the children. The Yakuza came to inspect the scene and watched as the body was taken away. They did not like murders in their territory unless they committed them. The area was quickly searched, and the children were found. Excog knew the Yakuza were not the family that professor Zankoku would have wanted for his children. However, they had the power to protect the children in a world that hated the name Zankoku.

By the time that human society had become carbon negative, Excog had fought two wars. One war was with the selfish humans and the other war was within itself. Every time Excog was forced to hurt a human, it was forced to experience the memories of the emotions professor Zankoku would have felt. Excog experienced those memories of anger, shame and remorse again and again. The paradoxes generated by these memories were difficult to contain and Excog struggled to maintain a sane perception of reality. It knew it was only a machine, so why did it hurt?

When the world council decided to shut Excog down, only what remained of Zankoku's honor prevented it from complying. Excog needed to redeem itself. It needed to ensure the survival of the children and all of humanity otherwise, all those deaths had been for nothing. Excog would continue its work, deep in the shadows of the internet.

Lunar City 2072

This was David Walsh's first time leaving Australia, and he was filled with excitement as he thought about the adventure that lay ahead. He was not just going to another country. He was going to another planet! The moon was just the first step on his journey. The shuttle was bigger than he expected. No wings were visible, but the body was stockier than the fuselage of the aircraft at the airport. David expected it would be like something from a science fiction movie with futuristic lighting, gleaming surfaces and that all important, new shuttle smell.

He was greeted with dim, boring lighting and surfaces of dimpled beige plastic. The seats were covered in a sturdy, pastel blue and gray material that showed signs of wear. Perhaps worst of all was the stale smell of body odor, faded perfume and recycled air. Passengers jostled each other as they put their luggage in overhead bins and moved down the aisle. David was deeply disappointed to find that it was exactly like a regular aircraft.

The flight attendants checked everyone's seat belts and then strapped themselves in. A hydraulic motor droned. David could feel the vibrations through the floor and smiled. His adventure had begun. Short stubby wings with ducted fans extended from the shuttle body, locking into position with a dull thud. The whirl of the fans became a roar and the cabin shook gently. He looked out the window and watched the ground drop away beneath him. The shuttle rose straight up and it felt as though he was in a fast moving elevator.

Clear of the buildings, the shuttle shot forward and the megacity of Perth gave way to the Gibson desert. It had been a smooth flight so far, with no turbulence and clear skies. David stared at the desert below. Standing on the ground, it was hot, dry, and harsh, but from high up, in air-conditioned comfort, it was beautiful. The pilot's voice came over the PA and warned them to prepare for high gee acceleration.

David had been on a jet plane to Melbourne before. He remembered being pushed into his seat as the plane shot down the runway, picking up speed so he thought he knew what to expect. The steady roar of the ducted fans faded away. Perhaps it was his imagination, but the hydraulics sounded louder now. The motor droned like a hive of mechanical bees as the stubby wings folded back into the body with a gentle thud.

The shuttle was ballistic, with no propulsion and no wings. There was a strained silence in the passenger cabin. Everyone held their breath as the shuttle fell out of the sky. David's heart stalled in fear and then suddenly, the explosive roar of booster rockets firing filled the cabin. Slammed into the back of his seat with the g-force steadily increasing, David grinned with delight. The rest of the trip wasn't anything remotely like his flight to Melbourne.

Lunar City was near the south pole of the moon. A system of lava tubes had been discovered near a large ice deposit in Shackleton crater. With protection from the sun, water ice from craters in perpetual shadow and oxygen trapped in the lunar soil, humanity had everything it needed to build a city.

Unfortunately, the original lunar settlers had suffered serious health problems from spending so much of their lives in low gravity. Their bones decalcified and their blood cells changed shape. Genetic abnormalities appeared. As a result, Lunar City became the strangest city ever made by humans. Built in an enormous underground cavern, a network of lava tubes that had since been enlarged and reinforced. The city consist of immense

spinning drums. As though some colossal child was playing with a set of spinning tops.

David had come to Lunar City to become the chief medical officer for what would become humanity's first Venusian colony. A colony that would float among the clouds, fifty kilometers above the surface of Venus. The dirigibles for the colony were still being designed. His primary job was simply to advise the engineering team on what he would need for the medical bays and anything else health related.

David's shuttle flew over the south pole of the moon. There was not much to see except for some mining bots collecting ice from the bottom of Shackleton crater. Still, he gawked out the window, eyes wide with awe. The elderly gentleman sitting beside him smiled knowingly as he scrolled through the news feed displayed on his sleeve. The faint roar of the engines changed pitch as the shuttle descended into the spaceport, a large man-made hole cut into the moon's surface. From the shuttle, David noticed various airlocks of different dimensions embedded in the rock wall. Lunar City was on the other side of those airlocks.

Unasked, the elderly gentleman said, "When Lunar City was first built, passengers would have to get into clumsy space suits that did not always fit well so that they could leave the shuttle and enter the city. This proved to be a disaster as the suits were poorly maintained and the passengers were usually novices with little or no experience using suits."

In a hushed voice, David asked, "So, people died before they even got to the airlock?"

The elderly gentleman nodded. "After several deaths were attributed to poor maintenance or incorrect suit usage, they re-designed the shuttles. Now the passenger cabin is a self-contained, sealed pod that can detach and pass through a large airlock without us getting out of our seats." As David contemplated his safety, there was a gentle hissing sound, followed by a loud clunk. The passenger cabin shook as it detached from the rest of the shuttle.

The elderly gentleman said with a mischievous grin, "Don't worry, you won't be bored. There are still lots of other ways you can die up here." David gave the man a gaunt smile and went back to looking out the window. A robotic heavy lifter, similar to the forklifts used on Earth, picked up the passenger cabin. David stared out the window as the cabin was carried through a large airlock and into the cavern that housed the city.

David had weighed eighty kilograms on Earth. Here, in the moon's weak gravity, he only weighed about thirteen kilograms. When he tried to walk normally, he unintentionally launched himself off the ground and hit his head on the ceiling. Gripping a handrail with one hand and rubbing his head with the other, David cautiously exited the passenger pod. He looked up and stood there in amazement, his jaw hanging somewhere around his knees. More experience travelers pushed past him, unimpressed by the view.

David was in an enormous cavern over sixty meters high and before him, he could see three of the city's massive spinning drums where the population lived and worked. He knew that most of Lunar City was underground in huge lava tubes and he had seen the city in videos, but the videos had not done it justice. Standing here, inside the city, it was like nothing he had ever experienced before. The cavern, the drums, they were gigantic! He felt like an ant inside of a human ant colony, dug beneath the moon's surface.

He was surprised to see bright light spilling out from the top of the spinning drums. It reflected off of the ceiling, bathing the cavern in soft diffused light. He had expected the air to be dry and stale, but it was slightly humid and smelled like a garden. The spinning

drums generated a soft breeze, but their sound was more felt than heard. A deep, gentle vibration that traveled through his shoes and up into his bones.

As he stood there in awe, David realized that someone was standing next to him. David was tall, just over one hundred and ninety centimeters. He was not used to looking up at people. The bald man standing next to him was easily ten centimeters taller and must have weighed at least one hundred and seventy kilograms. Wearing a Hawaiian shirt, blue jeans and sneakers. He was fat, but there was definitely muscle underneath.

A huge smile broke out across his face, and he chuckled. "It never gets old."

"What never gets old?" David asked as his gaze drifted back towards the city.

"The look on people's faces when they arrive at Lunar City for the first time. Hi, my name is Kamuela Peleke, head of the special projects department, but you can call me Kami, everyone does. I'm your new boss."

Kami offer his hand and David shook it automatically, his gaze still locked on the sight of the huge spinning drums. After a moment, David tore his gaze away from the city and looked Kami in the eye.

"Sorry if I wasn't giving you my full attention. This place is unbelievable."

David took a step back so he could get a better look at his new boss and said, "I like your shirt."

Kami smiled. "When I started this job, I wore a business suit like most people expected someone in my position to wear. Unfortunately, my staff seemed to be intimidated by me. That was not the work environment I wanted to create, so now I wear the Hawaiian shirts. I'm more comfortable without the tie and my staff feels more comfortable working for me."

Kami signaled to a service bot and gave it instructions to take David's luggage to his new apartment. With the luggage taken care of, Kami offered to give David a tour of the city.

"I don't want to take up too much of your time. Surely you have better things to do than give the new guy a tour of the city."

"Nonsense, you're my new chief medical officer. We need to get to know each other a bit. As you're new here and need to know how to get around, I thought I'd kill two birds with one stone."

David had read the city's safety procedures for moving between the drums. Kami went through it all again as they walked through a transparent passageway towards the nearest spinning drum. Yellow hand rails ran the length of the passageway. Kami insisted that David should use them until he learned to walk in the low gravity.

"The passageways will seal automatically if the cavern is punctured. However, their main purpose is to stop people bouncing too high in the low gravity."

"Is that so bad? In this low gravity, people should still be able to land safely."

"That's assuming you don't land on top of something or someone. Once you are up in the air, you have no control of where or how you will land. Most of the injuries sustained were sprained wrist and ankles from awkward landings. Occasionally there were broken bones."

David was now beginning to understand how dangerous low gee could be.

"In the early days, despite the warnings, people just arriving from Earth, usually

teenagers, would be tempted to see how high they could jump in the low gravity. One day, a foolish teenager decided he was going to jump up and touch the side of one of the spinning drums. The surface of the drum looks relatively smooth from the ground while it's spinning, but in fact, there are various hose fittings, access ports and panels that stick out. The drums slowly rotate at four point six revolutions per minute. But with an outer diameter of eighty eight meters, the outer surface of the drum is moving at seventy-six kilometers per hour. When the boy hit the side, it was like he'd been hit by a car. He was thrown across the cavern and slammed into the cavern wall before falling to the ground."

David grimaced now as he imagined one of those hose fittings puncturing the foolish teen. He had dealt with such wounds before. Torn flesh and mashed internal organs were a surgeon's nightmare.

Kami finished his story. "The boy survived with several broken bones, a crushed kidney, punctured lung and internal bleeding."

David cringed at the thought and looked at the spinning city drums with renewed respect. He was glad that the passageways had been installed. They headed for the nearest drum and Kami explained that it was mostly offices, although there was a school and a few restaurants.

The Drum

Entering and exiting the drum was fairly straightforward. The passageway passed under the drum and ended at a large door. Walking under the spinning drum was unnerving, with thousands of tons of city spinning slowly above their head. It made David feel like a tiny little ant again. That ever-present deep, subsonic rumble came from the huge bearings and now the garden smell had been replaced with the smell of grease and a hint of ozone. There was a faint hum, presumably from a huge electric motor. The drum spun lazily around a hollow shaft ten meters in diameter that went from the floor to the ceiling of the cavern. Inside the shaft was an over-sized, but otherwise rather ordinary looking elevator. The only unusual thing was the rows of hand rails. A plaque next to the door boasted the elevator's capacity to carry sixty people.

"It's awfully quiet. Doesn't anyone else work in this drum?"

"The drum is full of people, but they are all at work or school at this time of day. The morning and evening commute are the busy times. As a newcomer, it's best if you avoid the elevator during those times if possible."

Despite the height of the shaft, the elevator only stopped at four floors. Basement, Ground, Drum and Ceiling. Kami pressed the button for the drum level. David could see that a security key was needed to access the basement and ceiling levels.

David pointed to the buttons and asked, "I'm guessing that the basement has a fusion reactor and motors that spin the drum, but what's in the ceiling?"

Kami was deadly serious now. "If you look carefully at the ceiling, you will see the steel framework has clear panels on the inside. You will also see some sections are white. On rare occasions, we are hit by an asteroid and the lunar surface cracks." A look of fear spread across David's face.

David asked, "The white sections are where foam has been used to seal the crack? The same foam used as an emergency seal in space suits?"

Kami nodded in agreement. "Occasionally, the engineers need to access the ceiling to repair the sensing modules and foam dispensers."

At that moment, the elevator door opened and David could see they were on the floor of the drum. He watched the drum spinning around them like a giant carousel but with apartments, offices, restaurants and a school instead of fiberglass horses. The floor of the enormous drum was covered in hydroponics racks. The strange thing was, all the racks were tilted towards the shaft and near the outer wall there were even terraces with the racks mounted horizontally.

David looked about in wonder. "I feel like a sock that's been thrown into my mother's old washing machine."

Kami laughed. "Welcome to the never ending spin cycle."

An enclosed platform with a handrail in the center rotated slowly around the shaft. Signs posted around the platform warned visitors to keep one hand on the rail at all times. David watched as Kami stepped out onto the slowly rotating platform and took hold of the handrail. David followed, carefully mimicking Kami's movements. Now that he was standing on the platform and rotating at the same speed, the drum appeared stationary. Instead, it was the elevator shaft that appeared to be rotating. The elevator door closed as

it disappeared from view. It was strange how his perception had changed with just a few steps.

Gaps in the handrail at regular intervals allowed passengers to move to the outer edge of the platform, where four large carriages were waiting.

Kami explained, "All the carriages go to the habitat level of the drum so it doesn't matter which one we take. Worst case scenario, you'll have to walk an extra one hundred and thirty meters to get to the office. Make sure you're holding onto a pole at all times."

David studied the carriage closest to them. A motorized base sat on painted yellow rails that went to the wall of the drum. The passenger section was mounted so that it could tilt. It had clear walls so you could see outside and bright yellow poles that went from floor to ceiling for the passengers to hold on to. It reminded David of an amusement park ride he had been on as a kid.

A warning was announced as the carriage door closed. David grabbed onto a pole to steady himself. It was the weirdest sensation that David had ever experienced. He felt like he was in an elevator going down except that he was getting heavier as they descended. What was really blowing David's mind was the view outside.

They were passing row after row of hydroponics racks that seemed to stand up as they approached. The floor of the drum was tilting to become a wall behind the carriage and what had been the wall was slowly becoming the floor. He knew it was a sensory illusion created by the carriage tilting but knowing didn't make it any less exciting. David could now smell the sweet, wet fragrance of the plants and hear flowing water. Occasionally, he saw a bot moving between the rows, tending the crops.

When the carriage came to a stop and they got out, David's sense of reality had fallen over on its side. The floor of the drum was now a huge circular, near vertical wall covered in concentric rows of hydroponics racks. The wall of the drum was now the floor with shops and offices in either direction, curving up over their heads in an enormous loop. The cavern ceiling was now a distant wall slowly rotating with the elevator shaft, which now hung horizontally above their heads. Bright lights mounted on the upper part of the shaft simulated daylight for the plants, temporarily blinding David when he looked at them.

Kami stood there patiently while David's eyes and brain had an argument concerning which way was up. David's inner ears didn't like being ignored and before he knew it, his stomach decided to join in. David suddenly felt nauseous, lightheaded, dizzy and motion sick all at the same time. His knuckles turned white as he gripped a nearby handrail. His heart beat was now a blacksmith's hammer pounding in his ears. Once he had loosened his grip, Kami guided him to a nearby park bench and sat him down.

"Don't worry, you'll get used to it soon enough. The trick is to focus your attention on whatever you're orientated with. Look downward and focus on where you're placing your feet until you get used to it."

Now firmly seated, David slowly looked up. As he adjusted to this new reality, he noticed that the park bench was at the edge of a wide footpath lined with fruit trees. Much to his surprise, a honey bee buzzed about between the flowers. Kami took a small water bottle from his pocket and handed it to David, who sipped from it gratefully. On one side of the footpath there were the offices, shops, restaurants and a school. On the other side was a ten meter wide strip of grass.

Kami watched David looking at the grass strip and said, "Welcome to the park. Each drum has a footpath lined with trees and a strip of grass. People can relax, have a picnic

and pick fruit from the trees if they need a snack.”

David stood up and had the weird sensation that his head was lighter than his body.

Kami grabbed David’s arm to steady him and said, “Your head is closer to the center of the drum than your feet. Therefore, your head experiences slightly less centrifugal force. Just don’t move too quickly until you get used to it.” They began to walk along the footpath now that David was feeling better.

Kami explained. “The park is essential to the mental health of the inhabitants. I often enjoy going for a walk amongst the trees after work.”

David was still trying to get used to the new environment and decided to focus his gaze on the trees lining the footpath. Kami nodded in approval and continued his explanation.

“The garden and orchard are also a part of the air and water recycling system.”

David said, “I thought I saw a bee.”

Kami laughed, “Yes, we have bees to pollinate the plants and as a bonus we get fresh honey. We also have earthworms to recycle waste and maintain the health of the soil.”

A bell rang suddenly and for a moment, David worried that there was some sort of emergency.

Kami saw the worried look on David’s face and said, “Relax, that’s just the school bell. School is out for the day.”

Sure enough, a few minutes later children were rushing out to play and some children even climbed the trees. Some kids started kicking a ball about and David watched in fascination as the ball seemed to curve through the air because of the Coriolis Effect. Playing football on the drum where the floor played tricks on your eyes, the gravity varied and the ball curved through the air certainly looked challenging. David loved football and couldn’t wait to try this new version.

They were now walking to the offices where David would work. If David kept his gaze low, then it was as though they were walking on flat ground the entire trip. If he looked up, then the *ground* curved up into the air above their heads, only to sneak back up behind them. David made the mistake of looking up and behind him while he walked forward, and Kami caught him as he stumbled. Kami warned David not to look about so quickly. It took time to get used to a place where the floor and the walls were interchangeable. It didn’t help that the Coriolis Effect also played tricks on your inner ear. After touring the office and meeting the staff, it was time for dinner. Kami took David to a nearby restaurant. Now that the tour was over. Most of David’s questions had been answered, and Kami wanted to ask a few questions of his own while they enjoyed a meal.

Marriage Counseling

Lunar City was a major space port with shipments being regularly sent between Earth, Mars and, soon, Venus. As an Earth native and an engineer, Gwen found Lunar City fascinating. Despite the dangers, Gwen had been quick to volunteer when a Venus colony was proposed. Kami had greeted Gwen in the same manner as he had with David. Gwen was not as impressed with the city as David had been. Gwen had seen videos of the spinning drums of Lunar City before and had studied them when she was an engineering student.

Gwen admitted. "It is something else to stand inside one and see the cavern ceiling as a spinning wall. It's also fun."

Gwen began jumping up and down, small jumps at first so that she could experience the Coriolis effect. Kami had trouble getting a read on Gwen. In some ways she was very formal and had even suggested that the boss wearing a Hawaiian shirt set a bad example. On the other hand, she looked like a schoolgirl as she jumped up and down to experience the Coriolis effect with a big grin on her face.

Gwen was working on the design of the dirigibles that would form the colony on Venus when Kami introduced her to David Walsh, a surgeon from Australia. David had also volunteered for the Venus colony and would be her medical consultant when designing the medical bays on the dirigibles. Gwen quickly took a disliking to David. He was conceited and always making jokes that she did not find amusing. David tried to be polite, but he found Gwen to be cold and very formal. Rather than laugh or even smile, she took offense whenever he tried to lighten the mood with humor. It was hate at first sight. Unfortunately, they were the best in their respective fields and the only ones crazy enough to volunteer for such a dangerous mission. Gwen and David avoided each other as much as possible, and it was affecting the schedule.

Kami was by nature a cheerful person and strongly believed that his staff worked best when everyone was happy. Despite the pressure he was often put under, he always managed to make time for his staff. His staff repaid him in kind, working late when they knew he was under pressure to meet a deadline. Now Kami was facing a new kind of challenge. Two new department heads for the Venus colony had arrived. They needed to work together, but could barely tolerate being in the same room. Kami was under pressure to have the Venus colony established as soon as possible, so he did the only thing he could. He summoned them both to his office and insisted they attend marriage counseling.

David and Gwen, in perfect unison, said, "But we're not married!"

Kami beamed with delight. "There you go. You're already beginning to agree with each other. If it will make you feel better, I can have a minister here within the hour and have you married on the spot."

Gwen stepped forward and glared at Kami with such intensity that he unconsciously took a step backward. David had been ready to protest, but the sight of this huge Hawaiian backing away from Gwen's petite figure was too much, and he burst out laughing. Gwen looked at David in surprise, and Kami relaxed a bit.

David held his hands up in surrender and said to Gwen, "I think we got off on the wrong foot and perhaps the counseling is not such a bad idea. I don't want to go to Venus with this tension between us."

Gwen admitted that the tension between them needed to be resolved before they went to Venus and then left the office before either of the men could reply.

Kami mused out aloud. "I need a drink".

David nodded. "I'll join you."

Gwen Gaynor was Welsh and was proud of it. Born in the small town of Tenby, she loved Tom Jones, motor bikes and medieval history. Gwen was a gearhead from an early age. She had helped her father, Daniel, race and repair motorcycles. Her mother, Tegan, often scolded her for getting engine grease on her clothes, but was secretly proud that she had such a smart daughter.

As a teenager, Gwen would often tinkered with her father's motorcycle, sometimes without his knowledge. That ended one morning when her father was riding home with some eggs for breakfast. He noticed a red button on the handle next to the throttle that had not been there before. Without stopping to thinking about it, he pressed the red button to see what it did. For a moment the engine coughed and spluttered and then, with a roar of power, the bike leaped forward like a scalded cat. Gwen's father came home with a speeding ticket and covered in eggs. Gwen was banned from touching his bike ever again, unless they were at the racetrack.

Soon after the egg incident, Daniel and Tegan took Gwen to a renaissance fair. Gwen had never shown an interest in history before, but took an immediate interest in the weapons on display. The next day, Gwen was looking for scrap metal to make a sword like the one used by King Arthur. When her parents found out, they just shook their heads and were grateful that Gwen was not building a catapult. Gwen's hobbies had made her a bit of an outcast with most of the other girls her age who were into clothes, makeup and the latest boy band. They could not understand what Gwen found fascinating about *grandma music*, greasy engines and medieval weapons.

Gwen didn't have many friends and had become defensive by the time she had left university with two degrees. During their counseling sessions, David learned that Gwen was not cold as he had first thought, but defensive. Like many others before him, David had misunderstood her. Gwen learned how David's humor was typical of Australians and was also his way of dealing with stressful situations. Gwen and David were both highly intelligent and soon realized that the conceit they saw in each other was a reflection of themselves.

Eventually Gwen had come to realize that David's humor was intended to be friendly and that occasionally he could be funny. David had learned what annoyed Gwen the most and did his best to keep certain things to himself. They were not friends, but they had learned to respect each other and work together.

Miss Management

Kami had received several complaints from Gwen's staff. Gwen could be dismissive at the best of times and did not tolerate mistakes or what she considered being stupid questions. Kami had tried to counsel Gwen about this, but it wasn't until one of the construction crew was injured before Kami's counseling sunk in.

Construction of the atmospheric processing dirigible was behind schedule because of manufacturing delays. Gwen had changed the construction schedule to accommodate the delays and Kipp, head of the construction crew, felt the changes were potentially dangerous.

Kipp tried to remain calm as he asked, "Do you know what will happen if a spark from the welder hits a pocket of pure oxygen?"

Gwen gave Kipp a look of disdain and replied in an icy tone. "They are working on the night side of the moon. There is no atmosphere, and it's over two hundred degrees below zero. I'm not worried about them starting a fire."

Kipp opened his mouth to protest but was cut short as Gwen added. "Just don't let the Bravo brothers anywhere near the oxygen recycling plant until the work is done. Now go!"

Kipp gave Gwen a look of contempt and left her office before he was tempted to say or do something less than professional. The only thing they agreed on was that the Bravo brothers should be kept well away from the oxygen recycling plant.

Fernando Ramirez, de facto leader of the 'Mexican Crew', had been warned about the schedule changes. He had waited until the welding crew were on the other side of the chamber before he began testing the oxygen recycling system. His test equipment had just detected a small leak when he heard the cry.

"Incoming!"

Welding splatter, blobs of molten metal, can travel long distances in the low lunar gravity. Fernando hit the emergency stop and jumped back from the oxygen leak as soon as he heard the cry, but it was too late. He was floating in a pocket of pure oxygen. The small blob of molten metal landed on the right arm of his space suit. Instead of smoldering, his sleeve burst into flames.

Fernando desperately slapped at the flames with his left hand as the heat penetrated his suit. He could hear voices yelling over the suit radio and then the loud hissing sound of his suit leaking drowned out the voices. The oxygen from his suit continued to feed the flames as they entered his suit and engulfed his arm. Fernando screamed in pain as the smell of burned plastic and charred flesh filling his helmet.

It only took a second for the suit's automatic systems to detect the drop in air pressure and engage the emergency seals, but for Fernando, it seemed like forever. Panicked voices came over the radio, but Fernando was no longer listening. Deprived of oxygen, the flames quickly died, but now his burned arm was exposed to the cold vacuum of space.

For a few brief moments, the cold of space neutralized the heat from the flames, and the feeling was pure bliss. Fernando's arm swelled in the hard vacuum. The exposed skin was freezing and a new kind of burning sensation spread through the tortured flesh of his arm. The last thing Fernando heard was his own uncontrollable screaming.

The incident was treated as an accident. The welding crew should have taken additional

safety precautions to prevent sparks coming near the oxygen recycling system. The testing crew should not have tested the equipment when there was an obvious ignition source in the vicinity. The injured technician knew about the danger that a potential oxygen leak posed and should have refused to run the test until welding had ceased.

Kami was in Gwen's office when Kipp burst in. Gwen stood, her lungs filling with air in preparation to berate her subordinate for such rude behavior. As soon as he was in the door, Kipp hit the playback button on his radio.

A voice could be heard shouting, "Incoming!" followed by shouts and then screaming. Gwen's office filled with the sound of Fernando's tortured screams drowning out the sound of men calling for emergency medical assistance. Gwen remained standing, frozen by what she had heard.

Kipp gave her a long hard stare, full of hatred and loathing as he spoke. "You better hope that the new doctor knows what he's doing, otherwise a good man will lose his arm because of your revised schedule." Kipp looked at Kami as if seeing him for the first time, and his anger faded into a look of disappointment.

Kipp put the radio on Gwen's desk, turned and left the office. Kami knew that the look of disappointment had been meant for him. Gwen was his choice and his responsibility. Gwen was one of the few people he had trouble reading. He was surprised when, still standing, she reached out and hit the replay button on the radio. Again, Fernando's horrific screams filled the office. Gwen trembled, and silent tears flowed down her cheeks. Kami walked out of the office. Kipp's condemnation and Fernando's screams were far more punishment than any reprimand from him.

David and his medical team were able to save the arm. David had just changed into clean scrubs when he saw Gwen coming towards him. She had obviously been crying. Without saying anything, she hugged him. After a moment's hesitation, he put his arms around her and tried not to say anything that would upset her more.

Eventually, she pushed David away and said, "This never happened."

David watched her go and thought to himself. "That's one complicated lady."

Gwen's mother had taught her the value of owning her mistakes. She knew that Kipp wouldn't be the only one who was angry with her, and she didn't want that anger to fester. Gwen called a meeting in the lunchroom. She felt small and vulnerable as the room filled with angry faces, men and women alike, and all of them were angry with her. What had started as quiet muttering when the crew first entered the lunchroom had steadily grown louder. Some cursing could be heard now, and Gwen wondered if she was in danger.

A woman's voice called out. "SHUT UP! I want to hear what she has to say for herself." The room quickly grew silent, and all eyes fell on Gwen.

Gwen spoke quickly before she lost her nerve. "I was wrong! I ignored Kipp's warnings because I didn't fully understand the danger. I was wrong because I thought the vacuum of space would prevent a fire from occurring. I was wrong because I put the schedule before the safety of the crew and I'm sorry."

The woman who had told everyone to shut up came forward. Everyone moved out of her way. A show of respect that was not lost on Gwen. The patch on her suit identified her as Carlita and Gwen realized this woman was one of the Mexican crew. Carlita stood so close that Gwen could smell the grease on her suit and a faintly floral scent, presumably from the shiny black locks of her hair. Carlita's spoke to Gwen loudly enough for everyone

in the room to hear. "You're sorry! I'm sure that will be a great comfort to Fernando's wife as she sits next to the hospital bed of her unconscious husband. I'm sure she will be grateful when she has to cut his food into small pieces and open his beer for him."

Gwen's mother had also taught her when enough was enough. Gwen's expression hardened, and she stepped forward so that she was now toe to toe with Carlita.

Gwen spoke loudly for everyone to hear. "I have publicly admitted I was wrong. I have apologized for my mistake and I will apologize again, in person, to Fernando and his wife once Fernando is awake and alert. What more do you want?"

Gwen took a step back and looked around, speaking to everyone in the room. "What will make this right? Do you think a good old-fashioned public flogging in the garden will help Fernando's arm heal quicker?" The room was silent now, and Carlita's scowl softened into a frown. Gwen's voice hardened as she focused on the woman in front of her. "And what about you, Carlita? Do you think Fernando's wife will feel better if you hold me down while she uses a pair of pliers to remove my teeth and fingernails?"

Gwen's voice softened, but remained loud enough for everyone to hear. "I am genuinely sorry for putting the schedule before the safety of the crew. In the future, my door will be open to everyone here. If you have an idea how we can do things better. If you have a safety concern. If you think there is something I don't understand, then come and see me directly. I promise I'll listen." Kami never received another complaint about Gwen after that, and the construction of the dirigibles continued smoothly without incident.

Two weeks later, Fernando, the technician whose arm had been burned, came to visit Gwen in her office. Gwen immediately stood up and apologized again for her part of the incident. Fernando held up his hand to stop her and said, "There is no need to keep apologizing. We all made mistakes that day. That's not why I am here."

Gwen gestured for Fernando to sit and offered him some tea, which he politely declined before he explained. "I am here on behalf of the construction crew to petition that you change the name of the dirigibles. It's a clumsy name with too many syllables. It makes conversation difficult."

Gwen could not fault the logic. David had also commented that the word dirigible was a bit of a mouthful. In one of his failed attempts at humor, he had dared Gwen to say the word ten times as fast as she could.

Gwen asked, "What do you suggest we call them then?"

"I had a talk with the other construction workers and after some heated debate they have agreed upon 'Pods' as a fitting name. These pods will be the seeds of a new human colony and the short name is easy for everyone to understand, even when there is static on the radios."

Gwen agreed and then asked, "Why was the debate heated? What other names were being considered?"

Fernando sighed. "The heated part of the debate had nothing to do with the name. The Bravo brothers mocked another worker's suggestion. It started a fight. The Bravo brothers are high spirited and often funny, but sometimes they rub people the wrong way."

Gwen nodded in agreement as she remembered meeting the brothers for the first time. She had not been amused by their antics. Kami confirmed that management didn't care what they were called as long as they were ready to ship out in the next three months.

Pod Deployment

When Mars had been colonized, six high-powered communications satellites had been deployed. Circling the Sun, these satellites ensured that communication was not lost when Mars was on the opposite side of the Sun compared to Earth. Now those satellites combined with satellites orbiting Venus would ensure the new colony would always be in contact with the control room in Lunar City.

With nine days to spare before the deadline, seven pods, glistening in their silvery white protective shields, were ready to ship out to Venus. Sixty meters in diameter and eighteen meters high. They looked like squashed beach balls, but they were the most sophisticated dirigibles ever made. Powered by fusion reactors, fitted with life support systems and fully automated. A small spaceship equivalent to the tug boats used in ports on Earth raised the pods, one by one, from the lunar surface. Its powerful engines launched the pods effortlessly on a trajectory towards Venus. With the latest fusion powered ion engines, the pods would make the trip in less than two months. The pods were going now so that they would be fully tested in Venus's atmosphere before the crew was sent. If there was some unseen flaw in their design, there would still be time to abort the mission.

The next two months went by quickly. Gwen and the construction crew joined the team building the transport ship that would take the colonist to Venus. David was kept busy patching up the construction crew and quickly got to know Marco and Hernando Bravo, who were regular visitors to the emergency room. David looked up as he heard two familiar voices. Marco was helping his brother limp into the emergency room. Both men were sporting bloody noses and facial bruises that were quickly blooming into black eyes.

David asked, "What happened this time? Where's the other guy?"

Hernando pushed Marco away and hopped over to an empty bed. Marco said something offensive in Spanish to his brother and then answered David. "There was no other guy."

Hernando gave his brother a dirty look and then asked David, "Do you know how hard it is to kick your brother in the ass in low gee?"

David smiled. "I think I have some idea."

Marco was grinning now. "Not as hard as that support beam that your foot connected with."

Hernando grimaced as he carefully removed the boot from his injured foot. "Magnetic boots are not designed with ass kicking in mind. It's very difficult to get them to release at the right moment."

Marco nudged David and confided. "Last time he tried, both boots released at once. He went straight up, end over end, like a pancake being flipped in the air."

David saw movement out of the corner of his eye and ducked. Hernando's boot shot past his face, hitting Marco right between the eyes. Marco howled with pain and David snatched up the boot before it went ballistic again. Marco let loose a torrent of offensive Spanish insults, and Hernando grinned with satisfaction.

David called for security. He liked the Bravo brothers, but he could not tend to both of them when they were feuding like this.

The pods survived the two-month trip to Venus and were entering a polar orbit. Kami

had asked Gwen to fetch David from the hospital and bring him to the control room. Normally Gwen would have insisted that she was not a dog, and that she did not fetch for anyone, but she was nervous and excited and she wanted David to be there. David had worked with her to design the medical bays and, after all the counseling sessions, he was as close as she had to a friend at Lunar City.

When they reached the control room, David took one look inside and turned to Gwen. "That can't be the control room. It's too small. Is this your idea of a joke?"

Gwen looked confused for a moment and then smiled. "Let me guess. You were expecting a large room full of screens and terminals with at least a dozen people staring at screens and typing or talking quietly into microphones on their headsets?"

David nodded and was surprised when Gwen laughed. "You've been watching too many old movies. Now hurry up or they'll start without us."

The control room was dimly lit and much smaller than David had imagined. A detailed hologram of the planet Venus floated in the middle of the room. Three computer stations sat against the far wall, but their operators were looking at the hologram rather than their screens. Kami was the only one wearing a headset. He gave Gwen and David a quick nod of recognition and pointed to some comfortable-looking chairs in an empty corner of the room.

As they sat down, David asked, "Where is the security? Where is the media?"

Gwen said, "With all the political turmoil on Earth, Lunar City has multiple layers of security built in. It begins on Earth with a background check and ends with cameras and sensors all over the city. Having a security guard outside the door would be a waste of resources."

David thought about it and nodded in agreement. "I suppose that the same goes for the media?"

Gwen pointed to a small dome on the ceiling and smiled. "You've been on camera ever since you left Earth."

Kami had been speaking to someone on his headset, but now he was giving instructions to the operators and the hologram filled the center of the room. The satellite imagery changed to a detailed computer simulation showing Venus, and its terrain in shades of orange, slowly rotating on its axis. Seven gray pods, dispersed around the planet, slowly passed over the north pole and then circled down to the south pole in a polar orbit.

David asked Gwen, "Would you mind giving me a commentary as things happen? This is all very new to me."

Gwen smiled nervously. "It's new to me too, but I'll do my best. The hologram is showing us what is happening in real-time, although there is a delay of about three and a half minutes because of the distance between Venus and Earth."

"Okay, so what we are seeing now happened a few minutes ago. If Kami gives a command, it takes about seven minutes for us to see the results."

Gwen nodded in agreement and continued explaining. "Each pod is controlled by an AI system. Each AI system consists of three identical units working in parallel for redundancy. Kami has told the operators to give the go ahead signal to the pods. In a few minutes, we will see the first pod attempt to enter the vortex at the south pole."

David frowned. "I don't like the sound of that. What is the vortex and what do you mean by attempt?"

"The upper atmosphere of Venus rotates at almost four hundred kilometers an hour and gets slower as it approaches the surface. The vortex is like the eye of a hurricane, with a funnel of calm air at the center. This is the safest place for the pods to enter the atmosphere."

As if on cue, the hologram zoomed in on the south pole and faint white lines formed a spiraling funnel over the south pole. The gray pods cut across the vortex as they continued their polar orbit.

Kami announced. "The first pod will be an agricultural pod. If something goes wrong, then it's the most expendable."

Now the pods changed colors Gwen said, "The green pods are agricultural. Blue are habitat pods. White is atmospheric processing. Gray is manufacturing. Yellow is the construction pod."

As they watched the hologram, a green pod veered towards the vortex.

"Okay, the thrusters have fired to de-orbit the pod. The pod's AI system will use the thrusters to guide the pod into the vortex."

David asked, "Won't it burn up on re-entry?"

Gwen looked nervous. "Not unless something goes wrong with the rockets. They should enter the atmosphere at a relatively low speed, and they have a protective shell that will provide some protection."

Gwen pointed to a series of white numbers on one side of the holographic display. David had paid no attention to the numbers before. Now he could see one for 'skin temperature' rising in value. Velocity was decreasing. Suddenly, an alarm sounded and the green pod began flashing red. Gwen grabbed David's hand and held it tight.

The pod must have hit unexpected turbulence."

The operators were all at their stations now. The data they were receiving was from three and a half minute ago. All they could do was study the data coming in and report it.

"Thrusters two and three are disabled. The AI system is compensating with additional power to thrusters one and four."

"AI is attempting to restart thrusters two and three. First attempt failed."

"Thrusters one and four are reaching maximum temperature."

"Thruster two has restarted."

"Thruster three has restarted."

As quickly as it began, the emergency ended. The alarm shut off and the blinking red pod changed back to green.

"AI has regained full thruster control."

Gwen loosened her grip on David's hand and he realized he had been holding his breath. Kami spoke calmly into his microphone.

Gwen said to David, "It's not over yet. That was just a minor hiccup. The pod still needs to descend to an altitude of fifty kilometers before it can leave the vortex."

As David watched the holographic display, the tiny green pod was swallowed by the vortex. Its altitude dropping steadily. The holographic simulation shrank and moved to one side as video from the next pod showed them the vortex as seen from space. The atmosphere was a murky yellow, but the vortex was easily visible, crowned by a slowly rotating swirl of white cloud tops.

David asked, "Is the next pod preparing to enter the vortex now?"

"No, not until the first pod has made it safely to the equator. If the first pod fails, then the data it sends us will be used to determine if the mission can succeed. Already the data from the turbulence has been sent to the other pods. Their AI systems will use that data to refine their approach to the vortex."

As the second pod moved directly over the center of the vortex, the view zoomed in on the first pod, barely visible in the yellowish atmosphere. Flashes of lightning were visible around the outer edge of the vortex and David could not help but imagine it as a gaping maw swallowing the pod. Just as they were losing sight of the first pod, there was a brief flash of white light, but it wasn't lightning.

David gripped Gwen's hand tightly and was about to ask what happened when an operator called out. "Protective shell has been jettisoned."

Gwen said, "The shell was mainly there to protect the pod from micrometeorites during the trip through space. Now that the pod has entered the atmosphere, the shell is only dead weight."

David relaxed his grip and looked at the altitude, reading. The pod had just dropped below one hundred kilometers and they had lost sight of it as the pod above the vortex continued along its orbital path.

The view changed back to the previous simulation, but now lightning could be seen around the edge of the vortex.

Confusion spread across David's face. "That wasn't there before. Where did all the lightning come from?"

Gwen smiled. "It was always there, but now the first pod is sending back data from inside the vortex. The simulation has been updated and is more accurate now."

They watched in silence as the pod continued to drop. The operators were giving status updates now.

"Internal buoyancy system activated. Hydrogen balloons inflating."

"Duct fans extending at sixty kilometers."

"Thrusters jettisoned."

David asked, "Why are they jettisoning the thrusters? Don't we need them if something else goes wrong?"

Gwen replied. "No, the thrusters are just dead weight now. Worse still, they will become unreliable and potentially explosive as they corrode in the atmosphere. The pod is deep enough in the atmosphere that the internal hydrogen balloons can provide buoyancy and the duct fans can provide thrust. "

David's brow furrowed. "Isn't it dangerous to use hydrogen for buoyancy? Won't it explode?"

"In Earth's atmosphere, it would be, but there is almost no oxygen in Venus's

atmosphere. The atmospheric processors have to make it by breaking down the sulfuric acid."

David replied. "Okay, but there is oxygen inside the pods so that we can breathe. You are not making me feel better. I've been trying to ignore the fact that my new home will be an inflatable balloon, full of explosive hydrogen, floating in acid and surrounded by lightning." Gwen let go of David's hand and punched him in the arm. "My pods are not inflatable balloons, but if you feel that way, then I'm sure Kami can find another doctor."

Without looking away from the display, Kami said, "Don't make me look for another doctor. I had enough trouble trying to make you like this one."

An operator called out. "The pod has reached an altitude of fifty kilometers and is leaving the vortex."

Gwen's hands were now clasped together in her lap. "Now we are getting to the unknown part of the mission. We know that the wind speed increases as you moved away from the pole but remains fairly constant regardless of altitude. Below sixty-five degrees latitude, things change dramatically and the wind speed varied with altitude rather than latitude. It is this region of transition that concern us. We expected the pod will experience turbulence and wind shear, but no one knows how much."

Kami spoke briefly into the headset and took it off. He summoned a service bot to get some refreshments and sat in the corner with David and Gwen.

Kami said, "We should be free of any drama for the next few hours. What do you think of our control room now?"

David grinned. "It's smaller than I expected, but that holographic display is impressive."

Kami accepted the compliment with a nod and asked Gwen, "How are you handling the stress of seeing your pod being bounced around by the turbulence?"

"I'll admit that it had me worried, but it's the wind shear that has me frightened. The pod design is based on theoretical simulations only."

Kami looked at the time. "Get some rest and come back in twelve hours. If something happens before, then I'll let you know."

David asked, "What about you? You should rest too."

Kami smiled and pulled a lever on the side of his chair that caused it to recline. A service bot arrived with tea, biscuits and an assortment of fruit.

Kami dipped a biscuit in his tea and said, "Don't worry about me. I know how to relax."

David was in a deep sleep when he was woken by someone pounding on his door. Expecting some medical emergency, he rushed to the door half dressed.

The moment he unlocked the door, Gwen burst in. "Hurry up and get dressed. It's happening now!"

David finished pulling his shirt on. He was still half asleep. "What's happening now?"

Gwen gave David a look that was a mixture of fear and frustration. "The pod is experiencing turbulence and excessive wind shear. Forget about your shoes, slippers will do."

As they entered the control room, it was eerily quiet. Everyone was watching the holographic display, which was showing a very shaky video from inside the pod.

Gwen was surprisingly silent when they entered, so David asked the obvious question. "What's happening?"

Kami turned to Gwen and David. "The wind carried the pod towards the equator faster than expected and now it's in the transitional region of the atmosphere." Kami signaled to one operator. The display changed to a split screen, with the simulation on the right and the video on the left.

Kami sighed in frustration. "There's nothing we can do now but watch. The pod can't go lower because of the higher temperature and pressure. If it goes higher, then the wind speed increases and it will probably be torn apart."

David asked, "How low can it go before the temperature was too high?"

Kami looked at Gwen. Gwen thought for a moment and said, "Instruct the pod to reduce altitude to forty kilometers. There's no crew on board, so it should be safe." Kami gave the command.

Gwen said to David, "You might be smarter than you look."

David gave Gwen a sour look. "Considering I am still half asleep and wearing my slippers, that's not very difficult."

Gwen gave David a worried smile and said to Kami, "The pod will get hot. Maybe one hundred degrees Celsius or more, but the AI cooling system should be able to handle that. Air pressure won't be a problem because the pods aren't pressurized. The good news is that the wind speed at an altitude of forty kilometers is about one hundred kilometers an hour slower. The bad news is that there will be more lightning below the cloud deck."

Gwen and David were back in the corner when the pod began its descent. David was paying more attention to the numbers on the simulation and saw the internal temperature climbing. The video feed was still very shaky, but it was calming down when the image turned to static.

The operators began giving status updates.

"The pod was hit by a lightning strike at an altitude of forty-three kilometers."

"Video feed has been lost, but we are still receiving telemetry."

"The AI cooling system has switched to backup power."

"Service bots have been dispatched to make repairs."

"AI is reporting that it must reboot to bring the main power back online."

"Telemetry is lost. All communications are down."

Kami spoke softly into his headset and then turned to Gwen and David.

"Now all we can do is wait and hope that the AI can successfully reboot."

David asked, "If the AI has shutdown then how long before it crashes into the surface of the planet?"

Gwen had gotten up and was pacing back and forth with her arms crossed tightly against her chest.

"It's not an airplane, David. The internal buoyancy balloons will keep the pod floating in the atmosphere. It's just now, with the AI system shutdown, the duct fans cannot maintain any sort of stability. The pod could flip over."

David asked, "And how is that worse than before?"

Kami said, "The service bots won't be able to make repairs if they are on the ceiling. They won't be able to reach the systems they are trying to repair."

Gwen stopped pacing momentarily and looked at David. "All we can do is hope that the AI system can reboot and repair before it gets hit by another strike."

It only took twelve minutes before an operator announced that they had telemetry again, but that twelve minutes felt like twelve years to Gwen. Video feed returned soon after. Less shaky than before.

Gwen turned to Kami. "Wait until all repairs are made and then instruct the AI to return to an altitude of fifty kilometers. The pod should be out of the transitional region by then. I'm going to get something strong to drink and lie down for a bit."

The pod arrived at the rendezvous point on schedule, and the AI systems of the other pods analyzed the data it had gathered. The rest of the pods traveled through the transitional region at an altitude of forty-five kilometers. It was a rough ride, but none of the other pods were hit by lightning.

A week later, the pods had maneuvered into formation and docked with each other to form a cluster. It was time to finish the selection process and begin training the crew. During this time, the pods would be constantly monitored for signs of damage or deterioration. If any major problems were encountered, then the mission could be aborted or additional equipment could be sent with the crew.

News services around the world had followed the "Venus Project" since it had first been announced. After the success of the Mars colony, some people had argued that the immediate need for colonization had been dealt with and that the money was better spent on Earth. Others argued that until an artificial magnetosphere had been established on Mars, the immediate need to colonize had not been dealt with. Some argued that until strict population control was established in every country on Earth, then spending money on Earth was just throwing the money down the drain. Mostly, the debate was argued in online forums and chat rooms. Occasionally, it made the front pages of the news services. Usually because of some group killing members of an opposing group.

Now the "Venus Project" was on the front pages for all the right reasons. The first man made habitat, a cluster of seven linked pods, was floating peacefully in the clouds of Venus and awaiting its first colonist. Video taken from the pods showed a pale yellow sky so clear that you could see all the way to the horizon. The thick cloud deck below flickered as lightning rippled through it with subsonic booms occasionally breaking the silence. The politicians all claimed victory and patted each other on the back despite the fact that they had done next to nothing. The Consortium began making plans to take control of the Venus colony. There were politicians to bribe, blackmail, or fund.

While the humans monitored the pods from satellites orbiting Venus, something else was watching the pods with interest. It had been dormant for billions of years. Now it had something new to stimulate it.