THE MARS FRONTIER

Vol. 6

The Commonwealth

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Miners

27 Aug. 2046

The Mars shuttle *Arsia* plunged into the Martian atmosphere at 4.2 kilometers per second and within seconds the metal heat shield covering its blunt, conical base was glowing red hot. A plume of ionized gas enveloped the craft, tracing a meteor-like reddish trail across the predawn sky above the Tharsis Uplift. Inside the pilot, Emily Scoville, watched the computer closely. It maintained the craft's lift at maximum, lengthening the glide and minimizing the gee forces on the human beings packed into two small passenger cabins just above the engines. They were surrounded by two cargo areas stuffed with twenty tonnes of cargo: consumables, drills, solar power units, sunwings, new computer equipment. The passengers anxiously watched the television screen in front of them as they endured up to two terrestrial gees of deceleration.

Just as the deceleration waned—the atmosphere had done all it could do to slow their plunge to a mere 1.5 kilometers per second—Emily came on the intercom with the laconic announcement, "parachute deployment." No warning was sufficient for the jerk caused by the deployment of the drogue chutes, then the violent jerk caused by the three main chutes ten seconds later. Rather than falling ballistically in a long, graceful arc toward the surface, the parachutes caused the trajectory to steepen and the *Arsia* to head more vertically toward the ground below.

Bang! The parachutes cut loose on cue when the *Arsia* was falling at a mere 700 meters per second—1,565 miles per hour—26 kilometers above and to the west of pad 7. For a terrifying split second they were in free fall. Then the *Arsia's* main engines,

formerly concealed behind now-open doors in the heat shield, blazed alive, expelling one hundred meters of orange-tinged blue flame. Weight returned, 1.3 terrestrial gees of it. The *Arsia* slowed, turned to stand vertically, then settled straight onto the bullseye in the center of pad 7, blasting dust and vaporized ice hundreds of meters across the surface. With a bump the spacecraft settled onto its legs and the engines shut off. The first eight of Columbus 6's forty personnel had arrived at Aurorae Outpost, Mars.

Two conestogas—large eight-wheeled vehicles—immediately circled the newly-arrived spacecraft, examining the heat shield and inspecting for venting gasses. Meanwhile, the arrivals climbed out of their seats, put on their life support backpacks, and prepared for an EVA. Scoville gave the green light for them to begin to disembark and lowered the ramp next to the airlock. Two by two they stepped out, placed their feet on the dust of Mars for the first time, and walked around excitedly. They looked at nearby Table Mesa and Boat Rock and gazed in awe at the hulking wall 1,500 meters high known as the escarpment, the northern edge of Aurorae Chaos twenty kilometers away. The Mariner Valleys were some of the most beautiful parts of Mars, and Aurorae Outpost was built in the easternmost end of that mighty chain of crust-cracking rifts.

Pressure-suited men jumped out of the conestogas to shake hands and hug their new coworkers. The cargo bay doors swung open and they began to unload twenty tonnes of cargo into the waiting vehicles and their trailers. By noon, they managed to unload almost everything. They drove back to the garage in the basement of Joseph Hall and went inside for more greetings and lunch. That afternoon another shuttle would arrive and the crew would repeat the entire exercise again. The next sol two more shuttles would land; the sol after, the fifth and last shuttle.

Coordinating the entire operation from his office in Habitat 1 was Commander Will Elliott. On August 27, 2046—the sol of the *Arsia's* landing—he was 45 years old and had lived on Mars ten and a half years, one of three people to remain on the Red Planet from Columbus 1. Every time an eight-person crew arrived he welcomed them personally in the garage of Joseph Hall. By 3 p.m. on the first sol there was a temporary letup in his work and that allowed him to send emails to two new arrivals, inviting them to meet him an hour later. At four p.m. Bruce Curry arrived at his desk.

"Bruce, welcome again to Mars." Will rose from behind his desk and stepped forward to greet Curry, an experienced miner fifty years of age, tall and thin, with balding grayish-red hair.

Curry offered Will his hand and they shook; Curry had a bone-crushing grip. He glanced at the Commander's melanin-hued skin and slightly curly, brown hair and considered the fact that Elliott was part African American, part European American. Curry was used to traveling around the world and meeting all types, but had never gotten completely comfortable with people of mixed racial backgrounds.

"Thank you, Commander. Delighted to be here. It's an incredible opportunity."

"For everyone; for you, for Consolidated Mining, for the Commission, for Mars. How was your journey?"

Curry shrugged. "I'm not much of an astronaut. Columbus 5 was quite crowded, but the food was good and there were plenty of training videos to watch again and again."

"I understood you got pretty good at zero-gee volley ball."

Curry smiled. "Now how did you hear about that? We had some pretty good matches up there. Just about everyone was on an intramural team. The 'middeck' was a

life-saver, considering how crowded the ship was otherwise. Twenty meters long and six meters in diameter: barely big enough for volleyball. The trickiest part is returning the ball at all—it's easy to jump from the wall to hit the ball more or less in the right direction, but hard not to crash into the opposite wall, let alone be ready for the returned volley! The second hardest part is getting the ball through the doughnut hole in the net! It's great exercise, but resulted in a few sprained fingers and wrists."

"I can imagine. We didn't have anything like that on Columbus 1."

"They didn't have it on ISS2 then! The new LEO Hilton has a nice volley ball gymnasium."

"I heard. The folks at Shackleton want to play a similar game on the moon; they're getting a big enclosure in a few months."

Curry nodded impatiently. "Any idea whether we can get my crew to Cassini sooner? There's no gold here at Aurorae! And when will we be able to deorbit the mining equipment?"

"The equipment comes down in ten sols. All five shuttles are busy bringing down the Columbus 5 passengers and ninety tonnes of supplies." Will leaned back in his chair. "You should have seen the aerobraking; it was spectacular. ACV3 flew right over Aurorae at about midnight a mere 2 kilometers up; it had to dip quite deeply into the Martian atmosphere in order to burn off the extra speed. We've never had cargo arrive at 8 kilometers per second before. It lit up the sky!"

"I bet. It's a shame we had to send it from Earth so late, but Muller Mining didn't have its act together."

“It didn’t raise the transportation cost that much, since NASA provided the solid core nuclear rocket for free.” Will paused. “I gather there was quite a rivalry between Consolidated and Muller on the flight out.”

Curry smiled slightly. “Well, let’s just say we beat them in volleyball three times straight!” Then after a pause he added, “As you may know, we have serious concerns about security. Our proprietary technology isn’t patented because we want to keep it secret. The four of us must watch over our stuff constantly. I wish it had been possible to fly us and our cargo straight to Cassini Outpost.”

“Cassini’s at 28 degrees north, so it can’t be reached from an equatorial orbit,” replied Will. “Phobos, Deimos, and Embarcadero are in equatorial orbits, so they can’t provide support and rescue in emergencies. Furthermore, we want everyone to land here first so we can be bonded together as one team. But your cargo on ACV3 will be delivered straight to Cassini. ACV3 aerobraked into an orbit with a 28 degree inclination. The shuttle picking up the cargo will be controlled robotically, so rescue is not an issue.”

Curry listened impatiently. “I have a pretty good understanding of basic orbital mechanics even if I am a rock miner. I hope the time will come when humans will be able to travel around this world in non-equatorial orbits. The new Sunwing model 3 won’t be ready for months. That means eight tonnes of our cargo has to be hauled 6,125 kilometers over dirt tracks.”

“Driving it won’t be difficult. A truck can pull a trailer with eight tonnes of cargo and a nuclear reactor at twenty kilometers per hour, twenty-four point six hours per sol. We haven’t tried automated cargo transport yet, but we will. It’s twelve sols to Cassini. We just widened the Circumnavigational and Cassini Trails so they can handle automated

driving more easily. If your team would like to go along, we can send a conestoga and the four of you can sit, play cards, and watch tv while you roll to your destination."

Curry scowled and was about to respond when they saw another man approach Will's office. He was a bit shorter than average, in his early forties, with a thin mustache. Will smiled and stood. It was Gerhard Bach, the head of the four-person mining team from Muller Mining, A.G.

"Gerhard, welcome to Mars!" said Will.

Bach saw Curry and they both momentarily stared at each other. It was clear they were uncomfortable together. Then Bach entered Will's office. Will came out from behind his desk to shake hands with the German national.

"Thank you, Commander," replied Gerhard. "And it has been quite a welcome."

"I trust you had a comfortable voyage?"

Gerhard nodded slightly. "Reasonably so. We kept ourselves busy while coasting between the planets. This is an impressive facility; much larger than Shackleton."

"Actually, the square meters of floor space is about the same, but Shackleton doesn't have the green space."

"The farmland and trees give this place a completely different feel."

"Have either of you seen Catalina yet?"

"No," both men said simultaneously.

"I didn't think so. Building 1 is completely purchased by folks arriving on Columbus 6, and none of your people bought in. Building 2 will be completed in the next two months. Let me show you." Will rose and Curry and Bach reluctantly followed him.

They crossed much of the Outpost while Will reminisced about the phases of construction. He opened the final airlock door and led them into Catalina. Like Yalta Biome, it was forty meters across and had a northern building and a southern building with agriculture on top of each. An east-west trending yard stretched between them. It was still underdeveloped, with saplings, scattered clover plants, and rather thin flower beds. “The sun floods the yard all sol,” Will said. “We’re near the equator, so when the sun is in the northern hemisphere the south building’s north-facing windows get oblique sunlight at midday; half an annum later, the north building’s south-facing windows get it instead. The buildings have two-meter overhangs, providing shade and radiation protection to anyone staying close to the building.”

“What’s the radiation exposure inside the buildings?” asked Gerhard.

“About one rem per year; the two meters of wet soil filling the rooftop farms provide robust shielding. In the yard you’ll get seven rems per year, a third the dosage in interplanetary space. The recommended max of fifty rems per lifetime will be exceeded by anyone living here, but with good medical care it can be managed. At least that’s how it looks right now.” He pointed to building 2. “Come look.” he led them over to a large window in building 2’s exterior vinyl siding. They looked inside at a huge, cavernous, empty space.

“That’s right, you don’t have a building bubble in this one yet,” noted Gerhard.

“The bubble for this building was used to build the dacha, our vacation spot up on the escarpment overlooking Valles Marineris. But a bubble arrived with the shuttle this afternoon. We’ll install and inflate it next week and the interior construction will take only six weeks, half the time Yalta’s buildings took, because we’ve automated some

work and converted some to mass production in Joseph Hall. In two months, your crews can be moved into here and be immensely comfortable."

"Very impressive," said Bruce. He stared inside. "But as I already said, I don't want my crew here. I want it at Cassini. When will Cassini get a biome?"

"We are recommending that Cassini's population be kept as small as possible; a maximum of six, with frequent crew rotations," replied Will, trying to offer a simple and persuasive answer. "The equipment can be run from a control room here just as easily as from Cassini. People are needed there principally for maintenance. This is a much more comfortable place to live, too, with a cafeteria and a social life lacking in a remote—"

"Commander, I want my entire team in Cassini," Bruce said emphatically.

"Do you realize what it means to build a biome six thousand kilometers from here? Suited workers have to lay a foundation of duricrete, with steel pilings to support the buildings. Otherwise the mass of the building could deform and puncture the airtight enclosure. That takes months. And while each building involves only a one tonne bubble and three tonnes of life support equipment imported from Earth, the interior walls of sheetrock, nickel-steel, insulation, pipe, and wires have a mass of seventy-five tonnes. The exterior vinyl walls and the steel frame to support the rooftop farm have a mass of twenty-five tonnes. All those things have to be made here and hauled there. The interior of the biome needs three thousand tonnes of regolith. It takes fifty tonnes of equipment that we need here as well."

"Commander, think about how to do this rather than complain about it," said Gerhard. "I agree with my colleague. My people didn't come here to buy flats in Catalina. They came here to earn maximum bonuses for themselves and maximum profits

for Muller Mining. I have no problem with them coming to the Dacha for vacation. But they need to be in Cassini."

"And the contracts call for you to supply four people to each of us to provide support," added Bruce. "That's sixteen people in Cassini. You can't put them in Mobilhabs and conestogas; it's too cramped. Cassini's not just a little temporary stop in the desert, Commander. It's Mars's gravy train. I don't know about my competitor here, but my goal is to dig 3 billion dollars of gold in the next eighteen months. If Cassini's going to produce wealth on that scale, it deserves a biome."

"I believe both of you saw the proposal we sent your companies; we copied you. It called for Cassini to have six to eight people at a time; two from each of your teams and two to four people assigned by us to assist and provide support services like food and life support. That's two Mobilhabs for now and a building bubble without an enclosure later. Cassini will get a biome during the next columbiad, which gives us time to figure out how to get everything there and set it up. A biome requires a dozen construction workers. Where will we house them *and* your people?"

"Those are details for you to work out, Commander, not us!" replied Bruce.

"I suspect our companies will cooperate on this particular matter," added Gerhard, looking at Bruce. "I sent a memo of concern to Muller himself, and I was under the impression he wrote the Commission."

"Perhaps he did, but I never saw a memo," replied Will. "I'll see whether the construction schedule can be accelerated. I can't guarantee anything." He turned and led them back into Yalta Biome. It was close to suppertime and many were seated at tables, waiting for the food to be put out. The kids were playing in the yard until their parents

arrived to greet them. It was a noisy, busy scene. Will led the two men through Joseph Hall—named after a victim of their flu epidemic four years earlier—and showed them the materials production and fabrication facilities and the construction assembly area where biome and building parts were made. They passed through Renfrew Hall—named after Paul Renfrew, the only astronaut to die on Mars—which housed Mars's biological research facilities. They entered the Geology Building, their first duricrete construction, now overcrowded with machines and samples. Finally, they walked through a few greenhouses and the old industrial and biological facilities, now used for storage and crafts manufacture.

Will attempted conversation about other matters—the men's lives, their children—but didn't get much. "I committed to two columbiads," said Bruce at the end of the tour, in response to Will's question about their future plans. "If they a big enough signing bonus, I might stay longer."

"My time here has a lot to do with my older son," added Gerhard. "My wife and I divorced ten years ago and my daughter got married just before I flew out. My son might want to come here in a few years after he finishes university. If he does, I'll stay."

"You might be our first father-son team," noted Will.

"I've got to finish moving our equipment to our secure location," exclaimed Bruce. "Thanks for the tour, Commander. It's an impressive facility. I hope Cassini will soon get this big."

"Good to get to know you better, Bruce." Will waved slightly; Curry waved back, turned, and headed to Joseph Hall.

Gerhard watched him go. “A difficult man to deal with,” he said. “Did you know that all four of the staff of Consolidated are Southern Baptists; Fundamentalists who reject the theory of evolution?” He laughed. “They can accept the science behind flying across millions of kilometers of space and building gigantic gold processing machines, but not the same science when applied to the development of life!”

Will shrugged. “People are funny, aren’t they? Sometimes I wonder whether Mars would have been more effectively explored and developed without them! But since we’re all here, Gerhard, we have to cooperate closely and become collegial with each other. It isn’t just a question of professionalism; it’s what we expect here on Mars.”

“That will be difficult, Commander, but I understand your point. Well, I have to check our equipment also; we have a lot of proprietary technology and we’re very concerned that our competitors will spy on us.”

“I understand. See you around the Outpost, Gerhard.”

“Thank you. Good sol, Commander.” Gerhard turned and headed on his way.

Will walked back to his office, wondering how the two teams would ever cooperate in a small outpost 6,000 kilometers from “civilization.” When he got to his desk, he called Alexandra.

“Hello Will,” she replied. The screen on his attaché—a clipboard-sized combination computer, videophone, and message center—had no picture on it. “I’m outside; we’re transporting the new bubble to Catalina. How can I help you?”

“I just met with Bach and Curry, and they both insist that Cassini get a biome.”

“Who do they think they are?” Alexandra sounded disgusted. “We don’t exist just to serve two small mining teams. We have a lot of work to do here at Aurorae. You’d

better get the Commission to straighten them out. Building a biome at Cassini will be nearly impossible. Hauling everything there will require ten flights, which would use up half the remaining flights of our five shuttles and half a year's electrical output. Moving everything by ground, at ten tonnes per trip, one round trip every month, will take twenty-one round trips, use ten percent of our electricity, and consume one entire staff position, unless we can automate them. A biome takes fifteen person-years of work to manufacture the parts and put them together."

"I know. I'll talk to Morgan. But Columbus 6 brought three biomes. Erecting them here will take just as much work as at Cassini. Each team wants to export 3 billion dollars of gold this columbiad; that's 200 tonnes of gold. If we send construction materials to Cassini by shuttle at forty tonnes per launch, then move gold to orbit at forty tonnes per launch, then land the shuttle back at Aurorae, we're talking about half as many shuttle flights as you projected. Cassini must get a biome eventually. Cassini's going to grow whether we like it or not because it's where the gold is."

"Then we'll have to build a biome at Dawes too, if gold is found there. That's where your argument is taking us, Will."

"It's not my path; I'd rather avoid it. But all we can do is postpone it, Alexandra."

"Well, postpone it as long as you can! We have to build Catalina's building 2, biomes 3 and 4—I'd like to name them Riviera and Shikoku—a biological waste recycling facility, liquid oxygen and methane tanks, refurbish the Geology Building, and accomplish a dozen other smaller but equally vital tasks."

"I know. I'll talk to Morgan. But be prepared, Alexandra."

She sighed. “Alright, I’ll do my best if you do your best to stop this madness. Bye.”

“Bye.” He closed the circuit and looked up. His wife, Ethel, stood at the door.

“How are you holding up?” She came over and kissed him, then rubbed his tense shoulders.

He smiled gratefully and relaxed a bit. Then he turned and gave her a kiss. “Thank you. The landings aren’t the problem; the people are! Both mining company bosses are insisting that we build a biome at Cassini immediately.”

“What?” As a fabrication and construction specialist, she knew what that meant. “Logistically impossible! They’re crazy!”

“I hope Morgan can convince their bosses, because I can’t convince them.” He sighed. “They’re going to make this entire columbiad difficult.”

“Do you regret the decision to buy their stock?”

Will shook his head emphatically. “No, we need to invest in Mars. Besides, they’re both the type to make the effort succeed. They’re going to be impossible, but they’re going to make big profits for their companies.”

“Then we might as well get a piece of it.”

2

Inaugurations

28 Aug.-1 Sept. 2046

Over the next two sols, three more shuttles descend from orbit with the remaining twenty-four arrivals. Meanwhile, in orbit, two Lifters, full of oxygen and methane propellant manufactured from the rocks of Phobos, fired their engines and pushed two Interplanetary Transit Vehicles or ITVs on trajectories that would take them back to the Earth in eighteen months. Each carried two tonnes of gold that the Mars personnel had wrested from Cassini's gold-bearing deposits.

An inaugural dinner marked the successful arrival of Columbus 6. Will went through the buffet line with Marshall, his six and a half year old son; Ethel followed with Lizzie, who was almost four. In front of Will was Muhammad Rahmani and Emily Scoville, the British pilot who had commanded Columbus 6.

"What an incredible spread!" Emily exclaimed to Will, as they reached the end of the buffet. "Chicken, turkey, tilapia, catfish, rabbit, beef, pork; the meat alone amazes me! Plus pastas, breads, casseroles, vegetable dishes, desserts; it's mind blowing!"

"It's gotten a lot better since we first arrived ten and a half years ago!' replied Will. "In 2036 we had ten species of vegetables, wheat, corn, rice, rabbits, and chickens. Local beef became available last fall; we imported steak until then. The biome now produces enough plant waste for six cows, and flowers to support a hive of honey bees."

"No sugar cane, yet."

"No, but last time we imported sugar beets."

“And this time we brought coffee and coca trees.” Emily eyed the payment area. One put one’s tray in one end of the payment device and it slowly moved through, emerging the other end a few seconds later with a list of items and their prices displayed on the screen. But they had cloths thrown over them. “Oh, we don’t have to pay? What a relief; this would be incredibly expensive!”

“The inaugural dinner’s on the house,” replied Will.

“Good. When I ran my breakfast through the machine this morning, I thought I’d die! It was 12 MCUs; $120!”

“If you think you were shocked, consider how everyone here felt! Food was free until yestersol. But now that we have non-Commission residents, we have to charge for food, water, electricity, and communications. Our salaries just increased by 15,000 MCUs per year, but that doesn’t quite cover the cost of food, so everyone’s grumbling.”

“I can’t blame them, but that’s economics for you.”

“I wish we had a name for the money,” said Muhammad. “ ‘MCU’ or ‘Mars Currency Unit’: what a boring and colorless name.”

“I agree, we need something better.”

Muhammad put his tray down on the drinks table, but rather than taking a cup, he grabbing his wallet and pulled out a russet-colored bill. “I was surprised to see the store had real paper money. When I got this yestersol my first impression was that it looked like a U.S. dollar, but it’s red, so I immediately thought ‘this is a redback, not a greenback’!”

Will laughed. “Redback; that’s clever.” He turned to the drinks table and grabbed a glass of juice for Marshall and a soft drink for himself. He held it up with glee. “We ran

out of Coke and Pepsi completely six months ago, so it's nice to be restocked." They headed to their table. "So, how was the flight out?"

"Fairly uneventful," replied Emily. "We had Consolidated in one ITV and Muller Mining in another, and they asked to be set on different time schedules so that they rarely overlapped with each other in the public spaces. We had some tensions with the Chinese and Arabic speaking crew; they naturally spoke their own languages and others resented it. Muhammad proved immensely helpful to me in making the Muslims comfortable."

"Overall, it went pretty well," added Muhammad.

"I'm impressed by the diversity of the crew; you brought people from twenty-one nations. The male to female ratio is one of the best we've seen, too."

"The crew was forty percent female. The mix had positive results. Some relationships seem to have been started; someone dubbed the flight 'the love boat'!"

"Oh?"

"Yes. Cornelius Beyer and Tatiana Gavrilova have become quite close; and Sheila Burns and Arieh Feldman; and Ni Gao and Marge Bailey. The latter relationship's interesting because Marge is one of Consolidated's workers and Ni Gao is Chinese, and those groups usually don't mix. I think Bruce has given Marge a hard time about the relationship. I mention all of this to you confidentially, since you're commander. In addition, we had nine married couples on board."

"Yes, that was remarkable." They reached the table and sat; Muhammad sat next to Emily and Will suspected she had failed to mention a fourth relationship. "So, Emily, you're staying just one columbiad?"

"Yes. My kids are grown, but I'm not ready to cut off my relationship with them. Besides, someone has to fly the ITVs back. Only four plan to return in eighteen months."

"While you're here you can have just about any assignment you want. You've got that kind of seniority; you've been flying fifteen years."

"Thank you. I want to do some research on meteorites; I did a lot on the moon, and the supply here is enriched in materials from the outer solar system. There's going to be a great increase in recovery of nickel-iron meteorites for nickel steel, platinum group extraction, and copper refinement, so I'd like to work on that."

Will nodded. "Excellent. Copper refining will take place at Cassini. If you want to be involved with that process, that will get you to Cassini. And frankly we could use someone who knows the mining teams to help coordinate our support with them."

Emily rolled her eyes, but then nodded. "They're a pain. But I can handle them."

Just then Ethel arrived with Lizzie, who had insisted on carrying her own tray. Ethel sat across from Emily; they were old friends. Within thirty seconds they were immersed in a deep conversation. Will turned to make sure Lizzie was eating correctly. She was not old enough to eat on her own without making a mess.

A man with oriental features approached and Will struggled to remember his name. "Ananda Thanarat, Commander," he said, offering his hand very gently.

"That's right; I'm sorry I forgot your name. Welcome to Mars. You do lots of things, I recall."

"Mathematics is my area, with a secondary focus on artificial intelligence."

"We need both, especially local expertise on further developing the artificial intelligence of our machines."

“I agree; this is the most automated society ever to exist. The other thing I wanted to say, Commander, is Alláh-u-Abhá.”

Will smiled broadly. Oh? You’re a Bahá'í? Alláh-u-Abhá!” Will exclaimed the Bahá'í greeting quite loudly and unembarrassedly. He leaned over and gave Ananda a hug.

“Thank you, Commander. I gather there are two Bahá'ís here?”

“Three; Enrique Delrio became a Bahá'í less than a year ago. And now we have you as well, and of course Marshall and Liz are Bahá'ís, so that’s six! It’s quite a strong group now! We’ll have to organize more events.”

“That would be great. I’ve mentioned the Faith to a few people and I think there are two or three who’d like to come to a meeting.”

“Marvelous. As you may know, we have interfaith devotional gatherings every Sunsol at 11 a.m. The Bahá'í spirit has inspired the gathering. Maybe you can help organize them.”

“Perhaps; I would be honored to assist.”

“I’ll keep that in mind. Please join us.” Will pointed to an empty seat at the table, so Ananda, who was from Thailand, joined them. Shortly thereafter Xiaopeng Cai, a Chinese eobiologist, sat as well, followed by Fatima and Husni Hijazi, who were from Palestine and Saudi Arabia respectively. “How marvelous that both an Israeli and a Palestinian could fly here on the same flight,” noted Xiaopeng.

Fatima smiled shyly. “Husni and I are delighted that we could stay together. He has always wants to go to Mars.” She spoke with a distinctive accent; very crisp and clearly enunciated, somewhere between an English, an American, and an Indian accent.

“Once he was selected, the word went out that Mars needed an elementary school teacher, and I have a doctorate in that very field. But of course, Palestine doesn’t have the resources to sponsor an astronaut. Fortunately, a group of wealthy Saudis and Palestinians sponsored me.”

“We’re delighted you’re here,” exclaimed Will. “We can’t wait to get first grade started. Marshall’s six and Sam turns six in January.”

“So I hear. When shall we begin school?” asked Fatima.

“How about Monsol? It’s the usual time for classes to start anyway. We’ve got a classroom just about ready.”

“Monsol it is, then. That’s how many days—sols—from now; four?”

“Three. This sol—we don’t say ‘today’—is Frisol, even though it’s Thursday on most of Earth.”

“Getting used to a 24.6 hour day—I mean, sol—will take some time.”

“I’m sure. The Muslims here consider Frisol their sabbath, if I can use that term, just as Christians use Sunsol. Otherwise, after 36 days of seven-day weeks, you’d go to bed on a Monday night and wake up the next morning on a Wednesday! Eventually you’ll have two Fridays that are only six days apart, or they’ll be 13 days apart because Friday was the day that got skipped!”

“It would be confusing.” agreed Husni Hijazi. “And clocks go to 24:39:35 before they switch to 0:00!”

“Yes, which is why we don’t have any clocks with hands; chronometers can keep the same minute and second as Earth, which has scientific value. But it also means that Mars has twenty-five time zones.”

“At least the times of prayer are not significantly effected,” noted Fatima. “We have sunrise, noon, mid-afternoon, sunset, and evening!”

“Ruhullah doesn’t take any chances,” said Will. “Whenever we lose an entire day compared to Earth, he ‘makes up’ the day’s prayers.”

“I may want to do that,” said Husni. He didn’t want a Shi’ite to look more pious. “I gather Ramadan is held at the same time as on Earth?”

Will nodded. “Ruhullah uses the Tehran times for the start and end of Ramadan and the fast ends up being the same number of days as on Earth. The sun is up seventeen minutes longer on average, but twilight is much shorter, and since Muslims fast from first to last light, it ends up being a bit less here.”

“We’d follow Mecca, not Tehran, of course,” said Husni. “You’re quite an expert on Islam, Commander. What has caused your interest?”

“I am a student of all the religions, Dr. Hijazi.”

“And you are a Bahá'í, right?” asked Fatima.

Will hadn’t wanted to bring up his religion because Muslims persecuted Bahá'ís in many countries. He nodded.

Husni smiled, stiffened. “I had no idea, Commander. Your prophet was born a Muslim.”

“Indeed he was,” agreed Will.

There was an awkward silence. Will raised his coffee cup. “Who wants coffee?” He took requests, then walked to the refreshment table and picked up a tray to carry everything back. He talked briefly to Alma and Johann Werner, two of the German

employees of Muller Mining. As he was about to squeeze the last cups of coffee onto the tray, Andries Underwood approached.

"Are you sure you can get all of them?"

"I think so."

"Let me help, I need a chance to complain." Andries began to transfer half the cups to another tray. "Curry's driving me crazy. He wants to excavate 100 tonnes of gold this columbiad. He wants to go to Cassini early next week, preferably by shuttle. And he wants more electricity."

Will shook his head. "Tell him I have to approve everything and he should bug me instead. But we can't give him more. We're importing fifteen solar power units and Cassini's getting ten of them. We need the rest here."

"I told him. His answer's always the same; 'look, we can make $1.5 billion for you and $1.5 billion for us, and the more we dig, the more investments you'll get, so why can't you do this?'"

"Because gold isn't everything. I'll talk to him."

"Thanks."

Will and Andries walked back to the table and distributed the coffees. Almost everyone had finished eating, so it was time for Will to give his welcoming speech. He rose and walked to the front, where he solemnly rang the Outpost's bell, which had been brought to the stage for the occasion.

It was not rung very often and immediately got everyone's attention. They turned to the stage.

“Good evening, everyone,” Will began. “Tonight we celebrate the safe arrival of forty more people on Mars. Our population, previously forty-four adults and twelve children, is now ninety-six. No one could have imagined, when Columbus 1 first reached the Red Planet, that Mars would have almost one hundred residents a decade later!

“When Columbus 1 arrived Mars had a single outpost and six people. Four years later ‘the Outpost’ had twenty-three adults and one child, and the need to register a birth and record land titles led to the declaration of a civil government for the Borough of Aurorae. The ‘personnel’ began to refer to themselves as ‘residents.’ The Outpost began to feel like a hamlet.

“After four years the residents began to feel that they were a sort of citizen of Mars. This doesn’t mean we have ceased to be Chinese, Europeans, or Americans; rather, that we have added a new identity to our national identities, an identity shaped by sols instead of days, annums and columbiads as well as years, greenhouses and biomes rather than farms and housing complexes, a long time delay to watch our native television and talk to our loved ones instead of instant communication.

“Then last year a dust storm preventing most surface exploration, the public’s interest dipped, our funding shrank, and we had to close a financial gap. Pursuing remote sensing data, we found what may be the largest gold supply in the solar system. Cassini may have as much as three billion troy ounces of recoverable gold; 90,000 tonnes, worth 5.4 trillion dollars. Dawes may have a billion troy ounces. Several other regions look promising.

“Our situation changed overnight. Shipping costs had dropped; gold could be shipped back to Earth profitably. Columbus 6 was expanded from thirty-four to forty.

Two companies sent the first non-Commission staff to Mars. Even more significantly, Mars is gaining a second outpost and a second borough. Cassini, like Aurorae, will need to elect a borough clerk and chair. Both boroughs will have to elect a treasurer for the first time. Mars Colony may soon need a clerk, chair, and treasurer as well. In another two or three columbiads, Mars may have over two hundred people and need to elect Borough Councils, which could meet jointly to serve as a Mars Council.

"The keys to our continued growth are two: viable exports and a continued decline in transportation costs. They were the keys to the Europeanization of the Americas as well. We have the first key in place: gold. It will create dust pollution and rip huge holes in the ground, but Mars will grow. A Mars with a thousand people will do much more exploring than a Mars with one hundred. Mars with a thousand will have a more comfortable life than Mars with one hundred.

"The desire for gold may distort some of our priorities, so we must keep our focus on basic principles: that this world will maintain peace, will strive for justice, will seek a life that is not just comfortable but happy, and that Mars will aim to become an example to Earth of a place where human beings from many cultures and religions can live together well. These Martian values are human values, and Mars can become a vehicle for demonstrating them. If we succeed, they may be our greatest export of all."

It was a busy weekend at Aurorae. Cargo was unpacked and stored, the store was filled with new goods and therefore shoppers, new arrivals set up their flats if they had them or their rooms if they didn't, crafts and furniture privately made was displayed and sold at the Satursol flea market, the new arrivals and old residents got to know each other, the

Satursol evening concert and dance was crowded, the Sunsol morning interfaith devotional program was packed, hiking trails outside the Outpost were busy, and the Aurorae golf course, laid out carefully over the last four years by Roger Anderson and other members of the Aurorae Golf Club, was active.

Monsol marked the beginning of a month of training, safety drills, and team-building. It was inaugurated by another event: the opening of Mariner Institute of Technology or MarTech.

Will and Ethel had to take Marshall to school on their way to the inauguration. The three of them walked to the second floor of Renfrew Hall, which once had held their apartment but now was half filled with rooms for child care. They were surprised to see that their old living room was now the classroom. Fatima Hijazi had a desk near the door; the two boys sat at a table between her and the window. Two attachés sat on the table. A plastic whiteboard occupied one wall with an assortment of colored markers in the tray below. The opposite wall had big maps of Earth and Mars.

“Welcome to your classroom!” said Fatima.

“I get my own attaché!” said Marshall, seeing the two computer/communicators that were standard issue for the adults on Mars. He ran to the table. “I want the red one!”

“That’s fine,” replied Fatima. She turned to Will and Ethel. “Will he be eating lunch with you?”

“Yes,” said Ethel. “The four of us eat lunch together every sol.”

“I noticed. Good, that means I have lunch free; I may need it to plan afternoon lessons! They’ll be playing in the yard starting at four every sol. Madhu told me Sammie still naps many afternoons.”

“He can take a nap too, if you can convince him,” replied Ethel.

“I’m not going to sleep,” replied Marshall. “Can I take the attaché home?”

“Yes, it’s yours,” replied Fatima.

“We had better say goodbye,” said Ethel. “Have fun, dear.”

I will, mom. I love you.” Marshall kissed his mom and dad, then turned back to his attaché. Ethel looked at Will, surprised; he shrugged and they walked out.

“That was easy,” said Will. “But then, he’s been in school up here for a year and a half, and he’s met Fatima several times.”

Ethel nodded. There were tears in her eyes.

“What is it?”

“My baby’s going to school.”

Will smiled. “I know. He’s growing up, my dear. He’s growing up.”

He hugged his wife and felt a tear in his right eye as well. He kept his arm around her as they strode to Yalta, across the yard, and through the tunnel to Catalina.

A crowd was already filling the folding chairs in front of building two. MarTech had its own entrance, big, arched, and grand, with its name and logo on top. It would occupy a third of the building with two classrooms and six offices, once they were built in a few months. It was a modest beginning.

Will and Ethel had dressed in their best clothes, but some attending wore academic regalia that they had imported from Earth. The six-person “Outpost Orchestra” was warming up.

Once the seats were all filled, Will, Dr. Martha Vickers, and Dr. Enlai Tang stepped forward and sat in the three chairs in front of a big screen. Martha and Enlai had

both managed to get their academic regalia from Earth; as the planners of the university, they were also its principal enthusiasts. Martha nodded to the orchestra and it began to play “Pomp and Circumstance.” When it ended Martha stood, welcomed everyone, and gave the history of the idea and the plans. Enlai followed, speaking about the technological progress that Mars exploration represented and the great intellectual capacities already present.

Everyone turned to the screen to watch a series of videotaped welcomes from the presidents of several universities across the Earth, as well as the American Secretary of Education, the European Union’s Minister of Education, and the Mars Commission’s Commissioner. Then it was Will Elliott’s turn. He walked to the lectern.

“In 1630, a thousand religious refugees from England crossed the ocean to New England By 1636, having established governments, towns, farms, and industry, they turned to education and chartered Harvard College. For the first decade of its existence, however, Harvard was a tiny institution with one or two professors and a dozen students, housed in a single building on a large yard used by grazing cattle, on which sat a well from which they drew their water.

“MarTech grows from similarly humble beginnings. It began in year ten, rather than year six, and when the population supporting it was less than one hundred, rather than several thousand. But it already has twenty part-time faculty, several dozen students on two planets, a dozen courses, and reciprocal agreements with Stanford, Harvard, MIT, the Sorbonne, Moscow State University, Tokyo University, and a half dozen other prestigious institutions. It can already offer Ph.D.s in Martian geology, planetary geology,

exobiology, Martian eobiology, ecological systems, and mechanical engineering. Even though it started later than Harvard, it is already growing faster.

"The promise of this institution lies in the future. Mars is slated to make a great contribution to human culture and civilization. MarTech will be central to our efforts. It will galvanize our scientific exploration, coordinate our engineering developments, and serve as a focus for the development of our arts and culture. If Mars becomes the center of human expansion into space, MarTech will be the educational engine making that role possible, directing it and galvanizing it.

"So this sol we stand on the threshold of powerful dreams. Our optimism, our community spirit, our hope for the future will drive MarTech forward, and MarTech in turn will pull us forward. On this sol, that feedback loop begins. Let all of us pledge to make this university grow. Thank you."

Will stepped down to sustained applause. He walked over to Martha, Martech's President, and Enlai, its Vice President for Development. Enlai picked up a very large pair of scissors and the three of them moved to the red ribbon that blocked the arched doorway. Together, slowly, the three of them cut the ribbon.

Everyone applauded and the orchestra struck up "pomp and circumstance" again; it was the only relevant piece of music they knew. Then Martha waved at the refreshment tables and everyone began to walk to them.

Bruce Curry grabbed a pastry and walked to Will, interrupting the latter's conversation with Martha. "Commander, when will I ever be able to take my people to Cassini?"

“Mr. Curry, the next month is devoted to safety and other training exercises. You’ve known that for months. The cargo won’t be deorbited for at least three weeks. So I suggest you not worry about it too much.”

“Commander, do you want Mars to grow or not? Because the more I dig, the more profit you get and the bigger the investment money that will pour in. Every sol you’re losing money.”

“Mr. Curry, money is not our only concern here; a higher priority is safety.”

“We don’t need a month of safety classes. We trained during the entire six-month voyage. Please, Commander, see what you can do. We’re itching to get started.”

“If we wait, we can plan better.”

“We’ve been planning for over a year. It’s now time for action.”

Will shook his head. “We don’t cut corners with safety.”

“What about a biome for Cassini?”

“I’m working on that.”

Curry scowled. “Well, you fritter away your time opening imaginary universities in front of buildings that are empty shells and I will act.” He turned and walked away.

Will watched him go, wondering how to deal with Curry. Routing messages via the Commission and Consolidated Mining hadn’t worked. Ignoring him was difficult.

Alexandra walked up. “What did he want? A Cassini biome?”

“That was the second request. The first was immediate transport to Cassini.”

“They need safety training. We can do it much easier here than in a tank of water on Earth. But I have a solution for a biome.”

“Really? Tell me!”

“We can give them basic housing in four months. We’d set up a building bubble without a biome enclosure, covered by plastic sheeting for protection against ultraviolet and dust, just like the Dacha, and set up tents inside. That’d take less than a week. The construction workers can complete the biome’s foundation in six to eight weeks. We wouldn’t excavate as much as we do here; we’d raise an earthen wall around the biome later. Once the foundation is ready, we’d place the main enclosure and bubble one and erect a building inside the latter. We’d finish single rooms for everyone and a few bathrooms. That’d take about a month. Most of the second floor would be left open and would be used for cooking, eating, and relaxing.

“After that, four workers would continue the construction. We’d send a shipment of twenty tonnes of construction materials every few months. Completing the biome would take two more years.”

“Brilliant,” said Will. “I’m committed to a Cassini biome, and you’ve made it possible, Alexandra. You’ve come through. Thanks.”

3

Debates

early Sept. 2046

Will entered the conference room with Daniel Shapiro. The heads of staff were there; several had entered the room just seconds before him. He nodded to Daniel, who began to connect his attaché to the wall screen and set up the communications system to broadcast their audio and video back to Houston. “I think you’ve all met Daniel,” he began. “He’s Comptroller of our finances on Mars, working directly under the Commission’s Chief Comptroller and me. Dan’s also President of Mariner Bank and will serve as secretary of this group.”

“Welcome,” said Érico. “So, Silvio’s turning the bank over to you?”

“He wants to develop the judiciary and Mars’s private sector,” replied Dan. “The bank doesn’t demand much of my time now; it’s got assets worth five million redbacks.”

“Redbacks?” asked Roger, frowning.

“Mars currency units,” replied Will. “We’re now calling them ‘redbacks’ until something better comes along. The bank will play a key role because all gold will be handled through it. Its assets will grow to hundreds of millions in a matter of months.” He looked at Emily. “There’s another announcement; did everyone hear the Commission has appointed Emily Scoville as Commander of Cassini Outpost?”

Some nodded; some were surprised; a chorus of “congratulations” followed. “Thank you,” said Emily. “It’ll be quite a challenge to create something that doesn’t even exist yet and build it up so that it can produce six billion dollars—600 million redbacks—of gold.”

“You can do it,” replied Lisa Kok, Director of the Ecology Department. She glanced at the wall screen, where Dan had projected an agenda titled “Implementing Cassini.” “You’ve got it backwards,” she said. “You’ve listed ‘ecology and horticulture’ fourth, after ‘construction and fabrication,’ ‘exploration and science,’ and ‘exports.’ But you can’t do any of those things unless you can feed the people. Right now we can feed 70 people. We have 96. We need the new biomes immediately. We need a biome at Cassini immediately, too, because a biome can feed twenty people and Cassini will have about that number.”

“Cassini’s going to run open-cycle for a year at least,” replied Alexandra.

“But even if we don’t recycle waste, we still need to feed them.”

“We can’t set up a full ecology quickly,” replied Alexandra. “It only takes a few kilowatt-hours per sol to extract water from the ground and split it for oxygen.”

“And we can feed them from here, right?” asked Will. “We’ll have sunwings and trucks going back and forth regularly. Aurorae will have four biomes times twenty people, which is 80, plus Clarke Dome feeds 10 more, plus ten greenhouses feed 20 more. Aurorae can feed 110.”

“Except we have a dust storm season starting in three months,” pointed out Lisa. “A category 5 storm will reduce our production over the columbiad thirty percent. We need to set up all three of the new biomes right away, including Cassini’s.”

“Yes, of course,” said Alexandra, irritated. “Our first priority is setting up the two new biomes here so you can get agriculture going in them.”

“But without Cassini’s, we’ll drain down our reserves and will have to import thirty tonnes of food next columbiad. We have seventy tonnes of reserves now, but they’ll go fast.”

“Can we really make these decisions?” asked Roger. “Because if the Commission’s going to overrule us, there’s no reason for us to spend time debating this.”

“We can make these decisions,” replied Will. “The Commission’s giving the authority to us. Alexandra, based on your plan, can Cassini start to produce food by the end of dust storm season; say, May of next year? That’ll give us a year to build our reserves back up.”

She shook her head. “Cassini won’t be finished for two years. If you want it set up for agriculture in eight months, we’ll need more construction personnel. That means either fewer support staff for gold production or fewer science and exploration staff.”

“Not on your life!” replied Roger. “I need all my people. We plan to complete the Virgo and Pisces Trails, start the Arctic and Antarctic Circle Trails, and extend the Cassini Trail northward to the polar layered terrain and southward to Hellas. No part of Mars will be more than 1,000 kilometers from a trail. We also need to prospect the Dawes gold deposits.”

“And obviously we can’t cut back on support staff; we need the profits and investment,” said Emily, equally adamant.

“Well, folks, something has to give,” replied Will. “Emily, you will be one of Cassini’s eight support personnel, as will its ecology specialists. Lisa, if we set up building bubbles outside—like the Dacha—temporarily, couldn’t we set up agricultural

trays in them? We're getting seven bubbles. Each can feed four. We'd need to cover them with plastic sheets, but that'd take only a month."

Lisa nodded. "The guys in Houston will go crazy when they hear you say that because it's an unexplored option, but the Dacha demonstrates we could do it. Of course, taking the farm apart and moving inside a biome later increases our work load."

"Granted, but it gets us crops faster," replied Will.

"It'd take a lot less time than accelerating the construction schedule!" said Alexandra.

"I'm not done with you, Alexandra," replied Will. "Your plan to construct Cassini in phases didn't account for the need to maximize food production. When we set up Yalta, agriculture was last, after sifting, warming, and placing three thousand tonnes of sand, gravel, and topsoil. You need to rearrange the schedule so that farming trays with ten centimeters of soil can be set up quickly and removed later when a section is ready to be filled with soil."

Alexandra nodded. "That's reasonable. But I'll still need ten construction personnel in Cassini for eight months, and my crew can spare only five."

"Okay." Will turned to Roger. "We need more help from exploration. Base as much exploration at Cassini as possible and rotate crews back there. I need four full time equivalents from them for construction and support for the gold operation instead of doing geological technical support."

"But we need the technical support!"

"We can outsource more of that to universities on Earth. They're complaining we do too much analysis."

Roger shook his head. “Look, Cassini isn’t going to produce two hundred tonnes of gold. Even if they did, we couldn’t ship that much back to Earth! So I’d favor less focus on the greed for mammon and more on science!”

“Roger, I wouldn’t make any of those assumptions,” replied Will patiently. “This isn’t a pursuit of wealth for wealth’s sake; it’s one part of our plan to settle Mars. It deserves some priority. First, it determines how big Columbus 7 will be. Second, with their new machinery and dedicated staff, even if they managed eighty tonnes each, that’d be a success. Third, we do have the ability to send two hundred tonnes back to Earth.”

“We’re receiving three automated cargo vehicles and lifters next week,” added Andries. “One ACV and lifter is returning to Earth immediately, loaded with argon and methane. The other two ACVs and lifters will head back to Earth about a year from now on a fast trajectory, loaded with gold. They’ll arrive before opposition and in time to be sent back here immediately with cargo. The shuttles and interplanetary transit vehicles returning to Earth in early 2048 will carry the rest.”

“If the fast trajectory works, interplanetary transit vehicles can use it to return to Earth and immediately bring crews back to Mars,” said Érico.

“Which means more people here, but we’ll have to do the maintenance on the ITVs,” said Roger. “So long as our science capacity expands every columbiad, I guess these other priorities make sense.”

“I wish we didn’t have to spend so much time planning and meeting,” complained Alexandra. “I like the idea of greater autonomy, but there are eleven of us in this room and we’re devoting at least half of our time to administration. That’s five full time positions on Mars devoted to bureaucracy.”

"The Mars Commission's direction has to come from here," replied Will. "When Houston told you what to do, you complained the priorities weren't thought through; now you can think them through and you're complaining it takes too much time! We can't have it both ways."

"Thanks for arranging for high-powered administrative assistants in Houston for all of us," said Yevgeny. "I am really impressed by what my assistant can do. Just having someone who can walk down the hall for me, ask questions, give me background about things happening in the office, explain someone's concerns to me or explain my concerns to someone. . . it's immensely helpful."

"They came with huge price tags, especially since they each have support staff," replied Will. "It took a long time for Morgan to come around. But in the long run, if you can learn how to use them, you'll find your ability to accomplish things greatly amplified." He looked around. "Alright, if you don't want to spend a lot of time in meetings, maybe we should end this one! Each of you has a report about your department, but we'll email them to everyone. I think we have a plan."

"As soon as we can get the two new mobilabs set up," agreed Roger. "That's our priority for the next month."

"Good," said Will. "We achieved consensus. Thank you to everyone."

Emily was intrigued by the group of people standing in the greenhouse, staring outside. Arieh was wearing his medical scrubs; John Hunter stood next to him, his black Lakota hair in a long braid down his back; Greg was wearing his priest's collar.

“I really love the labyrinths,” exclaimed Arieh, as she approached. “Madhu’s a genius at outdoor decoration.”

“You should see the sculpture garden at the base of Face Rock,” noted John. “You can follow the labyrinth there to reach the wind sculptures in the middle.”

“It’s quite large,” echoed Greg. “You can spend half an hour in it at least.”

“What’s a ‘wind sculpture’?” asked Arieh.

“A rock sculpted by natural forces,” replied John. “We’ve found some pretty interesting ones on our explorations around Mars, and we’ve brought them back here for Madhu to arrange in the park at the base of Face Rock. Salt weathering and sand blasting have produced some pretty unusual shapes.”

“It’s sort of like driftwood on Earth, but rarer,” added Greg.

“I hadn’t realized the geologists were collecting them,” exclaimed Emily, joining the conversation. “I thought Madhu and maybe Roger had done it.”

“Will encourages it,” replied John. “Everyone got into it pretty quickly; we craved the aesthetic dimension of life.”

“Madhu told me that in some societies, labyrinths were sacred objects,” noted Arieh. “That’s a funny notion to me, as a Jew. Places are sacred because of the history that transpired at them, like Jerusalem or Masada.”

“And for me, everything is sacred,” replied John. “Everything is alive; every rock has a spirit. This world is alive with spirits.”

“The spirits of the dead planetesimals that made this place, and the dead microbes that lived here,” exclaimed Greg, looking at John. He knew of the man’s vision quest and the spirits he had seen at the dacha.

“But what sort of spirits do they have?” asked Arieh. He sounded skeptical, yet willing to believe.

John didn’t answer right away, and the silence began to feel thick. “They feel. They can love, and therefore they can hate,” he finally said.

“What will they think of our ripping huge holes in Cassini?” asked Emily.

“I suspect they will feel the same toward that as the spirits on Earth feel toward mining. Some understand and some resent.”

There was silence again as everyone wondered whether to push the conversation any farther. It was not an area where they had a common ground. Emily looked at the maze of red sandstone and black basalt that Madhu had laid out over the piece of “dead ground,” a chunk of Martian terrain surrounded by buildings on all four sides. With her eyes she followed a red path, avoided a dead end, and reached the image of a mesa about a third of the way through the pattern. She had looked at the same labyrinth just the sol before and it seemed much harder that time. “Do they change the maze?” she suddenly said.

“Yes, every month or so,” replied Arieh. “Madhu was out there yestersol moving a few short sections to change the paths drastically. She said she wanted to update them before starting her recovery.”

Emily suddenly realized why Arieh was dressed in his surgeon’s scrubs. “Did you just operate? How did it go?”

Arieh nodded. “Pretty well. Greg was one of the nurses assisting me. We made two very small incisions in order to get the laparascope into her lung. We got the growths.”

“Cancer?” Emily asked.

Arieh nodded. “I’m sure of it. I’ve seen it before. But we got all of it, and with the new chemotherapy drugs we brought she should recover.”

“She’s lucky,” added Greg. “Staying here was a big risk.”

“It was a very discrete, slow-growing tumor.”

“Radiation?” asked Emily.

Arieh shrugged. “Who knows. It could be from radiation exposure or from silicosis; we’re exposed to extremely fine dust particles.”

“Mars is not without hazards,” said Emily.

“To babies, also,” added Greg. “Radha and Lal just learned that their baby has Downs Syndrome.”

Emily’s eyes grew wide. “Oh Lord, that must be a terrible burden on them. How serious is it?”

“It’s too soon to say,” replied Greg. “We did a genetic test. She’s three months pregnant, and now they have to decide whether to keep the baby.”

“A mentally retarded child on Mars.” contemplated Emily.

“It doesn’t matter,” replied John. “The child will be able to love, and certainly he or she will be able to contribute.”

“John, if the case is severe, the child will require almost constant care all its life,” said Arieh. ‘It’ll be a huge burden on Mars society.”

“Why do you define the child as a burden?” replied John. “”What are your assumptions, my friend?”

Arieh said nothing; he didn’t want to argue.

"Is radiation the cause?" asked Emily.

Arieh smiled. "We'd all like to know that. Lal's 41 and Radha's 34. Statistically, 34 year olds have a relatively low chance of a Downs Syndrome child. We've had thirteen children on Mars; this is a high incidence if it were statistically significant."

"Which it isn't," added Greg.

"Another reason to pray," said John. "No matter how good the technology gets, life will never be predictable or controllable."

"If prayer helps," replied Arieh. "Life here is not as easy as on Earth."

"It beats hunting buffalo and living in skin tents when it's twenty below."

"But this is the twenty-first century, John," persisted Arieh.

John looked at the Israeli. "Our children are living better than those of some of my cousins on the rez, Arieh. In fact, we're living better than half of humanity."

In a place as small as the Outpost, both news items spread very fast and had a deep impact. In groups of twos and threes, the human population of Mars once again reconsidered the wisdom of their residency on Dusty Red. The issue surfaced at the first town meeting that Satursol evening.

"This issue won't go away for a while," noted Madhu to Will, Roger, and Ethel on Sunsol afternoon. She reclined on a chaise-long in the yard of Yalta Biome, resting from the surgery. "It cuts pretty close to the bone, especially for anyone with children."

"I'm always amazed by the range of reactions people have to a life challenge," said Ethel. "Some people are natural pessimists, I guess."

“I think a lot of folks will forget,” replied Roger, sitting next to his wife. “Or maybe I should say they’ll turn to other events. Three automated cargo vehicles aerobrake into orbit in a few hours. Riviera Biome is now open for walking inspections; having three biomes here is exciting. The Cassini crew leaves in a few sols. We’ve got other things to focus on.”

“I don’t know, Roge,” replied Will. “This is pretty big because it reminds us that life here can’t be quite normal. It’ll be a few decades before having kids here is not frightening, before we know whether life expectancy is close to the same as on Earth. Those are big issues.”

“And the choices are hard to deal with,” agreed Madhu. “Everyone is hugging Radha and Lal; they have to make a difficult decision. It was a risk for me to wait six years and have lung surgery on Mars.”

“Thank God it worked, too,” added Roger. He looked at Sam playing with Marshall, Lizzie, and Corazon nearby.

“Hey Will,” said Érico, who was walking by carrying a plate of barbequed chicken and vegetables. He stopped. “I hope you’re okay with the election of Alexandra as Borough Chair.”

Will shrugged. “Sure, why not? There’s nothing saying the Commander has to be chair. I wasn’t last columbiad.”

“If I can be frank, my friend, it’s better for our democracy anyway,” continued Érico. “The Borough government is a parallel body to the Commission’s command structure. They shouldn’t be mixed. Someday, parts of the organization here could be transferred.”

“I agree. I could see the Department of Ecology and the Department of Education, Health, and Culture being transferred to the Borough, for example. Construction, fabrication, and repair might someday be privatized.”

“Exactly. Everyone can’t continue forever to work for the Commission. If Mars is ever going to go anywhere, it has to have its own healthy private sector and its own civil society. One hundred is big enough to make a start.”

“I agree, I agree. I didn’t take it personally.” Will didn’t want to admit that he had been a bit hurt. Sensing that, Érico leaned over and patted his friend on the shoulder.

“You’re a great Commander, Will, which is why I didn’t vote for you.”

Will smiled, appreciating the irony. Then Érico continued on his way.

“It is amazing to think there are one hundred of us up here,” added Ethel, after he left. “And two outposts, for that matter.”

“It’s like getting married,” replied Will. “The terms ‘wife’ and ‘husband’ sound strange. For a while it’ll be strange to refer to ourselves as a ‘colony.’”

“I really don’t like the implications of the term,” noted Madhu. “It makes us sound like a part of an imperialist operation.”

“Maybe that’s honest,” replied Roger. “Because the gold changes everything, after all. Greed, not science, will dominate this world from now on.”

“I don’t agree,” replied Will. “Roge, I’m always amazed how you are capitalist at one moment and anti-capitalist the next! Nothing here will happen without money. But that doesn’t mean money is the only motive we should have. I’d rather see us try to control and direct greed to positive aims.”

“So would I,” agreed Roger. “Let’s just say that I believe in original sin.”

“Which gets us back to the issue of optimists versus pessimists again,” commented Ethel.

“And they both need wealth for their scenarios to work; they just view it differently,” added Will. His voice trailed off as he thought about the choice of words. “Hey, Madhu! If you don’t like ‘colony,’ how about ‘commonwealth’? Doesn’t that capture our dilemma; we need wealth, but it has to be ‘common’? The wealth must be generated in community?”

“‘Commonwealth. . .’” Madhu considered the term. “Of course, it makes us sound like the British Commonwealth, which is a loose collection of nations, and that’s not what we are.”

“The so-called Commonwealth of Independent States was an even looser a collection of states,” added Roger.

“Of course, there’s also the Commonwealth of Massachusetts,” noted Ethel.

“And the Commonwealth of Pennsylvania,” added Will. “The term is used lots of different ways, just like ‘borough.’ And we need a term we can redefine for ourselves.”

“Commonwealth ain’t bad, where redefining is concerned,” agreed Roger, slowly. “And it does capture an issue for us: how to use the flow of wealth coming our way.”

“Then we’ll give ‘Commonwealth’ a try,” said Will. “And we’ll see whether we can manage to make the wealth ‘common.’”

4.

Settlement

Sept. 30-Oct. 6, 2046

Shortly before noon on September 30, 2046 an impressive caravan rolled up to the future site of Cassini Outpost. Emily Scoville was in the lead mobilhab, a double-decker, eight-wheeled mobile habitation and laboratory. From her office on the top floor she looked over the beautiful, rolling terrain. The site chosen for Cassini Outpost was a natural terrace half a kilometer wide in the crater's outer rim, bordering the vallis where the gold deposits were located. Cassini's ancient, battered rim was a rolling series of ridges and hills rising to the west. She could make out Deadwood Pass, a slight dip in the rim leading into the crater. Three kilometers to the north the rolling, stony terrace widened and was punctuated by a series of cleared landing pads; the spaceport. Stretching across it was the end of the caravan riding down Cassini Trail: its three nuclear reactors, each towed by a robotic truck. Closer were two conestogas, eight-wheeled single-story vehicles with bulldozer blades and cargo trailers, one for Muller Mining and Consolidated Mining respectively, and two rangers, each pulling a portahab, a vehicle the size of a small house trailer. The other mobilhab, which housed eight of the construction crew, was backing up to achieve a hard dock against her mobilhab, which contained the outpost's eight support staff. Over the next half an hour the conestogas and portahabs would follow, producing a docked chain of vehicles that could house twenty-eight personnel. It was the largest caravan ever to leave Aurorae.

Emily began to email everyone reminders of their various tasks that afternoon. About the time she finished, Bruce Curry and Gerhard Bach entered her office.

“Do we really need to stop here?” asked Curry. “We see two priorities: preparing the spaceport for the arrival of the *Arsia* and getting the mining equipment set up. The former task needs two personnel in a ranger. The latter requires everyone else.”

Emily shook her head. “The first priority is setting up two building bubbles so that we have pressurized space and life support redundancy. Yes, we’ve managed without them during the eleven-sol drive here, but that doesn’t mean we forsake the extra safety now. We’ll have them inflated tonight. Tomorrow morning we’ll handle routine spaceport maintenance; the shuttle will land in mid afternoon, which will require all vehicles to be on emergency standby. Each of you will have all of tomorrow morning to start your setup. Once the shuttle arrives with six more folks, you’ll have four support people each. I may consider assigning you each one more person if setup gets off to a good start.”

“The sooner we get started, the sooner we can dig gold,” said Curry.

“I know. If you want to dig gold, help my people right now on site preparation.”

“Commander, can’t we at least take a ranger and go see Pretoria and Joburg?” asked Bach.

“No! We’ve got plenty of time to poke around the area. I want to see Pretoria and Joburg, too. I want to drive up to Deadwood Pass to see the wind turbine sites and look into Cassini. There are a lot of things I want to see, but we’re starting with the outpost.” She said that firmly; she couldn’t have them push her around as soon as they arrived.

“Aye, aye, Commander.” Curry offered a mock salute and turned away. She saluted back and finished sending emails, then ran down stairs to grab a sandwich and remind everyone of their tasks. Within an hour everyone was suited up and outside.

“Okay folks,” she began. “The ranger 1 crew heads for the red stakes.” She pointed to an area with red stakes that had been prepared over the summer. “Finish the site of bubble 1. Team gold, you’re responsible for unloading and setting up bubble one, including its life support system.” She pointed to another area adjoining the first. “Ranger 2 and team silver, you have the same responsibilities with the area with green stakes and bubble 2.” She pointed to a larger spot surrounded by blue stakes. “Transvaal Biome will go there, at the base of the northern side of that low hill; we’ll be excavating its foundation in two sols. Teams blue and purple and the team with conestoga 1 will start preparing the ground for three solar power units marked by the orange stakes, a half kilometer north of here near the spaceport Team red will take mobilhab 1 and head for the spaceport to check the methane and oxygen tanks, blow dust off the solar panels, and resolve the electrical problems at pad 2. Team orange will take conestoga 2 to the well in the vallis to thaw the frozen pipe and get water production restarted. Mobilhab 2 stays here as backup. Questions?”

“Will we get a good shower tonight?” asked Eliseo Andaluziano.

“If we can get the water from the tank next to the well, we’ll be able to take unlimited showers. Anything else?”

There was nothing. “Good, let’s get started,” she said. Everyone dispersed to their areas to get started on the work.

Scoville was on team gold and was soon busy preparing the ground for bubble 1. She glanced around the site, imagining the possibilities. The gold supply would last half a century; silver, copper, and nickel-iron were abundant; a small, deep crater nearby had a good deposit of calcium and other sulfates, essential for making gypsum wallboard; the

wells had good supplies of water; the crater rim offered wind power. Cassini had infinite potential.

In two hours the sites for the two bubbles were leveled and smoothed by the rangers. A dune of wind-blown dust was bulldozed over them to provide a thin, talcum powder-like cushion. Heavy plastic tarps were rolled over the dust and anchored with metal stakes. The life support equipment—three tonnes of oxygen, methane, and nitrogen air tanks, carbon dioxide scrubbers, pressure regulators, fuel cells, power transformers, water and sewage storage tanks, water treatment units, water heaters, and related items—were unloaded from a trailer next to the place the airlock would be.

It was mid afternoon when the two bubbles were brought out, placed on the tarps, and unrolled. Transparent plastic covers were laid on top of them; once the bubbles were inflated, the covers would be staked down to protect the bubbles from the dust and ultraviolet radiation. They began to inflate the transparent, croissant-shaped enclosures, thirty meters long and six to twelve meters wide. They were eight meters high; enough to accommodate three stories. The bubbles took their final shape very quickly, but filling each with a tonne of oxygen, argon, and nitrogen would take many hours. Fortunately, the caravan had access to plenty of gas; there was a storage tank by the spaceport.

Once the bubbles were partially pressurized, workers began to move equipment inside: the life support system, two portajohns, two portable showers, and “tent” housing. Others, outside, anchored the plastic covers and connected the two bubbles together with two inflatable tunnels. Once the inflation was finished, the residents of Cassini would have six hundred square meters of living and play space; much more comfortable than the mobilhabs.

At sunset they went inside the mobilhabs for supper. There was an excitement in the air; they had reached their destination and their temporary housing was taking shape rapidly. After supper the mobilhabs undocked from each other and maneuvered into place against airlocks that connected them to the bubbles. By then the oxygen pressure was 0.12 atmospheres; enough for people to walk around without a pressure suit, though not for long. So Emily led everyone into building bubble 1. Flashlights and the pale light of a half-full Phobos illuminated the bubble in a ghostly fashion. The western rim mountains were a dark presence against the stars, which shone brilliantly through the transparent enclosure. After eleven sols of confinement in vehicles or space suits, the freedom of the bubble was exhilarating; a few started to sing and dance. Emily was amused.

"Don't overdo it; the air's pretty thin!" she reminded them.

She walked over to the edge of the bubble to look at the dark landscape, and she could almost see the silvery ghosts of bubbles stretching to the horizon. The almost-vision was interrupted by a hand on her shoulder. She turned; it was Muhammad Rahmani. "What do you see?"

"The future of Cassini."

"A big future?"

"The capital of Mars."

"You can make that happen." He leaned over and kissed her. She smiled a thank you and kissed him in return.

"We should finish the set up tonight," exclaimed Bruce to her. He was a few meters away. "We need to turn to the gold tomorrow."

"Bruce, you're in too much of a hurry!" scowled Emily. "Enjoy the space! The gold won't go away."

"The more we dig, the more money we all get."

"A few hours is a few grams. We can afford it."

"Will it really take six months to complete the biome?"

"Phases one and two."

"What about phase three?"

"Ask Will. The construction personnel will be needed elsewhere by then."

Bruce shook his head. "When will you all ever take this project seriously!"

Will hurried into his office. It was 8:30 a.m. and Habitat 1 was already humming with activity. The former bedrooms along the southern side had been converted into work stations for driving Prospectors—telerobotic rovers—and controlling equipment, and were already busy. The old great room on the north side had been divided, part becoming his office, part becoming the bridge. Hab 1 was a communications and control center that could run every piece of equipment in Mars space, from shuttle engines on Deimos to fans in Yalta's life support system. They had even occasionally controlled robotic explorers in the asteroid belt or errant satellites orbiting Neptune.

Will was surprised to see Kent Bytown, looking bleary-eyed, still sitting at his desk in the bridge. "Good morning! I thought you would have left an hour ago!"

"I was waiting to give you a report."

"Oh, I didn't know. I'm sorry I'm late. I took Marshall and Lizzie to their classes and just as we arrived, Lizzie had an accident and peed all over her dress. So I sent

Marshall ahead to his classroom and took Lizzie home to change her. And wouldn't you know it, the cleaning robot had just let itself into our flat and had started vacuuming Lizzie's room. So she wouldn't go in—she was scared of the thing—and then once she got used to it, she insisted on staying to watch it pick up things, put them more or less where they belonged, and vacuum. I finally had to drag her away, crying."

Kent chuckled. "Miranda and I wonder how people manage to get things done and raise kids! I suppose we'll find out, soon enough. I've been here since 10 p.m. My report's short. We've got a slow leak around one of the pipes running between Yalta and Catalina; I'm not sure exactly where, but I managed to isolate it enough to turn in a repair report to Karol, and he's devoting the morning to sealing the leak. The oxygen loss is pretty slow and it's leaking into the outer envelope anyway, where we can pump it back in. As a result, I had to postpone some routine work for Muller Mining, so you may get a complaint from Bach later this morning. I was supposed to be running the centrifugal separation unit; they had loaded up the hopper with fifty tonnes of rock, enough to keep it going all night. But rather than focusing on the separator until 2 a.m.—7 a.m. in Cassini—when someone there could take over, I felt I had to give the leak priority."

"I agree. How long was the separator down?"

"Forty-five minutes. I let it run while I focused on the leak, but the crusher got stuck and shut itself down, and I didn't want to stop the search for the leak to unstick it. They didn't lose much production."

"How has the night-time Cassini work been? Alright? You've had to do it four nights, now."

“It’ll be fine. I’m glad to be providing a part of our labor quota while doing all necessary nighttime monitoring of life support.

“Continuing my report: about 4:30 a.m. a couple in bathrobes who will remain nameless visited the swimming pool in Yalta to go for a skinny dip. Before they got the covers off the pool, I switched on the intercom and reminded them that the pool was off limits at that hour. Practically scared their bathrobes off of them!”

Will laughed. “We should enforce that rule.”

“It’s public space at any hour. It’s amazing how many people are up and walking through the biomes at 4:30 a.m.! Besides, the irrigation system was due to go off at 5:00 a.m. and that would have surprised them.” He picked up his coffee cup. “I’ll be back at 10 p.m., as usual. Tonight I’ll be checking the control interfaces for some of Consolidated’s new equipment. That’ll take much of the night.”

“Good. Who’s the day officer?”

“Zach; he’s in cubicle one running a Prospector until trouble comes along. We’ll have three folks running Prospectors until suppertime, then two until midnight. They’re all certified to run the systems.”

“Good. I’ll be in my office all day, as usual. Have a good rest.”

“Thanks, have a good sol.” Kent rose and headed toward his flat in Catalina. Will walked into his office to get started.

He sat and activated the attaché on his desk. There were several emails to deal one. Chester Stoughton, one of Consolidated’s workers, emailed complaining about Bruce Curry’s slave-driving ways. There wasn’t much Will could do about that; he had no jurisdiction. He emailed Stoughton to that effect. Eliseo Andaluziano, an engineer

providing construction support at Cassini who was also trained as a nurse, videomailed to report that in the first week of work at Cassini, two workers had serious muscle strains because of overwork. They had been reassigned lighter duties. Will called Emily about it and they jointly called Curry, the source of the trouble. He replied that the workers were not in proper shape for the duties they were given, but after ten minutes of arguing, he agreed to slow his schedule somewhat.

When the call ended, Will needed to compose himself before continuing his work. His old friend David Alaoui had sent a videomail during the night; it would provide the relief he needed.

Will activated the videomail. He was surprised to see that much of David's curly hair was now streaked with gray and that his friend looked older. He had to wonder whether stress or radiation was responsible.

"Good sol, my old friend," said David. His voice and face carried the energy and enthusiasm Will remembered so well from early times together. "We got good news today: Magellan 3, which leaves for Venus next May, will carry six crew. Magellan Station will expand to three ITVs. The extra space will be very welcome up there, but I think the larger crew will be the big change; seeing the same three other people for two years got on my nerves. But in spite of that, I miss Venus! When I dream every night, I still see the beautiful, swirling clouds of her atmosphere. And I literally dream of walking around on the surface; those Prospectors sent back such realistic imagery that I can still clearly see areas where I drove them around.

"I suppose the only personal news is my own anguish." He sighed. "I really don't know what to do with myself. Forty-seven years old, flown to Mars, commanded the first

Venus mission, and now stuck with a job as one of eight Assistant Directors of the Venus Commission. I'm bored, I'm too busy pushing paper to do research, and I'm buffeted by all sorts of internal politics. I'm tempted to become a professor of planetary science; Caltech probably would give me a position. I'm also tempted to enter politics, but I'm not sure which I like less: French politics or Moroccan politics. So say some of your prayers for me, Moonman. I could use them.

"There's not much else to report. The boys are in college and doing well. Aisha says hello. Kiss Ethel, Lizzie, and Marshall for me. Bye."

Will smiled as David's face faded on the screen. He hit reply.

"Hey, David! I commiserate with you. I bet my life is more hassle-filled than yours, right now. Hassle is a four-letter word that is spelled G-O-L-D. Rather than clearing trails to promising fossil localities, and drilling areas to search for the origins of Martian life—or evidence of contemporary life—we're flying sunwings over auriferous units for detailed reconnaissance, dropping Prospectors on them for exploration, planning trails to them, walking them to examine outcrops directly, and writing up the details to a commercial world eager to make a new deal with us and ultimately to haul in a big profit. We're under intense pressure right now because if Consolidated and Muller Mining do well over the next year, tens of billion of bucks will be beating down our doors. Even now—when no one wants to finalize anything—the line of would-be suitors is amazingly long. Some of the folks in Commission headquarters regard this as a big money game; the fact that it is for the purpose of developing another world is lost on them. Maybe we need to have more folks here go home and take up work in the H.Q., so that the reality on the ground here won't be forgotten.

"So that's a big discouragement for me. The hardest part is trying to be a bridge between positions, supplying resources to the gold exploration and recovery efforts without dismantling our other efforts, conserving the exploration and science programs and making sure they grow, but not as fast as they could have this columbiad. The problem with being a moderate is that both sides accuse you of compromise. So I'm under a lot of stress right now. Please pray for me, too! Reciprocal prayers: maybe that will work.

"But life has its bright side. Marshall's in first grade; we actually have an institution called 'Aurorae Elementary School' with a kindergarten and a first grade. Lizzie turns four next week and is developing very fast. The other sol Cornelius Beyer and Tatiana Gavrilova announced that they plan to get married in December; they're the first marriage from the 'love boat,' as someone called Columbus 6. A few more marriages are contemplated, and some sparks are appearing between some of our older, unmarried residents and some new arrivals. As the hopeless romantic that I am, these developments really warm my heart. The Deschanels have announced that they're expecting a child in May, who will be number fourteen if all goes well. This is good news because we now know for sure that child number thirteen will have Down's syndrome. That discovery and Madhu's cancer have caused quite a ripple of concern up here about the health effects of living on Mars, with some worrying about every millirem of radiation and others dismissing the entire issue almost fatalistically.

"You wouldn't recognize this place if you came back. Catalina Biome has people living in building one. Building two will be completed in late December. Riviera Biome has been inflated; it'll be completed before the end of 2047. Cassini's biome will be

inflated in a month. Shikoku is scheduled to be finished by mid 2048 and then Aurorae will have four biomes! Over the summer we built a dozen cryogenic storage tanks. Each can hold seventy tonnes of liquid oxygen or thirty tonnes of liquid methane. We've flown a pair to Phobos, to Deimos, and to Embarcadero, we drove a pair to Cassini in July, and the other four are set up here at Aurorae. They can refuel two shuttles, so we no longer have to wait three months to manufacture the fuel. We also have reserve energy for dust storms.

"These are little things, but they are milestones for this place, and milestones are always exciting. They're compensation for all the bullshit I have to put up with. Your calls help, too; they encourage me even when they aren't meant to! So thanks for calling. Bye."

He sent the message off to David. Then he couldn't resist firing off a video message to Sebastian Langlais, Commander of Shackleton Station. When Sebastian had commanded Columbus 2 he had been a pain and something of an adversary; but they had become friends. Will checked the time at Shackleton Station, then recorded a message.

"Good sol, Sebastian! Say, what's your advice about handling contractors. Both are determined to haul a hundred tonnes of gold back to Earth in eighteen months. Never mind that we've already picked up all the big, loose nuggets and blown up the really rich spots. They'll be lucky to recover 200 grams per tonne. They're working about eighty hours per week and they're driving my people crazy with overwork and unreasonable demands for biomes, reactors, rangers, mobilhabs, etc.

"But in spite of the stress there's a bright side. The canaries have escaped in Yalta Biome and sing from the trees; a nice touch, though we would like to recapture them!

The biomes now have butterflies as well, and we just got coffee and chocolate plants. Columbus 7 won't be importing much food; we may even export Martian steak for the low earth orbit tourists!

"I hope everything is well there. I hear Shackleton can now accommodate twenty tourists. The big radio telescope construction project sounds exciting; I hope the rumor's true. How do you juggle everything? Bye."

Will sent the message and turned to his other messages. Mich Dvorkin, the Mars Commission's Director of Exports in Houston, was still wooing Sibir Resources Company, or Sibireco, with a contract to dig the gold deposits near Dawes Crater. Sibireco had lost out in the last round of negotiations, but now they had a U.S. subsidiary that considerable expanded their capacities, not to mention their political clout. Will videomailed Mich begging him not to arrange a contract that specified the establishment of a Dawes Outpost before Columbus 8. The work would be too much.

Louisa Turner, the Director of Public Relations, emailed him, asking whether video resources on Mars could be made available to Skip Carson, a major Hollywood movie director. He was considering a flight to Mars on Columbia 7 as their first tourist and wanted to have some Martian scenes filmed. Will emailed her and questioned the wisdom of such a proposal. That put him in a foul mood again; everyone wanted Mars to do more and more when they could barely manage everything they was doing already.

Then the replies came back. He played David's first.

"Hi. I can imagine the gold is a huge hassle. But what can you do? Money makes the world go round. It justifies Mars exploration, and that has always been the hardest part. Hang in there. Everyone says that without you Mars would still have a dozen

personnel in a couple of inflatable habs. One person can make a difference, Will. Because of you, my oldest, Zecaria, might be among your crew some day. And Mars is giving us confidence to try other things. Confidentially: Europe and Russia have started talking about a mission to Mercury's north pole. Shackleton provides the surface technology, Mars provides the interplanetary transportation technology, and nuclear engines provide the boost. I suspect in a decade we'll have people on Mercury and a decade later there will be humans going to Jupiter's moons. So keep up the good work. Bye."

Will had to smile at his friend's kindness. Then he activated Sebastian's reply.

"Good sol, Will. Yes, the news from the moon is good. Shackleton has continued to grow; with the Chinese facilities, we can accommodate 131. A side note: as of next month, the Chinese clocks are changing to match ours. It's more convenient for them to be on U.S. Central time and visit us than it is to be on Beijing time and talk to mission control.

"As for the radio telescope rumor, no, it isn't true. But it looks like we will get a contract for a 500-meter liquid metal optical telescope located in a permanently shadowed crater nearby. That will be an incredible advance for astronomy. And our new shuttle repair hanger is really beautiful; go take a virtual reality tour on our website. We now have the contract to refurbish the Mars shuttles.

"Contractors: be firm and make sure everything possible is specified in writing, otherwise they'll take advantage of you. I saw the contract the Mars Commission made with the gold companies and shook my head. Our lunar ice production contracts are 1,000 pages; ten times as long as yours. I suppose there were too many uncertainties when you drew up the contracts, but now it's coming back to haunt you. We have three companies

up here extracting water from the frost deposits, we have the support services working well—which took quite a while, I admit—and the price of lunar hydrogen and oxygen is dropping steadily, which means tourism is becoming cheaper. LeMonnier Station is planning to offer a two-week stay for 20 million, including visits to the Apollo 15 and 17 landing sites, where they'll build boardwalks. That's comparable to the early ticket price to low Earth orbit, though admittedly the dollar is worth ten times less now. Shackleton will have to lower prices to compete. One third of my personnel support the tourist business directly or indirectly, and forty percent of our income comes from them.

"So my advice is, be hard nosed and look to the advantages of your situation. You have an atmosphere and biomes; we don't, and we miss them. Keep in touch. Bye."

He was wrapping up work just before lunchtime when his videophone buzzed with a call from Michiko Suzuki, their meteorologist. Will's heart sank when he saw her name on the caller identification. The dust storm season was still two months away, but the Mariner Valleys could get them any time. "Is it bad news, Michiko?" he asked, answering the call.

"Don't shoot the messenger. The long-term, ten-sol forecast shows a dust storm developing in Aurorae Chaos and lasting about two weeks. It'll be category 2 or 3."

"Category 3 triggers a lot of restrictions that category 2 doesn't."

"I know, but it's the best we can do. The ten sol forecast is seventy percent reliable."

Will pondered. "Okay. In three sols, the seven-sol forecast will be eighty-five percent reliable. Let's use the three sols to educate people about the limitations that storms impose."

“The miners will be the toughest. Even category 2 means no sunwing landings or takeoffs at Aurorae, which means we’ll have to use shuttles or robotic trucks and both of them need nuclear reactors for their power sources.”

“I know, it means we can’t spare reactors for them.”

“Cassini’s forecast is still good. It isn’t in an area prone to storms, unless we get to category 4 or 5 conditions. Maybe you should ship our solar power units there and bring their reactors here.”

“I’ll try that. We may have to call back the scientific expeditions also, since they need reactors. Otherwise, Aurorae has to cut back on fabrication and construction. They’ll require all six reactors. Can you send me the detailed forecast by email; I’ll send it to the heads of staff, and we’ll figure out how to reallocate resources.”

“Okay, right away. Sorry to make your life that much harder, Will.”

“Thanks, Michiko. We’ll survive.”

5

Crime

late Dec. 2046

Will, Alexandra, and Lisa stopped their inspection tour of the rooftop garden of Catalina's building 2 to watch the dust devil move across the valley toward Face Rock. It was fairly small for Mars—a mere hundred meters across and perhaps a kilometer high—but it seemed particularly fierce. They were alarmed to see the dust devil veer northward and bear straight down on the Outpost. They all felt momentary apprehension—a sucking in of breath—as the swirling funnel cloud passed over the habs, greenhouses, Yalta, then right over Catalina. The gale force winds were visible in the rapid whirl of the dust. Then a talcum powder rain fell on the plastic bubble.

"Wow, that was something!" said Lisa. "I've never seen that before!"

"I did once before," exclaimed Will. "It was about a kilometer in diameter and the entire Outpost was shrouded in dust for several minutes!"

"I thought my heart would stop!" added Alexandra. "I knew it couldn't hurt the dome, but it still felt like we were going to be in a tornado."

"We were, but the atmosphere's not thick enough to do any damage," replied Will. He looked at the thickening deposit overhead. "Your crew just blew the dust off the dome, and now they have to do it again. Twice in one sol."

"I hate the dust storm season," growled Alexandra. "Dreary outside, dark inside, and we never have enough power."

"Well, you got building two done," said Will, looked around at the flourishing rooftop garden. "Lisa, the garden's doing well, in spite of the diminished sunlight."

“This is one of the gardens getting nighttime lighting.” She glanced at Alexandra nervously. They had been competing for power over the last three weeks.

The three of them turned and walked back into building two’s rampwell. “Even so, Will, future biomes need at least thirty percent more farmland per person,” exclaimed Alexandra. “Agriculture just isn’t as productive as projected.”

“We can match the productivity if we want to eat a poorer diet,” replied Lisa.

“We need bigger biomes,” replied Alexandra, raising her voice at Lisa.

“I know. The fifty meter design will be good,” said Will, glancing at both women.

“The bio-50 has only twenty percent more mass and sixty percent more interior space, thanks to some new materials and incorporation of more parts made here.”

“I know. I’m sold on it, Alexandra.” Will stopped on the ramp where it reached the top floor landing and opened a door. It led into a classroom; the electronic blackboard had been installed, but nothing else. He entered, admired the work, then walked out the other side and went down another ramp. The women followed. “MarTech’s got a great facility,” he said.

“Thanks,” replied Alexandra. “We should be able to start classes in January, assuming we can make the furniture in time.”

“It’s in the energy budget,” replied Will. “Ethel’s getting started tomorrow.”

“Will, if we could find even five hundred kilowatt-hours per sol, we could start Riviera Biome,” said Alexandra. She stopped at the bottom of the ramp in the MarTech lobby. “That’d be enough to run a ranger with excavation equipment and finish the hole, with some energy left for making and pouring duricrete.”

“You’ve already made that point a few times,” said Lisa.

"Well, you got five hundred kilowatt hours more per sol for agriculture!"

"Do you want your construction people working fifty-five hours a week on three quarters rations?" replied Lisa.

Will shook his head. "Stop, both of you. Alexandra, we have to preserve our reserves—food and energy—because the forecast is too unpredictable. Besides, right now you have enough people for fabrication or construction, but not both. We won't have the energy for both until the storm season clears."

"I wish the forecasts were better," said Alexandra. "They *claim* they're seventy percent accurate!"

"We know better," agreed Will. "Thank God we took the conservative approach, got a nuke from Cassini, and sent them the solar power units."

"But did you have to send out the two geology expeditions? The nuke they're splitting would make all the difference here; for agriculture as well as construction."

"Not to mention safety issues," agreed Lisa.

"Safety is fine. Mission Control's satisfied. Cassini can offer better emergency services than Aurorae because its weather currently allows sunwing and shuttle flights. The expeditions have been in the northern hemisphere where the atmosphere is dusty, but not stormy. Even the solar power units have worked fairly well at Cassini. The exploration teams have maintained our media presence very, very well. Elysium-Utopia has been geologically fruitful and interesting."

"And where will we put Viking 2?" asked Lisa.

Will smiled. "How about the park below Face Rock? No, I'm joking. I think we'll eventually put it in our first museum after we've studied it thoroughly." He turned to

Alexandra. “But back to your concerns. Alexandra, why not go to Cassini yourself for a few months and oversee the construction there? It has plenty of solar power while Aurorae struggles on limited nuclear and wind power. We can send construction people there to finish the biome while the folks here turn to fabrication, then when the storm clears the extra personnel can return here and turn to construction with a vengeance.”

“I know.” Alexandra sighed. “I just hate to think of Cassini and its pushy gold miners getting as big and sophisticated as Aurorae.”

“Alexandra, don’t think about that! We have to think about Mars, not about our borough!” Will had raised his voice. He lowered it. “Come on. Let’s look at this rationally. Catalina’s done. If we start Riviera in May or June, we can still finish it and Shikoku before Columbus 7. Let’s get Cassini finished as much as we can.”

“You want Bach and Curry off your back.”

“That’d be nice but this is a rational reallocation of our people. Build where there’s power. Then let’s turn to a few other essentials, like installation of wind turbines on Cassini’s rim and the microwave power relay to the outpost.”

“We’ve got to get the relay system running,” she conceded. “If we can beam power to Aurorae from the top of the escarpment, where the atmosphere is much less dusty, we can set up the solar power units and wind turbines up there.”

“If the microwave link is efficient enough,” added Lisa. “The agricultural bubbles up there are getting about ten percent more sun than the ones down here.”

“We may be able to beam the power from here to Phobos, and Phobos to Cassini!” replied Will. “And vice versa, depending on who is enshrouded in dust. And from either outpost to a mobile expedition almost anywhere on the planet. Or from

Magellan station to rovers on the Venus surface. They've already successfully beamed power from Shackleton to the facilities in permanent shadow, and last month they beamed power to ion engines pushing cargo from earth orbit to Gateway. Doesn't that capacity excite you?"

Alexandra hesitated. "Yes, it really does. I agree, we need to test that equipment. I was hoping to test it here, though."

Will was surprised by that. "You know it was meant to be tested at Cassini."

She shrugged. "As I said, I had hoped. Okay, Will, I concede your logic. I don't like it, but I agree, it's a logical plan. I really think you've been giving away too much to our greedy miners. But I will go to Cassini next month, for two months, and take six additional construction specialists along. They'll be enough to get all of building one finished."

"Good." Will smiled; she was stubborn. "A Mobilhab and a ranger are scheduled here the sol before Christmas with four crew. Two Mobilhabs can go back. They're departing January 3."

"How long will that take? Why not fly?"

"Fly? There's no energy for shuttle flights, remember? Besides, you can use the ten sols pretty efficiently, reading or whatever. You can even relax. It's allowed."

"I might drive Prospectors; I haven't done that for a while."

"The Mobilhab has the capacity to control four at once," replied Will. "The guys coming back will be pretty busy; some will be running mining equipment all the way home."

Alexandra nodded. "Okay, I'll go."

Will smiled. “Excellent. I think you’ll enjoy the trip.”

Less than a week later a Mobilhab and a ranger rolled into Aurorae bearing four workers from Cassini and two explorers who had flown to Cassini from Elysium. The truck pulling the reactor carried five tonnes of gold, the total production of both companies for the previous month.

“The work is hell,” Eliseo Andaluziano said to Will over coffee that afternoon. “Curry is a real slave driver and Bach, to compete, has felt he had to do the same. So we’re working seventy-five hours a week, sometimes more. And something is always breaking; the mining equipment wasn’t designed to operate in Martian cold. They’re lucky to keep the equipment going seventy percent of the time.”

“We don’t have the energy to run it all the time, anyway,” added Louis Tremblay, who had also just returned from Cassini. “Even with extra solar power units, the combination of mining and construction is very power hungry. I had a lot of trouble figuring out how we’d keep fuel in the shuttles.”

“You did a good job, Louise,” said Will. “How’s morale?”

“It ain’t great, but it ain’t horrible either. Emily got the biome bubble set up in record time. Next week the bottom floor of building 1 will be enclosed, which means everyone will have a real room to live in. Of course, it’ll be another month before the rooms are painted and comfortable.”

“Less,” replied Will. “We’re sending Alexandra and six workers plus replacements for the four who left, and they’re taking more construction materials. They

should have all three levels of building one enclosed in two months. They'll set up the outside structure for building two, also, though the structure inside it will be minimal."

"That'll help a lot," said Louise. "I understand Ray Munson has bought a flat here in Catalina building 2, and that Curry tried to order him not to."

Will was surprised. "He has bought a unit, but I don't know anything about the circumstances. The Werners have as well, and I don't think they're mad at Bach." He pointed to Chester Stoughton, one of Consolidated's staffers, who was strolling through DiPonte's store. "So, why did he get permission to accompany all of you here?"

Eliseo shrugged. "He hasn't told us, but my impression is that he has come to hate Curry and the work. He's still working hard, just remotely. He was running mining equipment twelve hours a sol on the ride here."

"Interesting. I guess I should ask him."

"I'd ask now, before he disappears into an operations cubicle," said Louise.

Will nodded and rose from the table. He walked over to DiPonte's store; the door was wide open and Stoughton was the only one inside. There was no need for DiPonte to staff it; anyone with questions could call him, and if anyone walked out with an item, they'd be billed for it anyway. A computer chip in each item, video cameras, and a paid monitor in India did the rest.

Chester was examining the Cuban cigars and the Russian vodka, though the latter was inside a locked cabinet. He looked up. "Oh, Commander. Good sol."

"Good sol to you, too. Welcome back to Aurorae."

"Thank you. This place is a sight for sore eyes."

“Cassini’s still pretty limited. We’ll be sending the Mobilhab back to Cassini in a bit over a week, so the visit won’t be that long, I’m afraid, especially when you add ten sols of travel each way.”

“It’s sort of like being on an old-fashioned cruise ship, except there’s no swimming pool and no open bar. Commander, is there any possibility we can arrange for me to stay here? I could continue to provide support services telerobotically. The isolation was driving me crazy.” He lowered his voice. “Especially the lack of women.”

“Have you talked to Bruce Curry about it? He’s your boss. He’s made it very clear that he wants his people in Cassini for maximum flexibility.”

“I know, but here, five time zones behind Cassini, I can provide support services to Cassini in the middle of the night.”

“And what did Curry say to that?” asked Will, point blank.

Stoughton looked down. “I think he’d be as happy to be rid of me as I am to be rid of him. I want to stay on Mars, but not work for Consolidated. Maybe we can arrange a swap with someone else?”

Will shook his head. “I think the chance of anyone else wanting to work for Consolidated is pretty remote. I hear working conditions are difficult.”

“Difficult? Impossible! Morale’s in the toilet! He’s a slave driver! Bach’s just as bad, too! Scoville’s driving her people too, in response. There’s constant repair work and a lot of work is being done by hand or in a spacesuit that was supposed to be done remotely because one thing or another is broken.”

“What do you recommend?”

“Set a limit on work hours, for personal safety! It really isn’t safe. Send down more people and figure out how to replace the parts that are breaking with other parts that are more robust. It’s an experimental operation, not a working operation.”

“Either way, it’s an operation recovering five tonnes of gold per month.”

“At the cost of a lot of sweat, and maybe blood.”

That got Will’s attention. “We will have to look into the matter, then. We’re sending down a bigger support team; that’ll help. Some of the people going down are experts at safety and others are experts at design; maybe they can solve some of the frequent breakdowns.”

“I hope so.” Stoughton looked at the vodka bottle, a liter, with a price tag of 300 redbacks. “When will someone be here, so I can buy this?”

“The vodka? The cabinet will be unlocked automatically Frisols and Satursols 6 p.m. to 1 a.m. Those are the only times alcohol can be purchased or consumed here. The cafeteria sells cheaper stuff, though; we’re now brewing beer locally, and it’s supposedly pretty good. We even have a contract to export five hundred liters to the Hilton Orbital.”

“I’ll try some, but I really want the vodka.”

“Come back tomorrow evening, then. Meanwhile, can I offer you chocolate? It’s the best quality money can buy.” Will reached down and picked up a 25-gram, 7.5 redback bar that had a famous logo cheaply printed on locally made paper.

Stoughton smiled like Will had made a bad joke. “No thanks, Commander. I really want something stronger.”

Frisol was busy and Satursol was pleasant. After half a sol of work on Satursol morning, Will came back to Yalta Biome for lunch, then remained for the quarterly flea market. About forty people had things for sale. Some had used clothes and toys they no longer needed, at prices half as outrageous as those inside DiPonte's Store. Even used paperback books sold for 10 redbacks, roughly the cost of flying them to Mars. But more interesting were Lal Shankaraman's remarkable photographs of natural objects on Mars, Enrique Delrio's metal furnishings, Madhu Gupta's ceramics with geometric designs, Friday Nguru's wicker chairs, Radha Bhatt's hand-woven rugs, Ernesto Alves's carved plastic and wooden sculptures, and Ryoko Furukawa's beautiful water color paintings of flowers. They were not cheap; five to ten times more than they would be on earth. But raw materials cost vastly more and labor was worth eight times as much as on Earth. Many objects were snatched up in a few minutes in spite of the price tag. Everyone walked around with a wad of thousands and hundreds; few items required anything smaller. The average consumer spent one or two thousand redbacks that sol.

Then Will and Marshall went for a swim while Lizzie napped and Ethel rested. Supper was always special on Satursol, with more meat and desserts than usual, even during the dust storm season. When the dishes were cleared away and the sun set, the stage was illuminated for the performance of a locally written one-act play by the "Aurorae Players." Marshall sat spellbound and a bit baffled by the play, but he had seen enough theatre to love it.

After the play ended about 8:30, the families began to drift out, the kids went to bed, the lights dimmed a bit, the music became more contemporary, and the cafeteria changed its character as Mars's singles gathered to socialize. Will and Ethel put the kids

to bed, then sat in the living room to watch television; Earth's favorite Saturday evening shows had been downloaded onto the Outpost's computers. They watched their usual lineup, then went to bed.

At 2:30 a.m., Will's attaché suddenly began to beep. In response, the house computer brightened the bedroom lights. Will jumped out of bed and grabbed the device. He deactivated the video, noted the name of the sender—Kent Bytown—with trepidation, and opened the circuit. "What is it, Kent?"

"Will, sorry to awaken you. About five minutes ago Sheila Burns came into the bridge crying and saying she had been raped by Chester Stoughton. I called Eve Gilmartin and Martha Vickers right away, waking them up, and they asked Sheila to meet them at the hospital. Martha stopped by to bring her. I figured I had better call you."

"Thank you. I'll be right there. Call Silvio as well and tell him I want him to come to the bridge immediately as well."

"Got it. Bye."

"Bye." Will closed the circuit, apologized to Ethel, pulled on his clothes, and jogged to the bridge. He felt numb and in shock, which the freezing air in the tunnels didn't cure. Mars had never had a problem like this before. It wasn't prepared.

When he arrived in the bridge, Kent was reviewing videotapes. "I found where she left Chester's apartment, and the computer's looking for the moment when she went in. They were in the patio all evening, so there will be a lot to review. Shall I call up the tapes of the camera inside Chester's room?"

"No, not yet. We need legal advice. The hallways and the dining area are public spaces. What happened?"

“Sheila was gradually going from shocked and angry to hysterical, so I can’t guarantee we know all the facts yet. Basically, she said she had a few drinks with Chester, he invited her to his room to take a look at something—I was never quite sure what—and he forced himself on her.”

There were footsteps behind them. They turned and Silvio DiPonte, hastily dressed, tired, and grumpy, entered the bridge.

“Has the price of gold collapsed?” he asked.

“No. Sheila’s in the hospital; she says she was raped by Chester Stoughton.”

“Who?”

“He’s one of the workers for Consolidated; he arrived here yestersol. Kent, you summarize.”

“Sure.” Kent repeated the account he had told to Will.

“Perhaps we should go talk to Sheila?” suggested Will.

Silvio shook his head. “Not yet, and I had better not go at all. I don’t need to know all the details of the alleged incident; I need to know enough to render an unbiased opinion.”

“You’re the borough judge, but who will be the lawyers? What law do we follow?”

“We have to follow the laws of the state of Texas, since the Commission headquarters is in Houston. Of course, we can’t follow either the laws exactly or the legal procedures, because this is Mars, not Houston. I don’t know the details of the rape statute, but we can assume that rape is a serious crime punishable by imprisonment. We’ll need to get the details.”

“But how can we hold a trial here?” Will exclaimed, worried.

Silvio shrugged. “Trial by jury would fit our circumstances best, with the judge and jury empowered to ask questions. We may need to hold a town meeting to establish the legislation needed for a trial. I’ll reread the Aurorae Declaration and subsequent declarations.”

“But we have no prison, and an angry resident can sabotage this place pretty easily,” said Kent.

Silvio nodded. “If this person were found guilty, most likely he would have to be sent back to Earth for punishment. But we would have to set up a system that maximizes his cooperation here; time off for good behavior if he cooperates, for example. And we don’t need a prison because we can enforce house arrest and all sorts of other restrictions. We’ll have to be creative.”

“Do we have the jurisdiction to be creative?” asked Will.

“Of necessity, we do. As chief judge I can make constitutional rulings.”

“Okay.” Will looked at Kent. “Let’s go talk to Sheila.”

Silvio shook his head. “Let the physicians do their job first. I’ll go to the sick bay and remind them of the legal need for evidence. Sheila came here and told to Kent; you have cause to arrest the accused. I’d bring him here, ask him if he wants a third party present to advise him, remind him of his rights under United States law, and ask some questions.”

“Who? The Commander?” asked Kent.

“No, the Duty Officer, who is charged with maintaining the health and safety of the residents. That includes law enforcement.”

“But I have no training!”

“Never mind about that, Sheriff Bytown,” replied Will, putting on a western drawl.

“Watch out, I’m swearing you in as deputy!”

“This is not the wild west,” replied Silvio. “Security is listed among your duties, Kent. Read the—”

“I know, I just never thought I’d need to do it! I’m a systems analyst!”

“Well, you are now the borough constable as well; that’s a better term than sheriff, I think,” replied Silvio. “You are authorized to arrest, hold, and question the suspect for a reasonable time. So go get him. I’ll talk to the physicians. The Commander can go along as your deputy.”

“I think we should get Érico and Alexandra involved, as secretary and chair of the borough government,” said Will.

Silvio nodded. “Good idea, since it’s not completely clear where your authority as Commander ends and where borough authority begins.”

“You call them while I get someone in here to replace me,” said Kent.

Will nodded. He and Kent made calls while Silvio headed through the tunnel to Aurorae Hospital in Habitat 2. Getting the attention of the women was complicated. Finally, Eve came out. When she saw it was Silvio, she immediately exclaimed, “She can’t talk to a lawyer now. She’s been traumatized.”

“Fine, Eve. I’m here to remind everyone of their professional duty. If a crime has been committed, it has to be decided in a court. The court will need evidence. The court will also need testimony; yours, Martha’s, maybe Sheila’s.”

“Court? We’re on Mars!”

“Indeed we are. That means we can’t ship Sheila and Chester to Houston tomorrow for a trial. No one can get to Earth for a year and a half. And we can’t push Chester out an airlock without a pressure suit. If we intend to be a civilized society we have to hold a trial and determine a punishment.”

“I see what you mean.” Eve looked horrified. “This is terrible.”

“Be thankful our first serious crime wasn’t murder. We’ll have one of those some sol, too.”

“I suppose. The Garden of Eden has just found its serpent.”

“No, the serpent has always been here; he just hadn’t bitten anyone. Now he has. As a physician, you have to play your professional part. Martha can counsel Sheila and the counsel will be confidential because of the physician-patient relationship, but she should be careful not to distort Sheila’s memories. You and Martha need to consider what evidence of rape should be submitted to the court.”

“I understand.” Eve nodded. “I’ll tell Martha.”

“Thank you.” Silvio turned and walked back to the bridge.

Kent and Will were briefing Érico and Alexandra. The five of them finished conferring, then Kent, Will, and Érico headed for Chester’s flat. They were somewhere between frightened and high on adrenaline as they crossed Yalta Biome, entered Catalina Biome, and headed to the main entrance of building two. They went down the steep ramp to the garden level and knocked on the door to Chester Stoughton’s room.

No answer. They knocked again, then again. Then they knocked loudly.

“Maybe he isn’t there,” said Will.

“He should be.” Kent knocked loudly again several more times. Then he pulled out his attaché and pushed a series of icons to see where Chester’s earpiece was. Most people wore theirs during their waking hours. “His earpiece is in there.”

“He’s probably there. How many times have we knocked?”

“Six or eight.”

“We’ll knock some more, and then we’ll ask the computer to open the door.” Will knocked loudly on the door. “Chester, please open the door!” He exclaimed loudly.

Another door opened nearby and Eliseo appeared. “What’s going on?”

“You’ll hear about it tomorrow,” replied Will. Érico motioned Eliseo back inside; he closed his door. Will knocked two more times. “Okay, constable.”

Kent nodded. “Computer, this is Kent Bytown invoking safety condition orange. Please unlock the door.” There was a pause, then every door on the hallway emitted a faint clicking sound.

“You should have been more specific,” said Érico.

“Let’s go,” said Will.

Kent opened the door. The lights came on automatically. Chester had a one-room flat with a bathroom and closet flanking an entrance hall. They could look straight into his bedroom and see Chester was lying on top of his bed, naked, sound asleep.

The three of them had to shake him several times before Chester stirred, and then he wasn’t coherent. “He must have passed out from alcohol consumption,” said Kent.

“Then let’s get a bathrobe on him and carry him to the hospital,” said Will. “We’ll call in some more doctors and keep him in another room.”

6.

Trial

late Dec. 2046

Emily Scoville glanced at a flashing warning on Transvaal's dome's humidity controls. The extensive farm plots they had set up were overwhelming the dehumidifiers. She turned off the warning for the hundredth time and turned back to the controls of Muller Mining's centrifugal gold separator. Even the Commander had to devote time to running equipment, even on Sunsol.

The chronometer rolled over to twelve noon. That was good news; she was hungry. She looked at the controls again to see when she could leave the machine. The input was being ground more finely, so the separator worked more reliably, and the supply hopper was nearly full because the grinder had worked without trouble all morning. It was a miracle.

The communications area of one of the control screens began to flash with an incoming message from Will Elliott. She reached over and activated it, and read the announcement that, because someone had been accused of the serious crime of rape overnight, there would be a town meeting in Aurorae at 1:30 p.m. Aurorae time to discuss legal procedures.

That shocked her. It was 7 a.m. in Aurorae and she immediately called Will. He answered the videophone, bleary-eyed, after three rings. "Hello, Emily. I take it you saw the email."

"Will, what do I say to my crew here? This will disrupt work, I'm sure."

“You don’t know the half of it.” Will lowered his voice. “Chester Stoughton’s the accused, but we’re not announcing that yet. Sheila Burns says he invited her to his place last night and forced himself on her.”

Emily took in a startled breath. “Oh, no. Chester’s been . . . unsteady lately. I’m really not sure what was going on with him.”

“He said to me Frisol it was too much work, too many fights with Curry, and no women.”

“That sounds right. So what are you going to do?”

“Put him on trial and if he’s convicted, he stays here under house arrest, working from his quarters, until he can be shipped back to Earth. Kent, Silvio, Érico, Alexandra, and I got no sleep last night. We discussed legal procedures and public relations with Douglas Morgan and a task force in Houston until a few minutes ago.”

“This is terrible for our image, too.”

“Our image *and* our actual community. It’s a major mess. We could have avoided this if Curry had been more accommodating and hadn’t insisted on seventy hour work weeks. We’ve got to crack down on that.”

“It’s greed and it’s been getting worse. Now that they’re recovering lots of gold, the value of both company’s stock has soared. Bruce has demanded higher pay for himself and Consolidated gave it to him. I bet he’ll demand a signing bonus for staying a second columbiad, even if he promised to do so.”

“Which means everyone else will demand it as well. That’ll cost Consolidated a small fortune.”

“But they’re earning a large fortune. I won’t tell anyone Chester’s involved. I’ll insist that no one work during the borough meeting.”

“Yes, they should watch. Your borough will need a civil government soon, too. I’ve got to go, Emily. Everyone’s heading to the patio for breakfast and I need to be there to answer questions. Bye.”

“Bye.” Emily closed the circuit and rose to go to lunch. Muhammad was standing in the doorway. “You saw the email?” he asked.

“Yes, I was just talking to Will. “It’s pretty upsetting.”

“I think the violence is a product of the greed here,” said Muhammad, with a sigh. “As the Holy Qurán says, ‘But to those who treasure up gold and silver and expend it not in the Way of God, announce tidings of a grievous torment.’ ”

“This is a grievous torment for all of us,” she replied. “The gold and silver are being treasured too much! Let’s get some lunch. Afterward I’m not coming back here to work. You once offered to help me study the Qur’án; let’s do that.”

He smiled. “I’d love that!”

No one in Aurorae could talk about anything else at brunch. The interfaith service at 10:30 quickly changed its theme to “the life of society” and Father Greg was engaged to deliver a sermon on the subject. Over half the adults attended and others watched parts of it on the web. It helped shape the tone of lunchtime discussion.

By 1:30, the food had been cleared from the tables and everyone was seated and ready for the town meeting. Alexandra called the meeting to order. Before she could say anything more, a sea of hands shot up.

“My goodness, people have something to say! Okay, we can entertain a few questions. Roger, you’re waving your hand too forcefully.”

He took that as recognition and stood. “Shouldn’t we know who is accused of raping whom?”

Alexandra selected her words carefully. “The purpose of this meeting is to discuss the legal proceedings that should be followed when a crime such as rape is reported. This is not the place to discuss guilt or innocence, nor should the question of who is accused of what influence our planning.”

“But I’ve already heard who the accused is!” exclaimed Zach.

Silvio rose and looked at Alexandra, who nodded. “Look, we know there’s gossiping and rumors, and I won’t deny the accuracy of some of them. But the town meeting should not be a forum for them. There has to be a trial and the question of guilt or innocence will be decided then. Our purpose here is to decide on the procedure. The procedure is unaffected by the details of who is accused of what.”

“A trial,” said Irina, shaking her head.

“Yes, a trial,” replied Alexandra. “Look, friends, most of us are still a bit in shock this would happen here. Mars has less than 100 adults and they are all highly trained professionals who have been screened for the ability to work in a team. But we aren’t perfect. All of us make mistakes, and occasionally the behavior of professionals will cross the line. When that happens, there have to be consequences. We have a chair because we have to deliberate on matters and that requires a facilitator of discussion. We have a secretary to record and implement our decisions. We have a treasurer because

some our decisions must be paid for. And we have elected a judge because we need someone to apply the law sometimes."

"Is this being handled by the borough government or by the Commander?"

"Raise your hand please, Lal. The answer to your question is 'yes.' It is being handled by one or the other. We're still not completely sure which."

"No, no," replied Will, raising his hand. Alexandra nodded, so he stood. "Mars no longer consists just of employees of the Mars Commission. It has employees of two companies. The Borough employs an elementary school teacher. Plans are underway to incorporate Aurorae Hospital and MarTech. The store and the bank have part time employees and many of us have small weekend businesses. I am not Commander of all these enterprises. The Borough has to set and enforce the law. I am the servant of the Borough in this case and I have participated in the planning heretofore at the pleasure of our elected officers."

Alexandra raised an eyebrow at that comment; Will had called them together rather than the Borough officers inviting him. "Our understanding of this crisis has developed lot in the last twelve hours," she added. "One lesson is that until we decide which tasks here are done by the Commission and which by the Borough—because a transition has started—the town meeting probably should appoint Dr. Will Elliott as the Borough Manager. Other questions?" She looked around. "Thierry."

Thierry Colmar rose. "I want to know what the Commission's position about this town meeting is. Do we really have the freedom to make decisions?"

Alexandra looked at Will, who stood to reply. "Yes, we do. The Commission participated in the discussion to hold this town meeting, and we made it clear to Morgan

and the others present by videophone that we live a hundred million kilometers from them and have to decide our own fate in matters such as this. Otherwise, morale and our collective will would suffer. The Mars effort, after all, is not just our jobs; it is our lives."

Will sat and Alexandra pointed to Tina Hvitmer. Tina rose. "I'm concerned that discussion of legal procedures is premature because they hinge on the concept of the society we want to create. A trial assumes a certain adversarial relationship in determining guilt or innocence. Even the terms guilt and innocence imply concepts of right and wrong. I'm wondering whether we need to start at a more basic level."

Hands immediately shot up, including Silvio's. Alexandra nodded to him. He rose. "I'm afraid we do not have the luxury of starting from scratch, in terms of social organization. After thousand of years of living together, human beings have discovered that they have to have laws, government, and a legal system. No society has every abolished them. If we were to try, we could precipitate a breakdown of society that would endanger our lives. We can't scatter all over this world to get away from each other. The Outpost has a population density of 15,000 per square kilometer, higher than many cities on Earth. Finally, the treaties on which this settlement is based specify that the laws of the state of Texas apply here."

"But how can we possibly behave as if we were in *Teeeexaaaas*!" exclaimed Jacques Deschanel mockingly.

"That's what the treaties say," replied Silvio, ignoring Alexandra. "Some Texas laws would be silly here. Others would be absurd. But this town meeting has not yet passed an entire body of laws and it has yet to define a legal procedure. We have to make a start in order to replace the Texas laws with our own."

“That’s the purpose of this meeting,” added Alexandra. “I said we’d have a few questions. We have done that. I propose we turn to Judge Diponte’s report. I don’t see a point to debating utopian matters now.”

No one disagreed with that, much to her surprise. Only a few residents had utopian dreams; their political philosophies represented the full spectrum one found on Earth, but no position could dominate. Under those circumstances, a variant of the terrestrial status quo had to prevail and could be changed only slowly.

Silvio Diponte walked to the stage. He tapped some keys on his attaché and a slide—the first of seven—appeared on the screen behind him. “One: The town meeting can only determine the procedure in Aurorae Borough, so that’s all we are discussing this sol. We have a legal vacuum if someone commits a crime on an expedition, so we will have to develop a mechanism for handling Mars-wide crimes eventually, but not this sol.

“Two: We have an elected judge who can preside over a trial and render the verdict. But we have an educated population here and we already have the institution of the town meeting, so I’d favor trial by a randomly chosen jury of twelve persons, which will be randomly reduced to nine jurors after the defense and prosecution have rested.

“Three: Since we have no lawyers here besides myself, I recommend that the role of the presiding judge be to insure that the jury gets full and impartial information. The Borough can appoint someone to prosecute the case and the defendant can appoint someone to defend him or her, lawyer or not, subject to the approval of the presiding judge. Whether the system is adversarial or not, it will have to be used if the crime cannot be resolved in any other way.

"Four: For felonies—which are crimes such as theft, rape, and murder that potentially carry prison terms—the punishment should assume transfer of the individual to Earth for imprisonment; however, the length of the sentence there will be dependent on the individual's cooperation with us up here, and the possibility of a substantial reduction in the sentence should be an available option to the presiding judge in order to give the individual an incentive to be cooperative until he or she can be returned to Earth. Such individuals will live under house arrest or equivalent until they return to Earth; they will be expected to perform as model employees, then return straight home to eat their meals until the next sol. Their freedom of movement will be sharply restricted inside the Outpost and they would not be allowed to leave it at all.

"Five: If the individual is judged unable or unwilling to function as a cooperative member of society, we have two alternatives. One would be to set up a pair of connected shelters a short distance from here and place the individual there without a pressure suit or vehicle so they could not escape. We could provide the individual with consumables and periodically order him or her to move from one shelter to the other, so that either could be entered for repairs. The individual would be expected to perform useful work in his or her prison shelter, and thus would be contributing to society.

"Six: The other alternative is much more gruesome, but could be necessary under some circumstances: execution. I am not suggesting we discuss and debate this matter this sol because I am sure it will take a lot of thought and debate. But I mention it because we have unusual circumstances up here: we must protect ourselves from an individual who could seek to endanger all of us. As a society we must make every effort to prevent felonies in the first place; even more than societies on Earth, because our population

density is so high and our life support systems so fragile. But we also must be prepared to protect ourselves as a society.

"Seven: This entire matter will no doubt provoke a discussion of the rights of the individual versus the rights of society. Perhaps I should say up front that my position about this eternal debate is a bit different than many, and it has influenced my proposal. I think our small population and the vastness of the world demands that individual initiative be tapped to the fullest. On the other hand, our high population density and fragile life support systems demand that social cohesion be maintained under all circumstances. We cannot afford a breakdown of law and order. Furthermore—and here is where my view is different from many on Earth, at least—I feel that maximal individual initiative and maximal social cohesion somehow have to be held together in a creative tension. They are not mutually contradictory; just mutually difficult to balance. Government *has to be* an instrument to maximize both, and if it fails in either case it will fail all of us and the society we are building. My hunch is that our technological and environmental circumstances can allow us to build a society that will hold both together, even though no one has done this on Earth before."

"Here, here," exclaimed Will, nodding.

Alexandra glared at him for speaking without permission. Hands shot into the air; nearly everyone wanted to speak. "I can see this is going to be a long afternoon, and I suspect Silvio's last remarks are going to cost us an extra hour. Okay, folks, we're going to start with questions about the proposal, to clarify its contents, then we'll debate aspects of it. Philosophy comes last! So who has questions? Érico, I need you up here to keep track of who gets the floor."

The town meeting ended only when supper came out and children—who had run underfoot during much of the meeting—had to be fed. Will invited Érico, Silvio, and Alexandra to sit with him to discuss while they ate. “I think this sol went very well,” Will said. “It was long and exhausting, and not everyone is satisfied, but the vote in favor of Silvio’s procedure was solid.”

Silvio nodded. “It means we can proceed to the trial next week.”

“What about the matter of the admissibility of the emergency audio and video?” asked Érico. “That’s a huge privacy issue.”

“Waiting for those arguments are the biggest delay we could face because we’ll have to engage legal minds on Earth. We could proceed to trial without the tapes. The evidence appears to be strong enough without them. There’s clear medical evidence of sexual relations and of their degree of inebriation, there’s videotape from the public areas, and both parties will have a chance to say what happened. Kent can testify as to Sheila’s mental state as well.”

“We’ll have to resolve the issue of the tapes sooner or later,” said Érico. “We all know there are audio and video transmitters in our private quarters, but they are there to determine whether someone is trapped in an emergency. If they are used to provide evidence of a crime, people will have an incentive to deactivate them and that will thwart their purpose.”

“Then we may be waiting a few months, which raises the issue of what to do with Chester and how to keep him away from Sheila. Besides, this is a small community and it needs closure,” said Will.

“Someone will have to decide whether to push the prosecution now or later,” said Alexandra. “The role of Borough Chair is to facilitate meetings, not manage. The Aurorae Declaration does not envisage what to do in this situation.”

“We need more law,” agreed Will.

“For Mars, not just for Aurorae,” replied Silvio. “The creation of Cassini forces us to separate the two. We need to plan a constitutional convention to draw up bylaws for Martian government, including a legal framework. Relying on Texas law here is problematic.”

“But we still have less than a hundred adults,” said Alexandra.

“So?” replied Will. “This isn’t a remote Australian village; we’re a hundred million kilometers from Earth. We’re not talking about independence, just civil authority. The Commission is essential to us as a conduit for development, but it doesn’t have to provide us with government.”

“Then we need another town meeting to appoint a Borough Manager,” replied Alexandra.

“How’s all this going to play out with the public?” asked Silvio.

“We’ll see,” replied Will. “The crime has already gotten us a lot of bad press. There are a million attorneys second guessing whether our system is fully legal. But Louisa says our reaction will be determinitive. The wiser we are, the better we will look.”

By skipping the issue of whether the audio and video taping of Chester’s room would be used, the trial was able to proceed a week later in the new MarTech classroom, which was set up as a courtroom for the occasion. Twelve jurors were chosen randomly from

the eligible population and sworn in; Silvio drafted the oath. Then with Greg Harris serving as defense counsel and Daniel Shapiro serving as prosecutor, they proceeded through the evidence. Eve and Arieh, the physicians who had examined the two parties, testified that sexual intercourse had occurred; Kent testified about Sheila's tearful arrival and played the audio and videotape of the two of them on the patio and in the hall outside Chester's room, as well as the tape of Sheila leaving, clearly upset. Both were given the chance to testify; Sheila did; Chester declined. The jury needed just three hours to find him guilty. He was sentenced to house arrest until he could return to earth, when he faced two to twenty years in prison, depending on his behavior.

"I was hoping this verdict would resolve the matter, but now I'm not so sure," Will said to Silvio and Alexandra after the trial ended. They had retreated to Silvio's office behind the store after everyone had left the courtroom.

"I wasn't expecting that," replied Silvio. "The Chinese, the Arabs, and some of the Latins are baffled by the idea that Chester could be thrown in prison for what he did, while the Americans and Europeans largely are outraged by his behavior."

"And the prospect that he might spend only two years in prison outrages some women," added Alexandra.

"The cultural divisions are a bit more complicated than that," said Will. "Some of the Chinese say he got what he deserved, and I've heard one American man say Sheila should have known better."

Alexandra was startled. "I hope you straightened him out."

"I tried. Attitudes are hard to change. We have racism up here, too. Ask Friday Nguru."

"And all sorts of tensions," agreed Silvio. "Arieh complained to me that the Arabs won't associate with him because he's Israeli."

Will sighed. "We shouldn't dwell on the negative side of life here. We need to plan some dialogues on these issues and give everyone time off to attend. The Commission needs to schedule more cultural sensitivity into its terrestrial training program for Columbus 7."

"Including how to treat women," said Alexandra.

"How's all this playing in the media?" asked Silvio.

"We'll see. Louise is calling me with a report about midnight. But she told me yestersol that in several countries there has been extensive media coverage of the issue of rape as a result, and national discourse has begun. So that's good."

"*Very* good," agreed Alexandra.

"Tomorrow's Christmas," reflected Silvio. "We have a good healing period coming up. Many people are taking vacation between now and New Year's, and there's Cornelius and Tatiana's wedding on Satursol. There will be a lot of time to relax together, talk together, and think about what happened."

"We should plan another town meeting for later in the week," added Alexandra. "We need to appoint the Commander as the official Borough manager, so that there is no question that he has authority to initiate law enforcement efforts in a situation like this."

"That's fine with me," said Will.

"I wish this meant I didn't have to go to Cassini."

Will chuckled. "Sounds like you're looking for any excuse to avoid the trip! I doubt the Borough Chair will have to handle a crisis like this any time soon. No, I need

you in Cassini. I have a videoconference with Bach, Curry, and Scoville tomorrow to lay down the law. No more eighty-hour work weeks. Low morale was a contributing factor to this incident. You and your engineers have to look over their mining equipment with an eye to improving it. Chester told me, before all this trouble started, that the cold was causing a lot of extra maintenance. Either the companies have to heat the rock before processing it or the equipment has to be redesigned. Take along your best engineers. They'll have to spend some time doing construction, but they'll have a new and interesting challenge to tackle."

"Will, that could take a lot of time. We don't have experience fabricating mining equipment to work well at forty below."

"Alexandra, your people love engineering challenges."

"We already have a few challenges scheduled, you know!"

"Yes, but this one is higher priority than you anticipated. We've got to recover the gold more efficiently."

"Or maybe we should spend less money and enjoy more time with our families."

"Maybe," replied Will. "We're still only four months into Columbus 6; this is the time to work. The relaxation comes later. Tell you what, Alexandra. Get all these tasks done and you and your team will be able to fly back to Aurorae."

Alexandra smiled at the thought, then frowned. "Wait a minute. If the dust storms aren't over, we won't be able to fly; and if they are over, you'll be flying the shuttles back here anyway."

Will smiled and shrugged. "Then pray the storms will be over!"

7.

Proposals

March, 2046

Will's stomach growled again. It was late morning on March second, the first sol of the Bahá'í fast. He had eaten a big breakfast before sunrise with Ethel, Enrique, and Ananda, but it was beginning to wear off. When a videomail from the United States Secretary of the Interior, Barbara Lindsley, arrived, he welcomed the distraction. He hit play.

"Good day, Commander Elliott. Or perhaps I should say 'Good sol'; I gather that's the Martian equivalent. I apologize if I am ignorant of your customs up there. Perhaps you've already heard rumors about the *Bioarchive* project. This is a proposal to ship ten biomes to Mars over the next ten years—two every other year, for some reason, though we could send one per year if that were better—each containing at least five hundred different species of macroscopic organisms adapted to a particular climate. The ten biomes would represent the full range of ecologies found in the United States, from Alaska's North Slope to the rainforests of Kauai. Each would be accompanied by two trained ecologists. The cost is estimated to be $10 billion over the entire decade and a steady $100 million in annual maintenance after that.

"The proposal was made originally by Senator Forest, one of your biggest supporters in Congress, and he thinks we can raise some of the money from agricultural research companies. The concept is controversial; a few critics have suggested it would be cheaper to set up a Kauai rainforest inside a bubble in Antarctica. I'm told it really wouldn't be cheaper there, though. We forwarded the proposal to Commissioner Morgan this sol and he requested that I copy you directly, and that you would forward it to your

Ecology Department. We in the Department of the Interior are excited by the prospect of archiving ten American ecologies on Mars, not only for your benefit, but to ensure their survival and to promote research on them. We hope this project proves to be possible at your end. Please let me know you've received this message—preferably by noon—since I am really not sure how to send a videomail to Mars. Bye."

Will smiled as he watched Barbara Lindsley's face fade. She was the wife of the Vice President and had a Ph.D. in the chemistry of water pollution. She was known to be daffy, eccentric at times, brilliant in some areas and utterly ignorant in others. Her reputation matched the message she had sent. He glanced at the message's time stamp: it was sent at 11:50 a.m. Washington time. She had expected an acknowledgement in ten minutes, which would have required communication at four times the speed of light. It was already mid afternoon in Washington. He hit reply.

"Dr. Lindsley, I've just arrived in my office here in Aurorae Vallis—it's almost 9 in the morning here—and immediately listened to your message. We'll review the proposal right away. We are delighted that so much interest is being shown in our facilities and their expansion. We welcome ideas such as this one. I look forward to further communications with you. For your information, currently Aurorae's clocks are 5 hours and 45 minutes behind yours; in other words, our clocks roughly agree with Hawaii's. Tomorrow, our clocks will be about 6 hours and 25 minutes behind yours. Because of the slowness of the speed of light, communications take about twenty minutes to reach Mars from Earth right now, and a reply takes twenty minutes to return to Earth. I'm afraid those are limitations we cannot overcome. Bye."

He sent the message, then forwarded it to Lisa Kok for her comments. He read the attachment. The proposal wasn't as weird as he thought. Some foot traffic would be allowed in parts of each biome. Buildings could be built inside them as long as animals could climb to the tops of what, to them, would be hills. Up to twenty percent of the interior could be devoted to human uses appropriate to the biome, such as raising nuts and fruits. The proposed ecology was not all "mosses and bugs," as someone had quipped; caribou, elk, fox, antelope, key deer, wild turkeys, quail, prairie chickens, mallard ducks, Canadian geese, humming birds, and various other larger species were proposed, even though it was hard to imagine how the larger species would be transported to Mars or would thrive in the small spaces. Even burrowers like prairie dogs and mice were under consideration, in spite of the possibility that their sharp teeth could cut a hole in the biome's airtight enclosure. Sensors and cameras would allow terrestrial researchers to supplement the two personnel assigned to each biome. A permanent increase in the construction crew by three would allow the biomes to be set up and maintained, though it was not enough to allow any interior construction.

The videophone beeped. "Will, this is better than I thought," Lisa Kok said. "Obviously, we want to support this. They're proposing biomes even bigger than the Bio-50 slated for Columbus 7; at least 75 meters across, which would enclose almost half a hectare. The ten would give us lots of interior space and a wide variety of climates and ecologies to experience. It would bring us considerable ecological expertise. Mass produced biomes would reduce our costs."

Will frowned. "We don't have the capacity to haul domes of that size and mass here yet. And do you really think the science in this plan is rigorous and useful enough?"

“We do a lot of highly respected, peer-reviewed ecological research, both detailed studies of microorganism populations and practical studies figuring out how to raise more watermelons on less space without decreasing the quality of the fruit. Our reputation is one reason the Bioarchive project has a chance. You could set up enclosures on Earth more cheaply, but maintaining the long-term financial commitment to them would be problematic; consider the difficulties faced by Biosphere 2 in Arizona. Everyone knows we’ll maintain them; they’ll enhance our quality of life and improve our chance of survival. You could say the same about the moon, except our atmosphere shields us from micrometeoroids and the month-long lunar rotation requires artificial lighting. And, everyone is wondering how to provision human settlements in the Jupiter and Saturn systems. Our biomes are the obvious precursor.”

“I still think it’ll be hard to justify this kind of expense in the next decade.”

“Well, let’s support the idea and see,” she replied. “With transportation costs coming down and the basic technological infrastructure developed, this is a perfect project for us.”

“That’s true. I’ll see what I can do. Thanks, Lisa. Bye.”

“Bye.” Will closed the circuit. Over forty minutes had passed and Lindsley had replied during his conversation with Lisa. He hit the play icon.

“Thank you for your acknowledgement, Commander. I had no idea Mars was so far away. I’d very much appreciate the advice of your ecologists, especially on matters like ground water remediation inside the biome; the high animal densities will generate a lot of fecal material. These will be very complex, sophisticated ecologies. They will give us insights how to support the mammalian diversity of the early nineteenth-century Great

Plains on the five percent of the land still available as national parks and grasslands. If we can convince the environmental lobby to allow an experiment in a few parks, intense ecological management could become an important alternative philosophy. The research has profound implications, especially as genetic engineering is expanded in more and more species. I just bought a GEN-401 Cornucopia tree the other day for my back yard; have you seen them? One branch yields peaches *and* pecans, while another has apples, the third gives pears and the fourth nectarines. The four major branches grafted onto the trunk all have slightly different leaf colors and the flowers are all different, so the tree is extraordinary to look at! Genetically, the tree basically is an apple, but it grows three times as fast. I'd like to see a cornucopia biome on Mars eventually, with species using photosynthesis five times more efficiently than unimproved plants and producing ten or twenty times as much usable biomass. An extraordinary possibility. Bye."

Will stared at the screen, then chuckled. He hit forward to send the message to Kok. "Lisa, this is F.Y.I. in case you want to know where the opposition to the Bioarchive will come from. Lindsley is not as green as she sounds, at least not to ecological purists, especially if they find out what's growing in her back yard. Bye."

Emily rearranged the pictures on her desk one more time. She was still getting her new office set up *just so*. She had moved in just yestersol.

Pleased with the arrangement, she looked out the windows—she was in the building's southeast corner and thus had views east to the gold fields and south to the spaceport—to survey her domain for the hundredth time. She could see a cloud of dust rising from the placer deposit and blowing northwestward; it bore silent witness to the

constant increase in Mars's prosperity. She was close enough to the window to look down at the floor of Transvaal Biome, green with vegetables, corn, wheat, and rice. A corner of Building Bubble 2, still set up outside the biome, was just visible to the west; it was verdant with agriculture as well.

She turned when someone knocked on the door. It was Zekeria Husayni, a Malaysian heavy equipment operator. "Come in," she said. "You're right on time."

"Thank you. Salam Aleykum, Commander."

"Aleykum asalam. I trust you are well?"

"I am, though I am very puzzled and hope you can provide me some suggestions and assistance."

"I'll try." She pointed to a nice chair in front of the desk. She decided to remain behind it; with a Muslim brother the desk provided useful separation, rather like the long sleeves and slacks she had taken to wearing lately.

Zekeria nodded gratefully. "Our work is so constant and difficult. Yestersol I worked thirteen hours. I suppose I could have stopped after twelve, but everyone else wanted to continue and Consolidated's crew was trying to break their one-sol gold recovery record of 300 kilos."

"You came close, too."

"We did, but even though the equipment didn't break, the ore concentration wasn't quite high enough. The 300 kilos was worth 18 million U.S. dollars. Consolidated's crew earned 12,000 dollars each that day. I earned 3,000. It just isn't fair, Commander."

“Remember that we’re here to build Mars and they aren’t. It cost billions to design the mining equipment and fly it here from Earth, billions to set up the outpost, and billions to build the transportation system to get the gold to market. The rest isn’t profit.”

“I know that, but the salary disparity isn’t just. I have a family on Earth to take care of.”

“And you can’t with a million a year?”

“Commander, it still isn’t fair. Curry wants to hire more personnel. I’d really like to be released from my contract with the Commission and switch to Consolidated.”

“Well, don’t talk to me, talk to the Commission.” Zekeria looked down, so she added, “You already spoke to Elliott, didn’t you?”

“Two sols ago.”

“I can guess what he said: that we aren’t here to make a personal fortune, we’re here to settle Mars, if we allow personnel to switch the companies will make even more profit and Mars will get even less of it, it will create salary inflation and everyone will want a raise, the Commission isn’t an employment agency. . .”

Zekeria nodded. “Basically. I was hoping you could say *something.* Could personnel here get some kind of bonus? For example, rather than a straight salary, couldn’t we get time and half over 55 hours per week?”

“We could arrange that, but that doesn’t add much!”

“We really should be paid a hardship wage as well.”

“The Commission discussed that. We’re all getting flight pay already, and it is assumed to be dangerous, here and at Aurorae.”

“But this place is definitely harder than Aurorae.”

She didn't reply to that because she knew he was right. "Look, Zekeria, I know the policy and you already talked to Elliott. Your case isn't any different from anyone else's. We all have signed contracts."

"And I'm scheduled to leave next year, but if the Commission is willing to give me more money, I'm willing to stay."

"In spite of your family on Earth?"

"Yes."

She pondered that, and Zekeria's flirting with various women at Cassini and Aurorae. Convenient, to have a distant wife raising one's children while one played the field. "Zekeria, I'm sorry. If you aren't pleased with your conversation with Will Elliott, appeal it to Douglas Morgan."

Zekeria scowled. "Very well, Commander, I guess I will. But thank you for giving me a hearing."

"Sure. Have a good sol."

Thank you, you too." He rose, nodded a goodbye, and stepped out of the office.

Emily sighed; his was the third request since they reached Cassini. She went back to work. When the sun began to pour into her office she closed the shades. Shortly thereafter the sun set and she went to dinner, where everyone gathered to eat and talk noisily, then gulp down big cups of coffee so they could enjoy a few hours of fun before going to bed. She headed to her room with Muhammad Rahmani and they opened their Qur'áns to study.

"*God is the light of the Heavens and of the Earth. His Light is like a niche in which is a lamp - the lamp encased in glass - the glass, as it were, a glistening star. From*

a blessed tree it is lighted, the olive neither of the East nor of the West, whose oil would well nigh shine out, even though fire touched it not! It is light upon light. God guideth whom He will to His light, and God setteth forth parables to men, for God knoweth all things." She read Surah 24 aloud, then repeated it. "It's so beautiful, but what does it mean?"

Muhammad smiled. "There are hundreds, thousands of interpretations offered by theologians and Sufis down through the ages. Is the niche the human body and the lamp the soul, with God's light shining out from them? The lamp is burning olive oil; does it represent faith? The oil comes from an olive which comes from a blessed tree; is the tree Muhammad and the olive His revelation, which gives birth to faith, which in turn gives forth the light of the divine? And it is light upon light! The light of faith comes to those whom God wills, and to those who can find faith through parables such as this." And he laughed.

She laughed as well. "So, am I niche illumined by the light of faith in His revelation?"

He looked at her. "That's my question to you, not your question to me!"

She smiled, but it was a very serious smile. "That's a good question. I . . . need this, Muhammad. Badly. My life is so sterile right now, arguing with people and manipulating machines all sol, every sol, except Sunsols when I sleep late and wash my laundry. . . these evenings reading scripture and contemplating infinity, a *spiritual* infinity, the unfathomable depths of Allah and His infinite mercy to us, are precious."

"Qur'án and Sufi poetry; they keep me going."

"But you don't say your prayers, you don't fast."

He shrugged. “I’m a lover of Muhammad, but I’m not always a good Muslim. Our nights together aren’t in conformity with the Prophet’s laws, either.”

“No, they aren’t.” And she looked at the long-sleeve shirt covering her arms modestly. “Perhaps if they are continue, we need to consider our relationship more deeply, then. Because I don’t just love you; I am falling in love with this.” She pointed to the Qur’án. “And there’s some tension between the two.”

“Then let’s get married.” He said it quietly, with his sweet smile, a smile she loved to see.

“Yes, let’s marry. But I think I need some time to explain things.”

“Whose reaction will be worse, your mother’s or your daughters’?”

“Oh, mother may have a heart attack! Mary and Kim will adjust, and they have their own lives now. I think I’d tell them of the marriage plans first, and Islam second.”

“That may be easier for them! My parents will be shocked as well, but they will be pleased.”

“I hope so!” He looked at her closely. “Are you sure you believe?”

She thought a moment, then nodded. “I’m sure. ‘There is no god but Allah, and Muhammad is the prophet of Allah.’ That’s what I’m sure about.”

He smiled again, and this time his face was covered with joy. “This is one of the greatest moments in my life, for not only have I found the love of my life, but she has found my other love as well.”

“I love you, Muhammad, my dear.”

“I love you with all my heart, Emily.” He leaned over to her and kissed her. She kissed him in return.

Two weeks later the *Pavonis* blasted off from Cassini and flew to Aurorae, landing on a tail of flame a half hour later. It brought Alexandra Lescov and part of her construction and engineering team home, as well as some geologists exploring the northern hemisphere and a few company people taking some vacation. The dinner on the patio that night was big, as was usually the case when a shuttle or an exploration team returned. As the meal was winding down, Alexandra stopped by Will's table and offered her hand. "So, did I do good, or what?"

"You did great, Alexandra; it deserves more than a handshake." Will rose from his chair and gave her a hug. "Cassini building one is completed, Cassini Biome has a thriving ecology, the microwave power link is working, and some of the worst design flaws in the mining machinery are patched."

"Of course, it took eleven weeks, and I had hoped to be back in eight. But we had a pretty interesting time."

"You seemed to enjoy the challenges."

"We did. The construction was routine. The mining equipment was the hardest, but we had repaired a lot of excavation equipment. The new, heavier parts should reduce maintenance, but an entirely new design has to be implemented." She looked around and lowered her voice. "There's one bit of scuttlebutt. Emily started wearing a headscarf about ten sols ago."

"Really?"

Alexandra nodded. "She appears to have become a Muslim. And she and Muhammad announced they plan to get married in the fall."

“I’ll be sure to congratulate her about that. Muslim, huh? That must be quite a journey.”

“Or something,” said Alexandra, with a growl in her voice.

“Congratulations on getting the power transmission system going from the crater rim to the outpost,” said Will, changing subjects.

“Thanks.” Alexandra raised her voice again. “It was fun!”

“Now we have to set up a relay on Phobos for sending power from one spot on Mars to another,” exclaimed Rosa Stroger, who was sitting nearby breast feeding her two-month old daughter. “The pointing technology has to be a lot more precise, but it’s cheaper than a power line to Cassini.”

“Right on,” agreed Alexandra. “How did the repair to the reactor go?”

Rosa nodded. “Pretty well.” Two sols earlier she had taken one of their six reactors apart using remote controlled arms and welded a patch over a crack in the vessel.

“Do you think we can build our own natural uranium reactor, Rosa?” asked Alexandra. “Because we are entering an era of potential energy shortages. Six reactors were enough to power everything during Columbus 5’s dust storm, but they weren’t enough this time and will be even less adequate when Columbus 7 arrives with 40 more people. We were lucky Cassini was spared by the storms; if it had been clouded over, the folks there would have been huddling in their Mobilhabs with the lights turned down low, conserving power and doing little gold recovery.”

“We need to build a lot more methane and oxygen storage tanks, so we can ride out a major storm,” replied Will.

“Will, nukes have a big future here,” replied Alexandra. “We should use those big uranium deposits north of Cassini.”

“How could we possibly build a reactor?” asked Will, skeptically.

Alexandra looked at Rosa, who was in charge of their reactors. “I’d go with a simple, reliable heavy water design, like CANDU,” said Rosa. “We’ve already accumulated a tonne of heavy water. If we imported the vessel, steam generator, and turbine from Earth, the efficiency and safety would be better.”

“Flying them here would be controversial,” noted Ethel.

“Much less so than flying a fully fueled nuke,” replied Rosa. “The equipment would pose no danger to Earth.”

“This would have been a crazy idea two years ago,” said Will. “First, we wouldn’t have needed such a reactor; second, there was no money to build it; third, there were no personnel to put it together. But now we’re bigger and the gold changes everything. We might be able to persuade the Mars Commission to support it. How big would it be?”

“Ten to fifty megawatts,” replied Rosa.

“What if we can import a solar cell manufacturing facility for a similar mass and less cost?” asked Will.

“They don’t work in dust storms, and I don’t know whether a plant of that mass could make enough solar panels.”

“And we’d have to devote personnel to the manufacturing process,” added Rosa.

Will considered a moment. “Okay, put together a proposal I can take to the Commission.”

“I’ll work with Rosa,” said Alexandra. “Heavy water reactors can also convert uranium 238 into plutonium 239. We could export fuel rods of plutonium-uranium mix for reactors on the moon, nuclear engines, etc. The current American administration opposes lifting radioactives to Earth orbit. Maybe we could supply them instead.”

Yevgeny smiled. “That’s potentially big income.”

“But controversial,” replied Will. “Plutonium production would give us the capacity to make nuclear weapons. The international community isn’t ready for that.”

“You’re probably right,” said Alexandra. “But it’d be easy to monitor us; the fuel reprocessing facility could be filled with cameras.”

“Yes, but the fear would be that if we turned off the cameras, we could build a bomb before anyone could stop us,” replied Will. “It would be a big act of trust to permit fuel reprocessing here. I can’t see it happening any time soon.”

Alexandra nodded. “We’ll make a proposal and see what they say.” She looked at the rays of the setting sun streaming across the entire length of the yard. “It’s nice to see the sun here again. I assume, after a short vacation, my people can resume work on Riviera?”

Will nodded. “The materials are ready.”

“Good. How’s the prisoner holding up?”

“Ask Greg; he talks to Chester every morning. Or ask Chester yourself. He’s permitted to come to the patio every morning between 9:30 and 10 a.m. and can visit the store at the time. It’s the only trip he’s allowed except to Martha’s office if she can’t go to him. His morale is improving and Greg says he’s beginning to accept why he’s being

punished. Silvio is beginning to ask whether ten years of this sort of arrangement isn't sufficient punishment, if his behavior improves as a result of counseling."

"Mars might not need prisons," noted Alexandra.

The next afternoon Will tried on the first pair of pants manufactured on Mars. He walked across the textile manufacturing area in them, then stopped to admire the pants in the mirror. "They feel a little stiff," he commented. "Or even thick, like wearing cardboard."

"Oh, don't say that!" exclaimed Susan Jung, their fabrics specialist. "I think the thread is a bit too thick. Next time we'll try a thinner thread. The cloth does have a bulky feel to it."

"Yes; maybe that's better phrased. How much cotton's in it?"

"Forty percent. It's sixty percent polyester. We'll use more cotton if we have it."

"Wash and wear?"

"If I did the process correctly."

"They do seem a little wrinkled." Will looked again. "It's exciting to wear clothes made here."

"We'll save a lot of imports," added Susan. "We'll have about 150 people here by the end of Columbus 7; more if we have more children. If each one imports 10 kilograms of clothes per columbiad, that's a tonne and a half."

"And how many did you make?"

"Just this one! We cut it to your specifications. You should see the automated, computer-controlled equipment at work." She pointed to a unit the size of two refrigerators side by side. "That thing can take loose cotton and/or raw polyester fiber,

spin them together, spool the thread, and feed it into a power loom. It can make everything from sheets and handkerchiefs to rugs and canvas." She pointed to a device about the size of a grand piano. "And the tailoring flatbed can take a length of cloth, spread it out, fold it and pin the fold, cut either the top or bottom piece or both, remove the scraps, sew seams automatically, and a lot more! It can embroider fancy patterns in a matter of hours. It's programmed with several thousand designs."

"So we can make everything from blue jeans to wedding gowns?"

"Yes, it's quite versatile. Of course, we don't have the fabric for wedding gowns!"

"Not yet." He looked at his pants again. "They feel a bit tight."

"Commander, the computer doesn't lie! You must have put on some weight since the measurements were taken."

"Come to think of it, I have. The increased availability of sugar lately has caused all of us to eat more sweets, and I've gained a kilo or two."

"There, you see! Why don't you wear them to dinner and show them off."

He smiled. "You're trying to drum up business with Diponte! Sure, I can do that. Why don't you make another pair with thinner thread. I'd make a dozen sets of pants for different people and give them a chance to try them on and test them for a while. We need to see how the seams hold up—"

"They're double sewn!"

"Good. But we need to test for shrinkage and other factors. Let's make sure the design is right before ordering new uniforms for everyone. Let's not take the chance that

it'll be wasted because of some error. Meanwhile, you can make towels, sheets, window curtains, etc. Do you plan to sell them through the store?"

"We may not. It makes more sense, with our small population, to let people special order what they want. We'll post a catalog to the web containing the designs we can make. They're standard ones from reputable clothiers, who will get a royalty and can advertise that their designs are used on Mars. People can select the color, weave, etc., and we'll make in a week or two, depending on demand."

"What will be the price?"

"About ten times the price on Earth, but that'd still be a third the import price. Silvio thinks we'll capture a major part of the gift market if family members on Earth can order clothes for their relatives here."

"He's right." Will glanced at his watch. "I have to pick up the kids, then walk to supper. Let me know when you have more to show me."

"Okay. Next time, let's show Ethel, too."

Will nodded. He grabbed the pair of pants he had been wearing and hurried down to the ground level, then through the tunnel to Yalta. He crossed the patio, already filling with people eating supper, looking for his kids. Marshall, now seven, was throwing a baseball to his friend Sam Anderson in the clover patch in the middle of the yard.

"Why are you carrying pants?' asked Marshall, when he saw his dad approaching. Then he made a face. "*What* are you *wearing*?"

"Pants! What's wrong with them?"

"They're ugly!"

"No they aren't! They're just a style you're not used to."

“You see them in the movies and on t.v.,” said Sammie.

“Correct,” said Will. “They’re called blue jeans.”

“But they aren’t blue!”

“They’re dark blue, but in this reddish light they look black. Never mind. How was school?”

“Ms. Hijazi took us on a field trip to Catalina Biome to catch butterflies!” exclaimed Marshall. “And we actually caught one! A swallowtail!”

“What kind of swallowtail?”

“I don’t remember. And she told us that pretty soon there would be ten biomes, each representing a different climate in the United States!”

“She’s right.”

“But then she laughed at you,” added Sammie.

Marshall looked hurt that his friend brought it up. “She explained to us that the purpose of the biomes was to bring all the plants and animals of a certain place here, so the entire group of living things could continue to live in harmony with each other. She explained that Mars would be kind of like Noah’s ark. But then I asked whether they were bringing elephants and giraffes and lions, and she laughed.”

Will laughed. “She laughed, Marshall, because you were smart! The plan is to send us a complete sample of all plants and animals. But no one is willing to haul the really big animals here yet.”

“Why not?”

“It would be very difficult. It would be hard to handle an elephant during a launch, in weightlessness, and in landing. How would you feed it for six months? What

happens when it poops in zero-g? And when it's here, pretty soon it would eat more food than the biome could make for it; what then?"

Marshall frowned. "But then, what sort of plan is this, to make a Noah's ark here?"

Will laughed. "A silly plan, that's what. Sometimes adults are silly. But it might happen anyway. Come on, let's get some supper."

Will led the boys over to Lizzie, who was so busy playing with Corazon she didn't want to eat supper, especially since she knew it meant she'd have to go to bed afterward. They went through the food line; Will focused on supervising the children because the sun wouldn't set for another two hours, and during the Bahá'í Fast he couldn't eat until the sun was gone. By the time they were finished Madhu and Érico had showed up, so Sammie and Corazon went to eat with their parents. As Will, Marshall, and Lizzie sat, Ethel arrived at the patio. She joined them at the table with a full plate; even though it was the Fast she was eating, thanks to the exemption for menstruation. The family always ate supper together at the same table; at lunch, however, the kids ate with their friends and teachers.

They talked about their adventures of the sol. Will's was his new pants, which Ethel liked. Marshall told everyone about the butterflies. Lizzie had had dancing lessons. Ethel had finished programming a lathe to cut a complex metal shape needed to strengthen one of the mining machines and she had tested it on a sheet of plastic. She looked forward to making the part the next sol.

As the kids were finishing, Ruhullah Islami walked over, a cup of coffee in his hand. "Good evening," he said to Will and Ethel nodding. "And happy Fast to you."

“Thank you, Ruhullah,” replied Will. He was pleased that the Muslim had acknowledged the Bahá'í Fast; Ruhullah had been extremely uncomfortable with Will and Ethel when he had arrived because of the long history of Islamic persecution of Bahá'ís in Iran. “It’s a beautiful evening, isn’t it?”

“Yes. Thank God the dust storms have cleared here.”

“Let’s hope it holds through the remaining six weeks of dust storm season. I hope we get more nukes; it would prevent the disruptions in our schedule.”

“We’ll see; we sent a preliminary proposal to Houston a few hours ago. There are other solutions to our energy crisis as well. We’re already building methane and oxygen storage tanks for the storm season. We can make wind turbines pretty easily, and they’re effective most of the time the solar power units aren’t; we got a lot of power from them during this storm season. And the Commission could manufacture and send to us a plant to make solar panels for less money than and the same mass as a nuclear reactor.”

“How many staff will it take, though?”

“Several, but it’s a safer renewable energy supply than a nuke.”

“But it’s less exciting.”

“And less controversial.”

“That’s true.” Ruhullah smiled. “As you know, we found big uranium deposits in Deuteronilus. In a few decades we could supply a major portion of Earth’s uranium. I’d love to lead an expedition down to excavate yellow cake and truck it back here. Keep that in mind.”

“I will. I think we will send an expedition after Columbus 6 leaves.”

“That’s alright, Commander, because I’ve been thinking about my commitment to stay two columbiads. I’m doing very rewarding work and having a good time doing it, and I’m helping build a new kind of community. So, perhaps, I’ll settle here.”

Will smiled a very big grim. “Excellent! You’ve made my sol!”

“Thank you. I hope I can do more here. Maybe we could talk some time about other tasks I could try. I’d like to develop some new talents.”

“I’m glad to hear it; we need everyone to be able to do at least two jobs well, preferably three or four! What would you like to try?”

“If you had any need for administrative help, I’d try my hand there.”

Will shook his head. “I wish administration didn’t take so much time already. It’s all my time, half of Daniel’s, and a quarter to a half of all the heads of staff. We’re hiring a few more high-powered administrative assistants on Earth to simplify our work.”

“With all the coordination problems that result.”

“Exactly; the time delay requires novel communications strategies. If there’s an opening, I’ll let you know.”

“Thank you, Commander.” Ruhullah smiled and walked away. Will thought about Ruhullah’s request for a while; it was intriguing.

Will and Ethel walked home and let Marshall and Lizzie stay in the yard to play. The parents had an hour of relative peace and quiet. After sunset the kids came in and the Will ate supper, then the kids went to bed. About 9 p.m. Will turned to his attaché to see what communications had arrived. His sister had videomailed from her new house in Santa Cruz, Bolivia, where her family had settled. He sent her a quick message in return and copied his mom; he tried to be in touch with them twice a week, which allowed some

level of family life to continue in spite of the distance. Then he spotted a message from Doug Morgan. He immediately played it.

"Will, thanks for the proposal for a reactor fueled with indigenous uranium. Your people did very thorough research in very little time; the capacities you are developing up there are impressive. The proposal will be controversial, not only because of the opposition to nuclear power down here, but because solar power will get much cheaper up there once you can make your own panels. I still think that's the better way to go, especially with a pilot plant operating on the moon that could be copied.

"Now, let me tell you about my conversation with Daffy Duck earlier this morning; er, I mean with the Secretary of the Interior, Dr. Barbara Lindsley. Sorry, I can't resist; it's not just that she's a Democrat, but that she's so goofy sounding. Please accept my apology for my partisanship. Here I go, sounding like her! Anyway, she and Senator Forest plan to push the legislation forward for the next fiscal year. I argued that Bioarchive is not only a useful biological backup for Earth, but biological self sufficiency for Mars, and should be coupled with an effort to develop Mars's self sufficiency in other areas, such as dome manufacture and power generation. Those two capacities would greatly reduce the cost of Bioarchive because the proposed domes are really massive—very expensive to transport—and they require power. She was interested in the idea that sixty tonnes of equipment to manufacture tefzel, teflon, PCTFE, and kevlar would be a better investment and the plastics manufacturing companies might want a contract to develop an automated manufacturing facility because they could use the technology to make their own plants more efficient. Finally, I argued that the only way to do a project like this was to put as much of the approved costs up front as possible, because there's no

guarantee Congress will be in as generous a mood ten years from now. Bioarchive could get funded for its first few years and then abolished otherwise. With the economy booming right now, this is the time to make a request for big bucks. She agreed, so I'm hiring a few consultants to develop the proposal. We'll pursue Bioarchive and related projects like plastics and solar cell manufacturing vigorously. There's still time to get something on Columbus 7; the cargo launch is scheduled for a bit more than a year from now. The reactor project has to wait for Columbus 8 or Columbus 9—until the Republicans get in power again, basically—so we still have some time to develop it. Bye."

8

Vacation

early June, 2047

"In short, Senator Stutz, this proposal is good for the United States in several significant ways, as well as protecting New Mexico's biodiversity and producing jobs in the Albuquerque," concluded Will. "By putting America's significant biodiversity on Mars, its species will play a bigger role in developing this world. Consolidated Mining, which has several significant operations in New Mexico, benefits because domes and power will be cheaper and more plentiful.

"Finally, Bioarchive is a new opportunity for collaboration. As you know, in some ways Mars has been out of favor in Washington for the last few years. This project represents an opportunity to set the relationship on a positive footing. The project's good for America and Mars; it's good for Martian exports and American mining interests; it's good for everyone's environment. I hope we can count on your support. Let me know if I can answer any questions. Bye."

Will stopped the recording and hit send. He had followed the script on his screen perfectly and had sounded natural; he was getting good at lobbying. Stutz was a prominent figure in Congress and had been mildly against the project, though Louisa Turner thought he could be brought around. Will was most of the way through the Senate membership; customized three-minute messages for all the senators were taking almost two full sols of his time, especially since some were asking additional questions and Louisa had to review the answers.

He turned to the message he was to send to Senator Talcott. He'd be a tough nut to crack; he had a record voting against Mars exploration. Will skimmed the message. Turner was a genius at crafting persuasive arguments. But the message would require a lot of care and earnestness and he was tired. To rejuvenate himself, he turned to a message from Sebastian Langlais. It would be a much more interesting to listen to him.

"Good sol, Will," Sebastian began. "Shackleton Station's director of ecology, Jaime Grondahl, wants to contact Lisa Kok about the larger biomes proposed for Bioarchive. I'm glad to see the bill is moving through Congress. I've even called some of our supporters and ask them to help. We can't host a project like this; don't worry, I'm not proposing that we steal a few of them! We don't have enough peaks that get near-perpetual sunlight, and we've already used the best ones for solar power. But we really could use one of the larger enclosures being built for Bioarchive. We have two peaks nearby that can accommodate enclosures up to one hundred meters across, so we want to coordinate with your plans. Are you planning to manufacture them there? Maybe we'll do the same or maybe we'll buy from you.

"We inflated Jacaranda Biome the other day and I just walked around inside. You'll love the new fifty-meter size; so spacious! You remember Palmer Pinnacle; you and David explored it thoroughly back in '31. We reversed the peak, digging out the middle and using the regolith and rock to built a circular wall as high as the dome crest. It gives good micrometeorite protection, but we have only a few small windows. The rotary track for the mirror and the micrometeorite shield above the dome was exhausting to build in spacesuits; the joke is that we now have the experience to build a lunar railroad.

Jacaranda has at least partial sunlight 75% of the time and needs artificial light only thirty hours a month.

"I hope you and your family are well. My son's application for Columbus 7 has been accepted, so you'll be shaking his hand in about 17 months. I just hope he comes back! Bye."

Will paused to think about a response, then hit reply. "Sebastian, tell Jaime to call Lisa any time. He's free to copy me as well. I think it's a shame we haven't worked together more, but there's a certain amount of rivalry in Houston between our headquarters. As a result, we developed biomes, and you adapted them to the moon; and you developed microwave power transmission, which we adapted it to Mars.

"We're arguing that Bioarchive is practical if we can make the enclosures here. The hundred-meter dome you're talking about would mass sixty-four tonnes, plus twelve tonnes of equipment. There are no rockets able to lift it from the Earth whole. But with fifty tonnes of imported equipment we should be able to manufacture one roughly every year. With proper equipment you could, too; if you need carbon dioxide and nitrogen, Phobos is your closest source, in terms of delta-v. So we'd be happy to work with you.

"There's another matter we'd like to collaborate on as well: power generation. We're probably getting a plant for manufacturing solar cells based on yours, but the new idea is building a reactor at Aurorae that uses natural Martian uranium. Right now we're being quiet about the idea because the Bioarchive project is supported by environmental groups who would oppose a reactor. But a reactor is inevitable now that we've found uranium. Mars could be a source for the moon or even the Earth in a few decades. So we

have a natural alliance where nukes are concerned. I'll suggest to Rosa Stroger and Alexandra Lescov that they talk to your power and construction directors.

"All is going fairly well. Cassini's set up and the mining equipment is finally working pretty well. Thanks to the muon scattering instrument, they can start with the very richest gold deposits. Riviera Biome will be pressurized next week and its agriculture will be set up by early September. Shikoku follows six months later. I'm glad to hear Helmut's coming to Mars; we'll make him welcome. Bye."

Will sent the message. He was about to turn back to his work videomailing Senators when a new message popped into his box from Doug Morgan. Will activated it.

"Good sol, Will. You're doing an excellent job contacting the Senators; we seem to have swayed two votes. But now a new complication has arisen. Tomorrow three Senators will introduce an amendment to the bill—on which their support will depend—stating that all American tax money for the construction of biomes must be spent on American firms. The biomes now come from Canada, though plastic manufacturing units exported to Mars would come from the U.S. The amendment also specifies that the equipment for implementing Bioarchive must have a use toward opening the gold fields at Dawes, such as manufacturing enclosures for that outpost. Bioarchive domes would not have to be built at Dawes. This is an underhanded way to get Dawes Outpost approved and to strengthen the hand of Consolidated or possibly of Stanwood Mining if they negotiate a lease of mineral rights. I know this will be difficult for you, but we may have to accept it. Bye."

Horrified, Will immediately hit reply. "Doug, good sol. *Please do anything you can to get this amendment killed!* The logistics of supporting two outposts is difficult

enough; three would be even harder, especially when you remember the gold fields there are so high that the sunwings won't be able to carry much cargo. We'd have to transport everything by shuttle or robotic truck. Mars will barely have 140 people during Columbus 7. Cassini's supposed to be occupying the time of eight of my people and it's occupying eleven instead. I'd rather not make resource allocation even more complicated. And don't forget a small outpost needs about twice as much mass of stuff as the bare minimum to guarantee life support redundancy, whereas a larger outpost needs only twenty or thirty percent marginal capacity. It's easier to double the size of Cassini than to build Dawes, and it'll get us just as much gold! Bye." He hit send and had to sigh. That was the danger of basing Mars exploration on politics rather than science and reason; the political process could cause as much havoc as benefit.

Will was too upset to videomail Senator Talbot, so turned to his other tasks. Lately there had been strange discrepancies between the daily gold production reported at Cassini—usually around 50 kilograms each for Consolidated and Muller—and the amount credited to the companies by the Commission. The discrepancy typically was less than ten grams and no one could account for it. Dan Shapiro emailed Will that the problem seemed to be caused by conflicting estimates of the gold production; the gold particles typically had a small quantity of silicate rock stuck to them, and when that was accounted for the gold production had to be adjusted downward slightly. That struck Will as a strange explanation because the gold dust was thoroughly cleaned before weighing and was not weighed again, so he forwarded Dan's email to Yevgeny, with a request that he look into the matter. There were also complaints that the value of the gold was less

than expected, but it turned out that the insurance on the shipment back to Earth was higher than anticipated. He had already forwarded that problem to Silvio.

When the sun began to shine across the floor of the bridge and into his office he knew it was time to go to supper. He headed to Yalta to play with the kids for half an hour, then eat supper with them. During supper, Alexandra stopped at their table.

"So, swimming and hiking, huh?" she said to Marshall.

He nodded. "We're going outside!"

"Well, you're a big boy now."

"I hope so," added Will, looking at his son worriedly.

"And Sammie's going along?" asked Alexandra.

Marshall nodded. "And Corazon, and their parents!"

"Oh?" She hadn't realized Érico and Carmen were going on the trip as well.

Ethel nodded. "It's more fun for the kids. The boys will share a bedroom, the girls will share a bedroom, and they'll have a grand time. We're also doing a virtual tour of a few cities and of Disneyland Paris. And Will has promised to do most of the cooking."

"Not most! I said 'suppers'!"

"Whatever," replied Ethel. "We need vacation space at Cassini; we'll get away from our responsibilities here and have a cafeteria where we can eat."

"Of course, if we go to Cassini I'll have meetings," replied Will. "Besides, I'm not sure I'd fly kids that far. Our transportation system isn't safe enough yet."

"That's a good point," agreed Ethel.

"Well, have fun," replied Alexandra. "Yevgeny and I went up to the dacha last month for a week. It was a marvelous change of pace. And everything here will be fine, Will; don't worry."

"I'm sure you can handle everything," he replied. He had appointed Alexandra the Interim Commander in his absence.

"Things should be quiet. The construction is all enclosed now, so it's safer. And tomorrow's conjunction, so communications with Earth are quieter."

"Not much," replied Will. "Magellan Station will relay half of our usual traffic for us."

"It's not a vacation period any more," added Ethel. "Communications don't drop noticeably. I think the better time for vacation is opposition, when one needs time to talk to family members!"

"Most people took some vacation then," agreed Will. "Just remember that my communications will work normally. You can always reach me."

"Better not send emails or videomails; I won't let him look at them," added Ethel.

"Thanks for the warning. I agree, you all need to relax. Have a good time."

Two sols later, the three families climbed into two rangers loaded with their food and clothing for four sols and drove up to the "dacha" on the top of escarpment. The thirty-three by eight meter bubble was bisected by a building in the middle with a great room, kitchen, and sauna on the first floor and four bedrooms each on the next two floors. A garage for three rangers had been built on the east side of the building; its roof, "the deck," serving as a dance floor or sports area; it had a basketball hoop. The open area to

the west of the building had a large swimming pool; for most of the first year every ranger going to the dacha had hauled up a tonne of ice, which was melted and added to the pool. Around the pool was a patio where people could sit in the sun to read; the bubble's protective films screened out the ultraviolet. The far western tip of the crescent-shaped bubble was a nature corner with potted trees and flowers. Part of the transparent floor extended beyond the cliff edge, so one could literally stand in the air to look down and outward at Aurorae. That corner rested on a small promontory that extended beyond the usual escarpment edge, giving one a view of the canyon system on three sides.

The children were thrilled to visit the dacha and immediately ran to the western edge to look at the canyon; the girls wouldn't stand on the transparent floor and were teased by the boys until Roger came along and stopped them. Everyone went to their rooms to unpack and settle in a bit.

"Let's go outside, I want to explore!" shouted Marshall, running through the second and then the third floor, once he was unpacked.

"Hey calm down!" exclaimed Will. "Don't worry, we're just about ready."

Ten minutes later, Roger, Madhu, Érico, and Will were donning their pressure suits and helping Marshall and Sam, seven and six years old respectively, to do the same. The boys had special suits that adults could control remotely; all the suits could be connected together with hoses for "buddy breathing" if necessary. They had a rule that there always had to be one more adult along than the total number of children.

It was a simple excursion, but thrilling for the boys. They walked about a half kilometer eastward along the rim, back from the edge most of the time; when they reached the point where the rim turned northward and followed Little Colorado Canyon,

they turned as well and walked about a kilometer to the north until they visited the natural bridge; then they walked southwestward across the plateau for about a kilometer to a crater about 140 meters in diameter and went down to walk around. Finally, they walked back to the dacha. Sammie was utterly exhausted; Marshall was pretty tired, too, but both boys were thrilled. Other than a few ranger rides and one other excursion outside before the dust storm season, they had never been out of the terrestrial environment.

Carmen prepared a feast while Ethel played with Lizzie and Corazon. They all ate together, the boys looking more and more bleary-eyed. After lunch the kids took a nap. After the adults washed the dishes, Will looked at his watch. “So, we have what? Another hour before they wake up?”

“About that,” agreed Carmen, glancing at her attaché. It showed a picture of the bedroom upstairs where the two 4 ½ year old girls were sound asleep. They had been able to get permission from the Outpost to transmit the picture from the room’s camera to her attaché, to serve as a sort of baby monitor.

“Let’s go outside and enjoy the sunshine,” said Ethel. She led the six them out to the patio by the pool. They carried the attaché and glasses of iced tea to a table and sat facing south and the spectacular view of the Aurorae Valley stretching to the horizon.

“I hope the kids don’t sleep too long,” said Madhu. “They’ll want to stay up and play all night, and there will trouble tomorrow.”

“We’ll take the boys out on another excursion,” said Roger. “That’ll prepare them for another nap!” He stood and took off his shirt, then sat on his chair to enjoy the sun.

“They’re growing so fast,” remarked Will. “It’s hard to believe. Marshall and Sam will graduate high school and begin university in eleven years.”

"Yep," agreed Roger. "And I'll be 62, and we'll have to decide whether the family should go back to Earth, because I won't be able to fly much longer."

"There have been 75 year olds in space, dear," replied Madhu.

"I wonder whether the kids will want to go to Earth for university?" said Ethel. "MarTech should be pretty good by then, though I suppose Earth will have an allure."

"Marshall's already fascinated," agreed Will. "It'll be hard to keep them here. By then I hope we have a free round trip policy; say, one trip every 17 years."

"It'd be the stuff of a movie," quipped Carmen. "Imagine an 18 year old arriving on Earth, never having driving in an automobile or seen an ocean or big animals."

"Not to mention having weak bones and virtually no immunity to terrestrial diseases, and no familiarity with muggers and con artists." Ethel shook her head. "I'd rather have them stay here."

"It won't happen," replied Roger. "They'll learn. They're human beings; they have to experience the mother world." He looked at Madhu. "I suppose we'll go back then as well."

"If Will can arrange that free round trip, we could go back for four years while Sam's in university, then fly back here," said Madhu. "I think I'd rather be here, health problems or not. I love the art I can do here. No place on Earth can give a similar inspiration."

"Where do all of us want to be in ten or fifteen years?" asked Will. "I'm curious." He looked at Carmen.

She scowled. "Will, we're on vacation, remember?" She paused and saw he wasn't fazed by her complaint. She shrugged. "I enjoy running our communications

systems. I think we'd stay here if Corrie wants to attend a university on Earth. We'd beg her to return; there are plenty of careers here, after all. If the place keeps growing and attracting young, bright people, it'll remain exciting."

"There will be fairly good choices for spouses here by then, too," said Will. He looked at Ethel.

She shrugged. "After twelve years, I have roots here. The roots on Earth are much weakened. I think new should stay."

"I'd rather stay and continue the research. I've been bitten by the exploration bug," said Roger. "Say, Will, when are we going to update our Martian geology text? The first edition won't earn us royalties pretty soon!"

"Let's schedule some time later in the summer," replied Will. "I think my life will be in more of a routine by then. This columbiad started out crazy, as they usually do, and has gradually settled down."

"As always," agreed Roger.

"You know, I never thought I'd like this place," said Érico. "When Columbus 2 left Earth I was counting the sols until I'd be back, and famous in all of Brazil. But here I am, settled down and doing good science and good engineering. I'd just like a few more expeditions, Roger."

"I give you as many expeditions as Carmen will let you take!" Roger replied.

"Thanks; blame me!" said Carmen, though she knew it was true.

"I wish you wouldn't go out, either," Madhu said to her husband. "Expeditions are still dangerous. Let the younger ones go out while you stay at the Outpost to coordinate and write."

“I don’t like a desk job,” replied Roger. “So, Will, you’re not off the hook.”

“Me?” Will thought a moment. “I suppose we’d go back to Earth if the kids wanted to go. I’d want to keep an eye on them while they adjust. The bigger question is, what will I do for the next eleven years? I’ve been Commander for almost eight. Should someone be commander for nineteen years? But how can I retire from being Commander and stay here? Should I retire at some point and go back to being a geologist?”

“You’d have earned full retirement,” said Ethel.

“It’d set a bad precedent,” replied Roger. “The other question is, at what age can the kids fly back to Earth? Maybe in six more years the radiation shielding will be better and it’ll be safe.”

“But I don’t know whether I’d want to fly back to Earth in six years.”

“What about if they made you High Commissioner of the Commission?”

“They won’t; the Europeans want a European to succeed Morgan. Besides, the High Commissioner should be on Mars, with the Vice Commissioner on Earth.”

Roger laughed. “But do you think that’ll happen?”

“Because what you’re talking about, essentially, is a form of independence,” added Érico. He leaned forward in his chair, very interested.

“It would be a kind of independence, though without national sovereignty. I don’t think it’ll happen in several decades, but I wouldn’t rule it out. Our gold output gives us a gross domestic product larger than a few nations. The gold has collateral effects; nations are more willing to sponsor citizens here than ever before. Columbus 7’s seats are filled and half of Columbus 8’s. Columbus 8 has to be bigger; maybe fifty people will fly here instead of forty. And it’ll be cheaper. The new interplanetary habs are cheaper to build

because, after eighteen years, the technology has matured. We need new Mars shuttles that will be cheaper and better. As gold exports increase, imports get cheaper, other exports get cheaper, more national and corporate money flow in, and a feedback loop develops. The economists say we won't depress the price of gold until exports hit four to six hundred tonnes per columbiad. That's twenty-four to thirty-six billion dollars."

"Even Columbus 7 will be cheaper," said Ethel. "What's the estimate? Under one hundred million per person?"

Will nodded. "For the first time, especially if Bioarchive sends more cargo our way. In six columbiads—2057—we could be receiving 75 colonists per columbiad at a cost of fifty million each, and Mars could have 400 people. That might be a good reason for Marshall and Sam to stay."

"But we have a long way to go to build our community here," replied Roger. "We have a lot of cultural differences, issues of language, issues of inclusion, and these aren't easy to resolve."

"We're trying," replied Will. "There have been a lot of meetings and forums this columbiad about these issues."

"Too many meetings!" replied Roger. "I think we're talked out!"

"Especially town meetings," agreed Carmen. "It's been killing almost every Sunsol afternoon, lately."

"It's a problem," conceded Will. "The web discussion forums have helped digest a lot of legislation, but the last four or five months have demanded a lot of time anyway; we've had to shape a legal code for this place."

"It's been important work, even though not everyone is interested in it," agreed Érico. "Roger's right; we're optimistic about this place, but we haven't resolved the issues of creating community."

"Neither has anyone else," replied Will. "We have a lot of work to do, but we have made progress. We have more community than one might think, considering that there are people here from thirty-seven nations. Some of it is generic democracy and some of it is science and consumerism. And we have a fairly good support system; some of it is modern psychiatry and some of it is old-fashioned friendship. The meetings have been a part of it."

"We have to develop a new culture here," said Érico. "Maybe we'll manage to create a new synthesis that is compatible with our existing values—religious and secular—and it'll be an example to Earth. Or maybe we won't."

"It's a utopian dream that Mars will become an example to the old world," said Will. "We will manage some social and cultural innovations here; we already have. But we'll never be a utopia, and while we'll contribute to humanity's social evolution, we'll never solve its problems."

Alexandra was busy inside Riviera's building bubble one, supervising the robotic welding of one of the first steel beams of the building's structure, when her communicator urgently beeped. It was Kent Bytown. He was running the day officer.

"What is it, Kent?"

"Communications with Earth just went down. Demand has overwhelmed the circuits."

“Well, shut down the requests for television shows, recreational websites, and videomail and get the rest up.”

“That’s what I’m doing. Shall we call Will? Or Carmen, since she’s the communications coordinator?”

“They’re on vacation; let’s try to manage without them.”

“Okay. I’ll put more communications filters in place to weed out more requests and let you know how it goes. Bye.”

“Bye.” Alexandra closed the circuit and turned back to the robot, which had stopped work; it had needed instructions and, failing to get them, had stopped. She turned back to her attaché, pulled up the robot’s controls, and checked the problem. She gave it a command and it resumed its welding. She checked another robot welding another beam nearby; she could run both at once.

Then Kent called again. He was having trouble with the filters; too much had accumulated and he was trying to postpone items without deleting them. In mid sentence, the screen went blank; before Alexandra was able to panic, the call reestablished itself.

“What happened?” asked Enrique, who was standing next to a robotic cart that had stopped in its tracks.

“Communications are down!” She turned to the attaché; Kent’s image was grainy and low-resolution, which meant that her attaché was connecting to Kent’s directly or via intermediary attachés. “Are we in self-networking mode?”

“Yes. Shall I call Carmen?”

“Yes. Oh, wait; you can’t, they’re too far away.”

"Right. We'll get everything back up, then. I'm calling in all the Prospector drivers to help." They were on the other side of Habitat 1 and served as emergency monitors when needed.

"Excellent. I'll be right there."

Alexandra hurried to the bridge, cursing that such a disaster would strike while she was in charge. Houston would be freaking out, especially with a round trip communications link taking over forty minutes. It would hit the news, too. Meanwhile, up in orbit, the ITVs and communications satellites would be switching to Cassini for control purposes. They'd have to be switched back. With no competition from Aurorae, Cassini would quickly hog the communications lines that were open via Magellan Station in Venus orbit and via, or all places, the Jupiter communications satellite system, a billion kilometers from the two worlds.

But Alexandra soon discovered that the collapse was not easy to fix; Mars was a big operation now and communications had expanded even faster than their population. Magellan was far less adequate than they had thought it to be. Just like restoring an electrical grid, restoring a communications grid was fraught with complications and sudden surges in communications demand. Though internal communications were restored in half an hour, the link to Earth remained unstable and difficult to control the rest of the sol. Alexandra was in a fowl mood when she went to the patio in Yalta for supper. When she found that her favorite main course had run out, her mood was not improved. But Yevgeny tried hard to cheer her up and as she started on her after-dinner coffee, she was feeling better. When Lal and Radha stopped by briefly, her mood improved; their two-month old baby Aditi, the thirteenth child born on Mars, was cute,

even if it had a mild case of Downs Syndrome. A little later, Silvio ambled up to the table. “Have you any time after supper? Maybe fifteen minutes?”

“Sure. Why?” replied Alexandra, assuming that Silvio was speaking to her.

“I want to show both of you some results of the financial investigation I’ve been making. I want your opinion before going to Will about them.”

“Okay,” said Alexandra.

Silvio was looking at Yevgeny in particular, since he was in charge of exports. He nodded. “No problem; let us finish our coffee. Ten minutes or so?”

“Sure, just come to the store.”

Yevgeny nodded; Silvio headed back to the store. “So, did he want your opinion or mine?” she asked.

“I’m not sure.”

Alexandra shook her head. She stood up with her tray, returned it to the kitchen, and got a second cup of coffee. She returned to her table, stretched out, and relaxed.

But a movement out of the corner of her eye caught her attention. Kevin Dunbar was making a beeline for another table, walking with a purposeful, determined step that was worrisome. She turned and saw he was walking straight toward the table where Jennie, his ex-wife, was seated with Ernesto Gomes. Jennie and Ernesto were flirting; they had been flirting a lot lately. Kevin’s attention was focused on their son Jake, who was almost three. When he reached the table he leaned over and scooped up the boy. “Come on Jake. I don’t want you to forget who your father is.”

Jennie’s eyes opened wide in anger. “Hey, I’ve got him tonight!”

“Then pay attention to your son and not other people!”

“Look who’s talking!” Kevin had been sitting with Andrea Shelton, whom he had been courting for months.

“You mind your business!”

“Then you mind yours!” Kevin walked away with Jake, who began to cry. Everyone in the patio had stopped their conversations.

Alexandra scanned the crowd and her eyes locked with Martha Vicker’s. She nodded; the psychiatrist stood up and headed to Kevin’s table.

Shinji, seated at the next table, leaned over and said to Alexandra, “I think Martha mostly works with Jennie, not Kevin. Greg’s been counseling Kevin.”

“Greg?”

“He has counseling training and is a man. Kevin needed to talk to a man.”

Alexandra scanned the crowd. Greg wasn’t there. She grabbed her attaché from her belt, unfolded it, and dialed his number. It went to his message center.

“His attaché’s off,” she grumbled.

“Many people turned them off all afternoon and haven’t turned them back on,” noted Yevgeny.

“I’m sure. Computer! Emergency condition yellow. Please locate Gregory Harris.”

There was only the briefest pause. “He’s in the laundry area.”

“Computer, privacy override condition yellow. Please transmit the image of the laundry room and activate the room’s intercom system.”

“Acknowledged. Please wait.” In a second the screen flickered, then the image of the laundry room appeared from a camera located in an upper corner. Greg was sitting and sewing ripped clothes; he had quite a pile, too.

“Greg, can you hear me?”

He jumped when her voice sudden came out of the intercom. He looked up, then turned to the camera, assuming she was watching as well. The laundry room was a public area and not under the same privacy restrictions as private quarters. “Yes, Alexandra. Is there a problem?”

“We’ve just had a personal incident here on the patio; can you come over?”

“Right away.” He rose and hurried out of the room.

Alexandra went to talk to Jennie; she was visibly upset. “He sleeps with Kim, then gets mad when I sit and talk to Ernesto with Jake present? He is such a self-centered, possessive idiot!”

“Greg’s coming down to talk to him; we all agree that Kevin has some issues to work out.”

Jennie laughed at Alexandra’s phrasing. “I want Jake back; tonight’s my night.”

“Martha’s working on that, I’m sure, and Greg will, also.”

“I hope so.” Jennie looked at Ernesto, who put his hand on her shoulder.

“It’s not easy, sometimes,” he said.

“Thanks,” she replied.

Silvio came out of his store and looked at Yevgeny and Alexandra rather urgently. He had missed the incident. Alexandra shook her head; Yevgeny rose and walked into the store.

It was another minute before Greg showed up. He went to talk to Kevin; Martha walked over to Jennie. A few minutes later, after hearing from Jennie about Jake, she walked back over to Kevin and returned a few minutes later with Jake, who was still red-eyed from crying. At that point Yevgeny appeared at the door of the store, beckoning her.

It was difficult to believe anything could be more urgent than the situation she was engaged in, but the worst appeared to be over. Kevin and Greg were ready to walk to Greg's office. She apologized to Jennie and walked to the store.

"What is it?" she said, irritated.

"This is pretty important," replied Yevgeny.

"How's that possible?"

"Come on; that crisis is over." Yevgeny turned and went back inside; Alexandra followed. Silvio was sitting at a little table in the back of his office looking very solemn, almost depressed. There was a spreadsheet open on the screen of his attaché

"What is it?" she repeated.

"I'm afraid Yevgeny gave me some pieces of the puzzle I didn't have; or maybe I should say that together, we found some pieces of the puzzle neither of us had before. Did you hear about the shortfall between gold production and gold logged into the accounts?"

"Yes. I thought it was a bookkeeping artifact."

Yevgeny shook his head. "That's what we thought," replied Silvio. "But it appears Daniel Shapiro is responsible instead."

"Why? He can't smuggle gold back to Earth."

“Maybe he can,” replied Silvio. “So far the mass shortage is thirty kilos; well inside the personal mass allocation of a return flight, especially if you have a partner helping you.”

“Ruth,” replied Alexandra, referring to Daniel’s wife. “But he’d have to steal some of the accumulated gold before the final weigh-in and transfer it to his luggage.”

“Unless he has an accomplice somewhere at Gateway or ISS, who could steal some of the gold after its arrival in Earth orbit.”

“Thirty kilos of gold is worth $1.8 million.”

“A tidy sum,” said Alexandra. “How much could he ship to Earth as personal property without going to Earth himself?”

“We allow three kilos of personal property to be shipped back, but people can purchase more mass at 300 redbacks per kilogram,” replied Yevgeny. “If he stayed here and shipped fifty kilograms back to Earth every columbiad, it would be a nice fortune in a few columbiads.”

“But the personal property has to be explained and described,” noted Alexandra.

“And we never verify,” replied Yevgeny. “After this, we’ll verify.”

“I think so,” agreed Silvio.

“This is still hard to believe,” said Alexandra. “It doesn’t make a lot of sense. This is a high-risk, relatively low gain effort. His annual salary is $1 million, after all.”

“It doubles his salary,” replied Silvio. “And it’s tax free. People can have funny motivations to do things like this. There’s a thrill to fooling people.”

“How sure are we that Dan is the culprit?”

Yevgeny looked at Silvio. “There is some computer checking we could do, to be sure the data was changed from his computer, for example.”

“Do it. We have to nail this down unambiguously,” said Alexandra.

“Come to think of it, back in December he came into the store wanting to purchase a very strong but light garment bag or duffle bag,” replied Silvio. “I didn’t have anything but suggested he ask fabrication to make something for him.”

“That rings a bell; I turned down a request to make a duffle bag while I was in Cassini,” said Alexandra. “Interesting.”

“Should we talk to Will?” asked Yevgeny.

“Yes,” replied Alexandra. “But I suggest we pursue this matter as much as we can, first.”

“I’m in an awkward position; Will asked me to audit the books, but I am also Aurorae’s judge and therefore have to approve requests to obtain records,” said Silvio. “We’re a small operation, so it’s hard to avoid conflicts of interest. I suggest we turn over the investigation to Kent. He has the skills. He can make requests to me for, for example, computer records from Ruth’s personal area.”

“Okay,” agreed Alexandra. “I think we had better talk to Morgan and the Commission’s legal department in Houston. We can do that without bothering Will’s vacation.”

“Except tomorrow’s a big staff training day in Houston, because of conjunction,” replied Yevgeny. “Then it’s the weekend there.”

“We’ll have to use emails instead of videomails, too, because of the communications limitations,” said Alexandra. “Okay, let’s gather information. When

Will comes back from the escarpment, direct communications with Earth will be restored anyway." She sighed.

"This has been quite a sol for you," observed Silvio, with a smile.

"Tell me about it! Communications breakdowns, a fight at supper, and now an embezzlement. Will gets one of these once a month, and I get three in one sol!"

"And I'm sure he'll be grateful you handled them, too," added Yevgeny, with a smile.

Up on the escarpment, the interruption in communications wasn't even noticed. Once the kids woke up, the afternoon was devoted to the pool. Roger had been a swimming instructor as a teenager and resurrected his skills to teach the two boys how to swim. The little girls were content to splash each other in a plastic wading pool Ethel set up for them. The others watched or swam. The exception was Will, who turned to the gourmet dinner.

After dinner they sat outside by the pool in the Phobos light, wearing sweaters against the chill, telling stories. The kids went to bed quickly. It wasn't until the next morning when Will called up the latest issue of the *New York Times* on his attaché that he learned of the communications snafus of the sol before.

The next three sols followed a similar pattern; hiking in the morning for the boys and play time for the girls, a nap, pool time, dinner, then a movie or a virtual reality under the stars. Everyone was very sad when the time came to pack up the rangers and drive back to Aurorae. Will hadn't been inside Yalta Biome five minutes when Alexandra called him. "When can you get to your office?"

“Office? I suppose in a few hours, why?”

“Because Silvio, Kent, and I are here waiting for you. There’s a serious criminal matter we have to deal with.”

“Criminal?”

“Yes. I had better not say anything more over the phone. We’ve got the proof and need to brief you right away. As soon as an arrest is made, it’ll hit the media.”

“Alright, I’ll be right there. Bye.” Will closed the connection. Ethel looked alarmed.

“Sounds serious.”

“Yes, I’m afraid so. I have no idea how long it’ll take, either.”

“So much for the afterglow of vacation.”

Will nodded for his office. The three of them were waiting there. “It sounds like I missed quite a lot in four sols.”

“You don’t even know about the incident on the patio between Kevin and Jennie, either,” replied Alexandra. “Silvio and Yevgeny have been checking gold production and storage records, insurance records, bank records, and a few other items.” She nodded to Silvio.

“It turns out that Dan Shapiro has been skimming a few dozen grams a sol from the gold production figures, hiding the difference in a “detrital silica” allotment, and depreciating the value of the gold by hiding the difference in a “detrital silica compensation” allotment. He has also fiddled with the gold production figures in the insurance reports so that they agree. He’s already set up a personal mass allocation for

himself and placed thirty-two kilograms in it, which happens to be the mass in the detrital silica column."

"He's scheduled to fly to Cassini twice in the next few months," added Yevgeny. "Perhaps he planned to steal the mass of gold while there. Or perhaps he planned to steal the gold after it was transferred here. We've checked the gold already stored here and the mass is accounted for."

"Is Dan on the passenger list for Columbus 6?"

"No," replied Yevgeny. "It appears he planned to ship the gold home as a personal allotment and stay, presumably in order to steal more."

Will shook his head. "This is extraordinary. Incredible."

"We have been immensely saddened and shocked by this," agreed Alexandra.

Will nodded. A tear appeared in one eye. "This is a massive violation of trust. He's such a bright, capable man."

"A man with a flaw," replied Silvio. "He has a shoplifting record in Massachusetts, where he attended M.I.T. and Harvard. He didn't report the record on his application and no background check was made. We got a thorough background check, and it found the record."

"You have been busy!"

"We haven't slept much in the last three sols," agreed Alexandra. "Here, let's show you the evidence in detail."

"Yes," agreed Will, with a sigh. "That's important. Kent, can we set up another system for house arrest and confinement?"

"We have to," replied Kent.

9

Organization

late June, 2047

By the end of the sol Daniel Shapiro was arrested, brought before Judge DePonte, and released on personal recognizance until his trial could proceed a week later. For the next week everyone on Mars spoke about little else.

The trial lasted ten sols. It proved complicated because Shapiro hired lawyers on Earth to help him. The slow communications stretched out the procedures. But in the end he was found guilty and sentenced to house confinement except for half an hour a sol. He would return to Earth for final sentencing and imprisonment. Shapiro continued to insist on his innocence.

“You know, this would have been much more complicated if he had stolen gold in Cassini or on a robotic truck during a drive back here,” noted Silvio to Will after the trial had ended. “Cassini has no code of law. It has no judge or borough officers, either; just an outpost commander.”

“As Commander of Mars Operations, I could authorize the arrest of violators of Texas law and authorize you to preside over the trial,” noted Will.

“Maybe. The mechanism isn’t specified in the treaty, and supplementing the treaty isn’t easy. Maybe the accused could insist on a trial in Texas.”

“Good point. We should ask Cassini to adopt all of Aurorae’s laws. Longer term, we have to establish a Mars-wide approach to this problem, not solve it borough by borough. It’s time to define a Mars level of governing authority.”

“What will the Commission say?” asked Silvio.

“I don’t know, but I’ll find out pretty soon.” Will glanced at his watch. “I’ve got an appointment to meet with Morgan starting in five minutes.”

“How long will that take?”

“Parts of four hours. Round trip communication takes forty minutes.”

“I know; I had to sit in my office half of last night exchanging slow videomails with a judge in Houston, napping in between! Good luck.”

“Thanks.” Will left the courtroom and headed back to his office. He took a long detour through Riviera Biome and had to walk along a narrow path across the open space while regolith was poured onto and pushed around the floor that would be the future “yard.” As soon as he reached his office and closed its doors, Commissioner Morgan’s first message popped into his in-box. Louisa Turner sitting next to him.

“I thought Louisa should participate in this meeting because the main subject has to be our image in the media. We have taken quite a beating in the last week. Two criminal acts out of a population of less than 100 adults is a serious blow. We need a strategy. Louisa can summarize the situation.”

“I can give you examples to look at if you’d like,” she said. “One space news website has the headline ‘Utopia Embezzled on Mars.’ Mars never was utopia, but there are hundreds of thousands who project their utopian fantasies onto Mars. That translates into property sales, political support, etc. We need to reinforce our base of support.”

“Property sales have dipped over the last week,” added Morgan. “Of course, a week isn’t very long and the dip isn’t very deep. The results of an international Gallup poll are more serious, though. The percentage saying Mars development and settlement is ‘very important’ has dropped from twenty percent to twelve percent. The number saying

it is ‘somewhat important’ did not change much; the number saying ‘unimportant’ rose to thirty percent. The numbers tell us we have a problem we need to tackle immediately.”

“So we were wondering whether we can change the conversation to an exciting topic,” continued Louisa. “Another expedition to the north pole or a trip to the top of Elysium Mons might capture the public’s attention. There are thermal vents in southern Hellas to explore. Mars and the asteroid Tikal are coming up on opposition in four months, and it’ll be only twenty million kilometers away. Two shuttles could fly there, visit a few weeks, and return in time for Columbus 6’s return to Earth. Tikal’s thirty klicks across; bigger than Phobos and bigger than anything that’s been visited lately.”

“Maybe you have other suggestions,” added Morgan. “The ideal, right now, would be discovering life! That’s the sort of boost we need. Have you any ideas, Will? Over to you. Bye.”

Will decided to look up Tikal. They had been looking at expeditions of this sort for some time. Asteroids a half kilometer in diameter or more flew within ten million kilometers of Mars about six times per year; the inner edge of the asteroid belt was close, and some asteroids strayed even closer. Expeditions to them were inevitable, but the timing was important. He hit reply.

“Thanks Doug, Louisa. I knew we were in trouble, but I didn’t realize it was so bad! We have to do something; this incident has the potential to do long-term damage. But what we do is important. If we act primarily for the sake of repairing the damage done to our public image, that will be obvious to many people. It could backfire. Exploration schedules are set months in advance in order to allow terrestrial geologists time to plan their support roles. Expeditions to asteroids need to be planned far enough in

advance to obtain equipment from Earth to place on the asteroid, and for data from terrestrial telescopes and radio telescopes to provide planning data. And there is NASA's Project Argo; if we trump it we'll earn the enmity of many in the United States. We can ill afford that right now. Argo starts in less than two years.

"What I suggest is more utopian and flows naturally from the recent trial: making plans to lay down a basic governing structure and law for the entire planet. If this theft had occurred in Cassini or on a robotic truck between the two boroughs, our legal situation would have been ambiguous. There are ways to prosecute crimes outside Aurorae Borough, but they could involve courts in Houston or in Texas, which are a long way from here.

"I know the Commission is uncomfortable about the matter. But we are not talking about national sovereignty or autonomy or independence. Mars is too small for that, and will be for a century or more. Rather, we're talking about subsidiarity: the principle that there are many levels of government and that each plays a distinct role. There are plenty of small towns on Earth that elect governments and run courts even though they have a hundred or so people. They do not abolish county, state, or national government in the process. Mars has bright, hard-working, articulate people who want a say in how their schools and clinics are run and what their laws are. Some people are not very active politically, but others are. And isolation here tends to breed a pride in Mars and in our boroughs; you might call it proto-citizenship.

"So the time is ripe for a Mars constitutional convention. If it's done right, it has the potential to make the hearts of the utopians go pitter-patter. It will stir public interest, be perceived as an effort to right wrongs, and demonstrate our long-term stability as a

society. That's good for investment. It also will establish a planet-wide legal structure that will foster the construction of other boroughs. That would be my recommendation. Back to you. Bye."

Will hit send and wondered how his proposal would be received. He had hesitated to propose a convention because he knew how fiercely Morgan—and the nations in the Commission—would resist the idea. Perhaps the trial would give the idea momentum.

While waiting for the reply, Will turned to the ephemeris and checked out the flybys of asteroids one kilometer in diameter or larger. There were fifteen of them predicted to occur in the next ten years, and some were quite close. One was a nickel-iron body. None of them had yet been explored robotically. They'd have to launch a mission some day, but not until Argo had a success.

It was almost an hour before the reply arrived; there had been lengthy discussion at the other end. Louisa did not look happy.

"Will, let's avoid a constitutional convention, or a charter meeting, or an all-Mars conference, or whatever you want to call it," replied Morgan. "How much democracy does a bunch of overworked, and largely politically apathetic, crew need? There's no guarantee the gathering would be received positively, either. Utopians—anarchists to communists—will simply dislike the compromises that Mars inevitably would have to make. Don't worry about the utopians. The real utopians don't buy land.

"Let's find a practical blockbuster mission instead. I agree, Tikal is not politically useful and could look self-serving or an attempt to upstage NASA. But a trip to Elysium Mons and the thermal vents north of it is interesting. Pursue that, okay? Bye."

Will frowned and thought about his response carefully. “Doug, the Elysium plateau is a good mission and I’ll get it started, but it’s not something we can send out in less than two or three months, so it won’t help our public image right now. The momentum for an all-Mars gathering already exists, however. Go look at the outpost’s web forums. The matter is being discussed. The decision to call such a gathering is not in my hands, either; I’m just a humble citizen of the place. Ah, I mean ‘resident’ of Mars. Alexandra and Érico are the elected officers in Aurorae Borough, and presumably it’s their decision. Bye.”

He sent the message, then regretted it. *Citizen;* that was a slip of the tongue. He shouldn’t have hit “send” so fast; he could have gone back and re-recorded the message, or even edited that sentence. Now he wondered what Morgan would think.

He sat worrying, mad at himself and at Morgan, staring out the window at the cinnamon landscape and the escarpment looming over Aurorae Outpost, and he realized that *citizen* indeed reflected how he felt about the place, even if it was a tiny human collective. It was home. He thought about the American flag flying over the Outpost from its flagpole at the base of Face Rock, a flag many wanted to take down and replace with a U.N. flag or, better, a Mars flag. The time to do that was fast approaching.

He was unable to work during the wait for Morgan’s reply. He sat and thought for the entire forty-six minutes until Morgan’s reply popped into his in-box.

“Will, please don’t hide behind the excuse that Alexandra and Érico are to blame. You’re in charge up there and everyone knows it. You command their respect. They’ll follow you on a matter like this. There’s to be no Mars Constitution at this time. The Commission has all the authority necessary to coordinate things, including enforcement

of laws. Military law, private corporate law, shipboard law; there's plenty of law available to us. Borough government and law make sense; these are settlements with legal residents. They need to pay taxes to support services the Commission was not set up to provide. But the space between the settlements, and between them and Earth, is the sphere of the Commission. A millimeter past the border of each Borough residents enter the realm of the Commission. That's always been our interpretation of the Mars Commission Treaty. And you are bound to uphold the Commission as its representative up there. Bye."

That startled Will; he was aware of that interpretation of the Commission Treaty, but had never heard Morgan quote it before. He thought carefully for several minutes and scribbled a few notes before replying.

"Doug, I very much appreciate and understand the position you are taking. But I respectfully remind you that you don't live here. We do; I do. We can't go to a soccer game or a mall, buy a newspaper printed on paper, or watch a fireworks display. Earth is in our memories and on the screens of our televisions. We speak almost two dozen native languages in our flats, yet eat our soy cheese and tilapia filets together in the same bubble of air, speaking to each other in the same standardized English with the same Marsisms, like 'good sol.' Our neighbors are Martians. Our elections are Martian. Our certification renewal classes are for the same things: space suits, rangers, shuttles, nukes, Prospectors. We watch amateur ballet with impossibly high leaps. We play golf outside as members of the Aurorae County Club, with an eighteenth hole that is a 550-meter par three.

"If you think our emerging Mars culture isn't going to be expressed as Mars politics, you need to reconsider. This is not my doing; it is something that is emerging in

the environment. I did not choose the word *citizen;* it welled up spontaneously inside me and surprised me because that is how I feel. I'm being frank with you; I'm not hiding behind anything. Please believe me, because I know the only way this videomail medium of communication can work is that everyone trusts everyone else. Otherwise it'll become a series of exchanged excuses and white lies and trust will break down. We have to maintain trust, Doug. There will almost certainly be a Mars constitutional gathering in a few months. We can use the event as a way to strengthen the relationship between the Mars residents and the Commission, or not; we can use it as an opportunity to improve our image, or not. It is inevitable. Bye."

He hit send, surprised by the emotion and honesty in his words. They had to be frank with each other, in spite of the risk that misunderstandings and biases would result. He left his office to pace around the Outpost, walking as far as Riviera in the process. When he returned he saw an e-mail message from Louisa, which had arrived right after he had stepped out and therefore about fifteen minutes before his response had reached Earth. It was short: *Don't worry, he'll come around*. Will imagined her excusing herself from Morgan's office to go to the bathroom, and hastily dictating the message from the toilet stall. When Morgan's reply arrived, it was more conciliatory.

"Look, Will, your colony is barely eleven years old. There's plenty of time to develop its government. If some sort of meeting must be held, make it a 'Mars Planning Conference' and invite terrestrial speakers to address it. We've had those before and they touched on social issues. Meanwhile, get the Elysium expedition into the planning pipeline. I think everyone will be surprised how fast the scientific justification of the expedition will snowball. Bye."

That was something he could live with. He hit reply. “Okay, Doug, that’ll work. We’ll start on this two-pronged approach right away.” He hit send, then pulled up Louisa’s videomail number. “Louisa, thanks for everything. Let’s look at a panel discussion about ‘alternative modes of governance.’ In particular, I’m curious about some recent articles that discussed non-competitive governance. One was an application of ‘appreciative inquiry’ to governance by, I think, Silvia Quinn. It was mentioned in last Sunsol’s issue of the *New York Times.* Sorry, I mean last Sunday. Another was about decision making without partisan advocacy, but I don’t remember a title or author. I’ll get my secretary to research the matter. If we’re going to create a new model of governance, we need to learn to manage partisanship. Thanks again. Bye.”

He sent the message, then thought about whom he should talk to about the conference. He decided to find Érico and Alexandra and interrupt their work.

Two weeks passed in a whirlwind of work. The Elysium expedition did indeed take shape rapidly; it was one of the last areas they hadn’t explored and warranted a thorough tour. Interest in a meeting to discuss Mars’s future, including its organization, developed almost as fast. The meeting was scheduled for the first weekend of September. Public interest was piqued. When the Mars Exploration Society announced plans to hold a parallel conference on Earth for all Mars landowners—who had no official legal mechanism for expressing their concerns or interests about Mars—the media, sensing controversy, became even more interested. Morgan found himself uttering platitudes about the importance of good governance on the Red Planet.

The issue of lack of government in Cassini was more pressing and easier to solve. As soon as the live television shows of the July 4th fireworks ended—shortly after the dawn of July 5 in Aurorae—a sunwing-B took off heading for Cassini. Will Elliot and Alexandra Lescov were on board. As soon as the sunwing landed on Cassini's landing strip, they were met by a ranger driven by Emily Scoville. They climbed into the ranger and Emily repressurized the cabin so they could remove their suits. Will immediately noticed that Emily's hair covered by a scarf.

"Welcome to Cassini, Will! And welcome back, Alexandra!"

"Thank you; it's exciting to be here," replied Will.

"How was the flight?"

"As good as a twenty-hour flight can be," replied Will. "I guess I should be thankful it wasn't a Sunwing-A, which would have taken thirty hours instead."

"The stationery bike with arm exercisers and the hammocks help a lot," said Alexandra. "We watched a lot of television, too."

"I wish we had more shuttle flights, but I know that isn't practical." Emily put the ranger in gear and turned around. They headed toward the Outpost, a shiny enclosure six kilometers away. "How are the plans for the Sunwing-C coming?"

Will shrugged. "We'll see if it's ready for Columbus 7. A biwing is complicated enough; the triwing design is driving the software engineers crazy."

"But it's supposed to have a shorter wingspan, right?"

Will nodded. "Shorter, but stacking three wings means it's taller, the propellers are bigger, and the wings are staggered behind each other to maintain the exposure to the sun, so the lift is distributed differently. We'll see whether they can pull it off."

"They're solving the problems, Will. It'll be ready," injected Alexandra.

"I like the scarf in your hair," Will said. "It looks nice."

"Oh, thank you." Emily sounded embarrassed and didn't speak further for a moment. "Muhammad and I have been studying the Qur'an together for a few months, and I decided to accept the Prophet Muhammad."

"Congratulations," said Will.

"What does your family think of that?" asked Alexandra.

"My daughters were surprised, my parents appalled, but they're getting over it."

"Congratulations on your plans to get married."

"Thank you, Commander. I never thought I'd get married again; I figured that I had married, had my family, and now I was free to give my career my priority. But it didn't work out that way! Muhammad's really sweet, and we seem to fill voids in each other's lives."

"I'm grateful you're both planning to stay here."

"I didn't expect that, either!"

"So, how has it been here over the last few months?" asked Will.

Emily shrugged. "There's really not much to add to the reports you already get from me. In March, not long after the construction phase ended and the design bugs were resolved in the equipment, everything slipped into a routine. Both companies have discovered that they are more efficient when they work together; Consolidated's rock crusher was better, but Muller Mining's repair crew was more effective, and Muller was better able to blast rock loose for the rock crushers to work on. They've learned from each other, and with our people here they've surveyed the deposits better to determine the

optimal recovery strategies. Geologists at the Colorado School of Mines have done excellent work designing the best strategy to blast and digest the various outcrops. As a result, output has climbed to five tonnes of gold per month, combined. Each company's producing about half the total."

"That's impressive." Will calculated. "We dug fourteen tonnes in the first six months. If we manage five per month for the remaining eleven months, that's sixty-nine tonnes to send back with Columbus 6, and fifty-four more when Columbus 7 arrives nine months later."

"They'll manage it, I think. Efficiency is improving faster than the decline in the quality of the gold deposits."

"Of course, one reason they're producing so much is because we're providing a lot more support than contracted," said Alexandra, who had always been critical of the support effort. "Each company's four people are busy loading the rock crushers and repairing broken equipment while operators in Aurorae keep them going twenty-four point six hours per sol."

"We're providing ten full time equivalents instead of eight," admitted Will. "But we're getting a bigger cut of the profit, too. We need the billions. How's morale?"

"Not bad, now. The work week is sixty hours, which is okay considering we're isolated, no one has families, and all food and laundry services are provided."

"I'm looking forward to seeing the social climate here firsthand," said Will.

"And to calling our first Borough meeting."

"Yes. It's time to elect officers and adopt bylaws."

"Who can vote? It isn't clear who's a resident here."

"Everyone here right now can vote. Officers can rotate back to Aurorae and return, especially if we elect a vice chair, assistant clerk, and assistant treasurer."

"Do we really need a treasurer?"

"Yes."

Emily nodded, absorbing the idea.

They drove on in silence for another minute. Then the ranger climbed up a steep slope, leveled off, and went around the edge of a hill, and Cassini's Transvaal Biome sudden hove into view. "Wow!" said Will. "It looks great!"

"Home sweet home," replied Emily.

The ranger slowly approached the main airlock. Emily pushed a button on the dashboard and the outer door swung upward, just like a garage door on Earth. Once it was out of the way she drove in and pushed the button again. The door swung downward behind them, then the pressurization cycle began automatically. "The darn thing leaks," she grumbled.

"They always do," replied Will. "But it's just CO_2 and electricity."

Emily nodded. A light on the dashboard turned green; she pushed another button and the inner door swung upward and forward, allowing them to drive into the garage, a big underground metal room able to accommodate four rangers. They entered and once the airlock door had closed again they opened the ranger and stepped out.

Emily led them out of the garage and down a tunnel. She opened the door at the far end and they were suddenly in Transvaal. The temperature and humidity told them that the climate was one of a mild savanna, not too hot or humid. Will stopped to admire the view. They had entered from the western end. On the northern side was a completed

building just like Yalta's. The middle area was a "yard" covered with fruit trees, flowers, vegetables, and clover. The southern side of the biome was a hole in the ground where the biome's other building would eventually be placed, the bottom covered by a thin layer of topsoil verdant with corn, wheat, tomatoes, beans, squash, broccoli, peas, eggplant, and other crops. Cucumbers climbed fences covering the walls of the hole. A robot moved slowly across the garden, picking anything ripe.

"You've got a garden on the roof as well?" asked Will.

Emily nodded. "And there's a nice view as well." She led them into the building. The right side was a dining area. "We've got a kitchen and lounge with television and ping pong tables on the left side. Ten of us have rooms upstairs; my office is there, too. The guest rooms are in the basement, which also has storage and a plant hibernation facility for the strawberries."

"I'd like to go down and rest before supper anyway," said Will.

Emily led them downstairs and showed them two empty rooms. Will moved into one, unpacked, and pulled out his attaché. He worked a while—it connected to the outpost's network without any problems—walked up to the roof to see the view, then pulled on his pressure suit and went outside with Alexandra to explore the area a bit. After washing and resting, it was time for supper.

Everyone came up to welcome him and chat. They sat at one long table, Will near the middle, answering questions while everyone listened. The relative ease everyone felt toward each other, and the fact that they sat at one long table together, were encouraging signs.

"So, how's it going?" Will asked Bruce Curry, when they both got up to get coffee.

Bruce shook his head. "I'm not going to hit a hundred tonnes, but I'm striving for seventy-five, and if it looks close we'll raise the goal to eighty. I hope we can do better next columbiad; 150 tonnes might be possible."

"You're planning to stay?"

He nodded. "They've agreed to a big signing bonus for staying; it'll cost Consolidated a hundred million to replace me, and because of me their stock has gone up thirty percent. You're here to organize the borough, right?"

Will nodded. "I guess that's alright," said Bruce. "But I'd be more in favor if the Commission gave us some concessions."

"No, Bruce," replied Will quietly but sternly. He stared at the man a moment, then walked back to the table. Emily watched Will approach, then stood and clinked her glass with a fork. "Attention, everyone! As you probably know, Commander Elliott has come to Cassini to address us about the need to organize the borough. I don't want to preempt his comments, so I turn the floor over to him."

Will barely had time to put down his coffee. He was a bit surprised they were starting, but he proceeded anyway. "Thank you, everyone, for your very warm and enthusiastic welcome. Things here are going very, very well. I can't tell you how happy I am that Cassini is established, running, and successful. It appears you'll produce almost five billion dollars of exports this columbiad, exceeding everyone's expectations.

"Cassini has eleven residents, which was the number of residents Aurorae Outpost had in 2037—ten years ago—when we organized ourselves. After months of deliberation,

Aurorae Outpost unanimously approved a declaration of civic government and elected a chair and secretary. Later we added a treasurer and a judge. The civic government handles ‘certification of marriages, births, deaths, divorces, and other life events of importance; adjudication of disputes; drawing up ordinances to regulate behavior for the common good; providing for common needs, such as education, health, safety, and the necessities of life; regulating businesses; raising revenue through taxation and other fees; and recognizing transfer of ownership of property.’ Since then we adopted bylaws and an extensive legal code.

“The time has come for Cassini Borough to organize as well. Aurorae has had to deal with two crimes in the last six months; Cassini may face the same situation at any time. Individuals here may wish to purchase pieces of land; it seems likely that within ten to fifteen years the technology to build private houses outside domes will have matured. Everyone is predicting that Cassini will be a great city by the end of the century. That great city needs a civic foundation now.

“How Cassini is set up is not up to me, or Emily, or the companies that recover gold here. It is up to the residents. You are free to come up with any arrangement you favor that fulfills the laws of the state of Texas and the Universal Declaration of Human Rights. The easiest path to take is to adopt the Bylaws of Aurorae Borough. That has the added advantage that all of Mars standardizes on the same model of governance. Earlier this sol Érico Lopes, the clerk of Aurorae Borough, emailed the Aurorae Bylaws to everyone here. I see one or two paper copies around the room and I know Emily has printed out a few more. But that is not, by any means, the only path open to you.

"In nine months you already have a far larger facility than Aurorae had after several years. You already have a financial and economic base that Aurorae still lacks. Don't compare yourself against Aurorae as it is now. Compare Cassini against what it will become. Vision, hard work, and dedication make a place grow. I see the hard work here, and I feel the dedication. I suspect the vision is here as well." Will turned to Emily and nodded, then sat.

"Questions for the commander?" she asked.

"I have one," said Muhammad. He stood. "No one can accuse me of bias against the Commander of Cassini, so perhaps I'm the best one to suggest this: it may be best if this meeting be chaired by someone from outside, so no one can say the results were manipulated in some way. My suggestion is Alexandra Lescov. We know her, she spent two months here and knows us, and she is chair of the Borough of Aurorae."

Emily, who was sitting next to Muhammad, immediately nodded. "Excellent idea!" Others in the room nodded as well, so Alexandra stood.

"I'll be happy to assist. Other questions for the Commander?"

There were none. Alexandra allowed a long silence to fill the room. "Perhaps we should start by going around the room and expressing our feelings frankly about organization. Do you favor? Oppose? Don't care? Do you have a thought about the form of government to follow? About the system in Aurorae? Let's start with Christina Stolz."

Christina was a German miner and she was sitting next to Ray Munson, a miner for Consolidated whom she had grown fond of. She paused to collect her thoughts. "I'm planning to stay here at least two columbiads, maybe three, so I feel I have a stake in this place as a community. I know some of us are here to earn a lot of money, and some are

planning to leave with Columbus 6 unless they get a big signing bonus. But I think all of us feel the need to give Cassini some long-term roots."

Alexandra nodded and looked at Munson. "I agree with Christina. A civic authority of some sort is a good idea."

Next at the table was Margaret Bailey, sitting next to Ni Gao, a Chinese engineer with whom she was fond. "I agree, and I think Aurorae's system is fine."

"I'm not a company person, but I'm planning to stay on Mars long term, and I may find myself in Cassini much of that time," said Gao. "I think we need a civil government. Mars needs one also."

Gerhard Bach, who was next, frowned. "I suppose people will say I favor a company town, but this is a pretty small place, and a place devoted to work, not family or leisure. I see no reason to change the status quo, except build another biome, of course, and haul in more equipment."

Several people opened their mouths to speak, but Alexandra shook her head. She looked at Alma and Johann Werner, two other German miners. Alma looked at Gerhard. "Frankly, I don't care what we do," she said.

"Well, I do," replied Johann. "Because we may start a family here. We may not have families here now, but we have couples, and a few more of them than are registered as married. We may need to celebrate marriages here pretty soon. After Columbus 7 arrives, how big will Cassini be? Sixteen? Twenty? Maybe thirty, after Columbus 8 arrives? I favor planning ahead."

Johann looked at Bruce Curry, who was next. Curry shrugged. “I want whatever is best for Consolidated. I suspect that means growing Cassini as much as possible and organizing it so that it can compete against Aurorae. Civic government? Sure.”

Alexandra looked at Emily. “Prophet Muhammad called for consultation, and Aurorae’s system provides that,” she replied.

“Government modeled after Aurorae,” replied Muhammad, who was next. “I read the bylaws this sol and was surprised they’re in plain English.”

“Very readable,” agreed Alexandra. “Louise?”

“I’ve been on Mars five years now, and I’ve participated in Aurorae’s system,” said the nuclear engineer. “It’s a good system. It helps create community because it makes all of us realize we are responsible for our outpost together. So I’d favor it.” She turned to Eliseo Andaluziano, her companion.

He nodded. “I haven’t been here that long, but the little of Aurorae that I saw impressed me. I have a long-term commitment to Cassini, so I want to see it grow.”

Alexandra smiled. “I’m surprised and impressed. Many reasons were cited in favor of a civic government. Only two were opposed to the idea. No one offered alternatives to the Aurorae bylaws, which seemed generally fine. Let’s refine this discussion now with questions and comments about governance.”

The discussion went until almost midnight. Few knew anything about Aurorae’s system, so it required a lot of explaining and discussion. The next morning after breakfast the residents of Cassini approved a modification of Aurorae’s bylaws that made the three officers a Borough Council. After dinner that night they elected Ni Gao as clerk, Emily

Scoville as chair, and Christina Stolz as treasurer. They elected Silvio Deponte as their judge; he could visit when needed. The three officers met with Alexandra the entire next sol to go over Aurorae's bylaws in detail and approve them. Meanwhile, Will inspected the gold excavations and discussed problems they needed to solve.

Five sols passed before Alexandra and Will flew back to Aurorae on a shuttle bearing three months of gold production. Will spent some time with Ethel and the kids and was at his office by 11 a.m. He was surprised to see Martha Vickers waiting for him.

"You won't believe what you've missed," she said. "The last five sols have been the most extraordinary in Martian history, in a way."

"Really?"

She nodded. "First, Sheila Burns and Arieh Feldman announced that they plan to get married in December—"

"Really! She's still recovering from the rape!"

"She is, but the event pushed Arieh and her to reconsider their relationship, and they decided to get married. Ernesto and Jenny followed by announcing their marriage plans two sols later; Kevin is reconciled to it, though he's unhappy, of course."

"Wow, that's great! What role are you playing in all this?"

Martha smiled. "Perhaps it's unprofessional, or perhaps it's a necessary improvisation, but I've discovered I'm not a bad match maker! I can help people in a courtship negotiate their way past some of the bad baggage."

"I thought so!"

"But wait, Will, there's more, Will. Daichi and Ryoko Furukawa came to the hospital for a maternity test; they'll have a baby in February. They feel guilty, since

normally couples don't have children here during their first columbiad. You need to reassure them."

"Okay, I'll do that."

"Then Érico and Carmen showed up; Carmen wasn't feeling well. It turns out she's pregnant as well, much to their surprise!"

"Wow! I'll have to congratulate them as well!"

"And there's more! Yestersol Eve Gilmartin discovered she's pregnant!"

"I thought they didn't want children."

"Well, they do now."

"I guess so. Wow, maybe I should go away more often!"

"I suspect we'll hear more pregnancy announcements. We haven't had any for a while, and conjunction marks a good time to start trying for a family."

"I'm tempted to say something at dinner tonight, but I suppose I shouldn't; the people who have decided to remain childless or unmarried will complain about my bias. Maybe I can start by admitting my bias and congratulate everyone."

"That might work, you sentimental guy. This'll be good news for the Commission, too, after the crime stories dominating headlines about Mars lately."

"That's true."

"I see Cassini elected the same civic government as Aurorae's except they added a Borough Council."

"They wanted to avoid endless town meetings."

Martha laughed. "They've been talking to their friends here! We've had town meetings twice a month and we still have months of items on the agenda. I think the

people in favor of the town meeting doing everything are beginning to accept the idea that the meeting has to appoint committees to digest matters first."

"It's ridiculous." Will glanced up and saw Ruhullah Islami outside his door. "My appointment has just arrived, so we should finish up."

"Oh, I'm finished with my report." Martha rose from her chair. "See you at lunch." She headed out of the office.

Will rose from his chair and followed her to the door, then welcomed Ruhullah. "I'm glad you could make it. I know you'll be heading for Elysium tomorrow." He sat in a chair in the front of his desk and Ruhullah sat next to him.

"The plans are finished; it's the fastest planning for a major expedition ever."

"There's so much data and so many previous proposals, it's relatively easy," agreed Will. "But I didn't call you here to discuss Elysium. Remember our conversation, some time ago, in the patio, when you asked whether there was administrative work you could do? I need someone to replace Daniel Shapiro to watch the finances, oversee the accounting of the exports, and help administer things. If I remember right, you have some accounting experience."

Ruhullah smiled broadly. "I do indeed! My parents insisted I major in business; it wasn't until graduate school that they let me switch to geology!" He laughed. "Maybe that business training will be useful, after all. I remember accounting all too well!"

"So, you'll do it?"

"Yes, sure! I'd be glad to. Thank you, Commander."

"You're welcome. From your management of expeditions, I've seen you can do this sort of work, and besides; you asked."

10

Conference

late Sept. 2047

"Look, Will, we aren't going to postpone the Mars Development Conference again," exclaimed Morgan. In spite of some fuzziness in the video, it was clear that his face had a determined expression. "Everything is ready to go. We can't help it if the Mars Colonization Society can't get the landowners to agree on who can attend their parallel conference. They shouldn't have tried to exclude the big corporate land owners in the first place. The lawsuit and injunction is what they deserve. I see no reason to help them out. TThe landowners want to stick their nose in our business. I find it hard to believe you want more hassle right now. Over to you, bye."

Will listened with growing agitation. He hit reply. "Doug, the land owners can be a pain in the ass, but they own land here, so they have a certain right to be! We didn't invite 55,000 people and 133 businesses to donate $1.5 billion to the Mars Commission out of the goodness of their hearts. They bought 35 million hectares. Naturally they want a say about what services they can get, whether they are taxed for their land, whether land will be released to the public so fast demand will collapse and the land value will fall, etc. Now I agree there is a problem when 133 corporate landowners get more votes than 55,000 individuals because they've spent more money. I also agree there's a problem when the individuals insist on one vote per person and thereby cut corporate owners out entirely. Neither situation is just. We can't solve the problem for them, but let's at least *help*. After all, our conference is scheduled to start tomorrow. There's a good chance the corporate land owners' injunction will be thrown out of court; this claim of the Mars

Exploration Society to be pulling together a meeting of land owners just in the Borough of Aurorae is very clever and perfectly legal, and excludes ninety percent of the corporate land ownership from the conference. But we can we at least invite corporate representatives to attend the Houston gathering so their voices can be heard? That's only fair. Back to you."

Will hit send and turned to other matters while he waited half an hour for Morgan's reply to return. The reply was late; Morgan was talking to other folks, such as Louisa. But finally the answer came.

"That might work as a compromise. They won't have a vote here, but they'll have quality access to the people making decisions. All right, you've worn me down. These time-delay meetings drain me. We'll invite the corporate members here and introduce them to everyone at some point. Bye."

Will smiled; he had won that round. It had taken parts of four hours. Someone had to invent communications that went faster than the speed of light; the delays took great patience and care. He had to admit, though, that he had figured out how to use the delay to his advantage.

Even though his stomach was growling for lunch, he had time to initiate another conversation. He recorded a message to Heather Kimball, head of the Mars Exploration Society. "Heather, this is Will. We're inviting representatives of the corporations to the Mars Future Conference in Houston. You've got to throttle these anti-capitalist, anti-globalization, utopianists. They haven't bought much Martian real estate. They're noisy and organized, but they are a minority. Why can't you propose that all votes require two majorities: a majority of persons and a majority of shares. That will force everyone to

listen to everyone else. Otherwise, you'll get two organizations, not one. Heather, I'd like to see us consider a bicameral legislature for Mars; the lower chamber elected by property owners, the upper chamber by residents. I don't think anyone would favor a tricameral legislature where corporations get a chamber of their own. The principle of property can be pushed only so far. I, for one, will oppose a role of property owners in the commonwealth civil authority if they can't get their act together. You're the one to bring them together. Let me know what you think. Bye." Will reviewed the message quickly, then added a blind copy to Louisa Turner; he liked to keep her in the loop when he was making theoretical observations, as she had more concern about vision than Morgan. He knew she would share some of the messages with the Commissioner.

He clipped his attaché to his belt and headed to the patio for lunch. Ethel was already there with the kids; they always sat at the same table for lunch with Sammie, Corazon, and their parents. Half way through his plate of food Heather Kimball replied. "Will, I'm trying. They really aren't controllable; they're all-or-nothing fanatics. But thanks for telling me about the idea of the bicameral legislature. I don't think anyone has thought about that angle. Maybe I can use it to push some sort of compromise. Bye."

Will closed the attaché with a smile. Ethel had seen Heather's face on the screen. "How's Heather? Trying to hold the property owners together?"

"Yes, and she looks frazzled. A group called Socialism for Mars threatened to pull out of the conference and split the property owners if the corporations were included. Louisa's going crazy over the mess, since the property owners' conference was scheduled to shape the agenda on three afternoons."

“Is it legal for the Commission to give three afternoons to the Aurorae property owners?” asked Érico.

Will nodded. “Yes. We plan to offer the corporations seats at the Houston event so they have a say as well.”

“Politics,” said Roger, shaking his head. “What a mess.”

“Hey, what’s this?” asked Ethel, looking at the large screen on a nearby wall. A British game show had been on, the banter visible as subtitles on the bottom, but it had been replaced by a news anchor. Then there was a cutaway to a collapsed, smoking skyscraper.

“Whoa!” exclaimed Will. “That’s serious news! Let’s get the sound turned up!” He grabbed his attaché and began to click through icons to find his way to the controls, but suddenly the sound started, and loudly. Someone else with managing rights had gotten to the controls first.

“We repeat, the building had at least 6,000 people in it when the bomb went off in the underground garage. Thankfully, many had already left for the day. As you can see, the collapse of the building was total and instant. Geiger counters are going off the scale at several locations in the area, hence it appears that the bomb had a radioactive component of some sort. Evacuation of the entire Défence area appears inevitable and it may be necessary to evacuate much of Paris. This absolutely unbelievable act of barbarism has caught France completely by surprise. Much of the civilized world is reeling in shock as the City of Light suffers the greatest act of terrorism in human history—”

“Oh, my God,” said Will.

The entire patio erupted into shocked conversation. There was a sharp cry from the next table over. They looked to see Eve and Gaston Gilmartin; Eve was in shock. “That’s where Paul works!” she exclaimed.

“Who?”

“My brother! He works there! It’s an office building for the European Union!”

“And it’s across the street from the new European Space Agency headquarters!” added Gaston. “And ESA has our medical and ecological support services!”

“God protect them,” said Roger.

“Who would do such a thing?” added Carmen.

The journalist, almost in response to the question, turned to something new on his computer screen. “And we are now receiving information from the newspaper *Le Figaro,* which reports it just received a fax from a group calling itself *Frenchmen for a Pure France,* who have claimed responsibility for the blast. It says the blow was aimed at the European Union, the Euro-Russian Alliance, the United Nations, and American corporate power. The release calls on all ‘true Frenchmen to defend the homeland from foreign cultural and linguistic domination and from alliances and unions that dilute French identity.’ The *Défence* is an ultramodern section of Paris dominated by glass and steel skyscrapers, filled with many multinational corporations and the headquarters of many intergovernmental agencies. It is located on the edge of the beltway circling Paris. We have just received a report that the highway has been closed.”

“This is incredible!” said Madhu.

“I hope this wasn’t the U.S. Army’s missing suitcase nuke,” exclaimed Rosa.

“Isn’t that just a rumor?” asked Ethel.

Rosa shook her head emphatically. “The army has never confirmed the report, but it has been very careful not to deny it. It must be true.”

“But how could a suitcase nuke be smuggled from Korea to France?” asked Roger.

“The trick would be getting the nuke across the border from Korea to Russia; the customs procedures are pretty careful,” replied Rosa. “But once in the Russian Federation, there are no tariff and customs barriers all the way to Paris.”

There was silence in the room as everyone contemplated that thought. They turned back to the screen, with private conversations and some private tears. When 1:15 came, everyone was still seated; no one headed for work. No work would be done the rest of the sol as they clung to every report. Will rounded up the teachers, though, and asked them to take the children away; the story was getting too terrible, the images too frightening.

It was soon confirmed that the bomb had indeed released radioactivity. Everyone in greater Paris was ordered to stay inside, except those within five kilometers of the explosion, which included much of the heart of Paris. Night had already fallen; in the dark, with the beltway highway closed, parts of Paris descended into panic and chaos.

Suppertime came and almost everyone was still watching. The children returned and the television screen went off in the patio. Father Greg announced an interfaith memorial service after supper. Almost everyone—even the self-proclaimed atheists—attended. The singing, scripture, and prayers brought some comfort.

“Humanity will always have terrorists, I’m afraid,” sighed Alexandra, after the service ended.

“I hope not,” replied Will. “We certainly can’t afford them here. Half the population of the Outpost could be killed in a minute.”

“No society ever created has avoided extremism,” replied Érico. “Fanaticism seems built into the human condition.”

“It does seem, but there is a better way, at least if the Bahá'í scriptures are to be taken seriously,” replied Will. “The ideal of unity is something we can recognize and strive toward. We may never get there, but the process of working toward it produces a different culture, and that different culture has less fanaticism and partisanship.”

“Partisanship?” asked Érico, surprised. “Don’t liberal Bahá'ís have trouble talking to conservative Bahá'ís?”

“We don’t have conservative and liberal Bahá'ís. Those terms don’t mean anything in the Bahá'í context. It’s quite remarkable.” Will saw Érico didn’t believe him. “It’s true. I can refer you to publications about the topic, if you’d like. We tackle partisanship at several levels, but one of the practical steps is that in Bahá'í elections, all nominating, campaigning, and mentioning of names is forbidden. Voting is a spiritual act; a form of prayer, you might say.”

“Interesting. But not practical in a secular society, I’m afraid.”

“True, I can’t see all of us here praying before we vote.” Will glanced at his watch. “I better help Ethel get the kids to bed. Good night.”

“Sleep, don’t watch t.v.,” said Alexandra.

Will walked home, thinking about the conversation. But soon he was home and Marshall was behaving very badly; he was upset about the news but couldn’t put it in words. After both kids went to bed, Will looked at his attaché and saw there was a

message from Morgan. “Will, we have to decide what to do about tomorrow. Everyone has arrived here, but no one wants to start the conference. I bet your people are distracted as well. Let’s talk. Bye.”

Will hit reply. “Doug, I think the attack in Paris makes some of our agenda more important than ever, especially the panel discussion about conflict and peaceful resolution of differences. I’m scheduled to speak on that panel—to introduce it—and I have a few ideas. So I suggest we keep it, but modify it slightly to fit the situation. I can work with Louisa about it. Bye.”

He hit send. Ethel looked at him from the couch. “I sense something unusual, perhaps even controversial.”

Will shrugged. “Maybe it’s time I spoke from my convictions, rather than just acting from them.”

“You’ve been Commander a while and have a pool of good will. But I’d be careful not to undermine it.”

“I agree. I’m going for a walk around the Outpost. I have to think.”

The next morning the patio’s large screen was filled by an image of a conference room in Houston slowly filling with people. The children were taken to school or day care, then the majority of parents hurried back to participate in the Second International Conference on the Future of Mars. A second wall screen showed the patio in Cassini.

Morgan welcomed everyone at precisely 9 a.m. Houston time—which was 9:15 a.m. in Aurorae—with an overview of the history of conferences about Mars, noting that the world’s continued expansion made governance, law, and culture a new priority.

Then the panelists of the first theme—"Social Change without Dissidence"—sat on the podium and Louisa Turner introduced them quickly. Present were a conflict resolution expert, a sociologist, and a traditional Lakota healer. She explained the use of dissidence—literally, "sitting apart," meaning that dialogue had broken down—and contrasted it with dissent, "feeling differently," which was a natural and acceptable level of difference in any society. Then she introduced Will Elliott, the invisible panelist, who had recorded his comments an hour earlier.

"Thank you, everyone, for coming this sol," Will began. "My thoughts inevitably are drawn to the terrible tragedy that occurred in Paris yesterday. This morning's headline in the *New York Times* was 'Today we are all French'; *Aujoud'hui nous tous sommes français*. It is a fitting echo of the headline in *Le Monde* almost exactly forty-six years ago, 'Today we are all Americans' which led their story about the destruction of New York's World Trade Center. Last night many of us discussed the implications for Mars of that gross act of terrorism and I felt moved to consider how Mars could create a culture where such wanton cruelty can never happen. We are even more vulnerable to terrorism than our terrestrial cousins, for a disruption in our air supply will kill all of us in three minutes. We cannot afford to build a world where an intentional disruption of our air supply is a danger.

"Is it possible to build a world free from terrorism? Perhaps it is not, but we must do better than history might suggest. The place to start is with our assumptions about the nature of society and social conflict itself. Difference between human beings is not only inevitable, it is good, but breakdowns in communication and conflict are not always necessary and inevitable. We must not look at the problems in contemporary human

society and say they cannot be ameliorated. The gradually thinning human skull and skeleton over tens of thousands of years is mute witness that we have become less violent. Humanity has abolished cannibalism and slavery. It is on the verge of abolishing war. It has managed to banish tyranny and dictatorship to small corners of the Earth, and in far less time than anyone might have imagined. At the dawn of the twentieth century only a handful of countries were democratic; by the end of that century, the majority of humanity lived under democracy or partial democracy; today it is the accepted standard for governance.

"Mars, obviously, will have democratic governance; nothing else is imaginable. But how does this relate to the goal of abolishing terrorism? Democracies clearly have not slain that dragon. Can we pioneer a form of governance able to reduce cultural and social conflict enough to save Mars from terrorism? Most would say no.

"Winston Churchill once commented that democracy is the worst form of government, except for all the other forms that have been tried from time to time. But perhaps Mars can do a better. The starting point I would identify is in the resolution of conflict. The various techniques and principles of behavior to be discussed by this panel today are not simply advice to apply when person x has a disagreement with person y. They have to permeate the political processes we use to select our leaders and the legislative processes whereby we determine our laws. For the last few centuries democracies have utilized political parties as the major players in the selection of leaders and laws. But consider where partisanship has taken democracies on Earth. Many advanced democracies today are now dominated by political machines that exist not for the good of their societies, but for their own advancement. One of the means to advance

the party is to play on the public's emotions by attacking the people and ideas of the other party, painting them as misled, foolish, dangerous, or evil. The result is not a focus on what is best for the nation. Rather, it is disillusionment and cynicism—for the people are convinced that almost all politicians are crooks—and legislative gridlock.

"At this point people will say 'alright, perhaps we agree with your point, but nothing can be done.' No, there is a lot that can be done. After all, we may assassinate the character of politicians, but we no longer poison their food. Progress in political behavior has been made; the behaviors that are considered culturally acceptable have changed, and they can continue to change. What we need to do here on Mars is resolve that we will not establish political parties at all. On Earth there are many cities that hold nonpartisan elections. Why not an entire planet? Especially when that planet has vast cultural diversity and a thin foundation of common values; one thing it does not need is politicians who intentionally play on differences and exaggerate them for short term gain. Entire countries have been destroyed when that has happened, and terrorism follows. The disintegration of Yugoslavia is the most chilling example.

"But will abolition of parties be the solution? Of course not, it is just a step. A second, more radical step, and one Mars may not be ready to follow, would be abolishing political campaigning. So far we have done pretty well where this is concerned. When we hold elections we call a big town meeting to discuss the future of the borough and let everyone speak their mind. No one is running for anything officially, but some people obviously have things to say, and a sort of unofficial debate results that does everyone a lot of good. Why not continue in this mode? Why take formal steps to create candidates? Some will say that if there are no official candidates, then the incumbents will

automatically be reelected, and that's dangerous. Perhaps, but in most democracies 99% of incumbents are reelected anyway, and that's after they've been dragged through the mud by their opponents. Can we create a culture where there is election turnover without screaming, yelling, begging for money, insulting the other person, lying about what the other person will do, and making false promises about what you will accomplish? Let us hope so! Let us try!

"But will elimination of extreme behavior in political campaigns clean up Martian governance enough? No, because we can't eliminate it simply by policy or law; it'll creep back through the loopholes and exceptions. The third step to take is the hardest: we must change our culture. We must understand, as individuals, that we have a human right to choose whomever we want for a particular office, and *we have a human right to do so without interference from others*. We must vote not whether we think someone will win, but because we think she or he will do the best job, and no one has the right to tell us he or she is the best choice. We must understand, as individuals, that we must seek truth, and not compromise it except under one situation: we must accept the decision of the majority, support it, and see whether it will work. The unity of our society is the practical higher value, but it must be unity in justice and diversity, for without justice and diversity there is no unity. We must see ourselves, first and foremost, as servants to others, for if everyone seeks to be servants of all, all will be served. Servants offer their ideas to others rather than advocate them or refuse to modify them. Servants respect all, love all, are courteous to all. Servants listen to all and seek to persuade, not intimidate or fool others.

"This is the society and culture we can and must build. It is a society based on many universal human values that are common to our religious traditions. A servant

society is neither purely capitalist nor purely socialist. It is democratic without the mob or the tyranny of the majority.

"Can we create a servant society? We must try. Such a society can greatly reduce partisanship, and as a consequence it will also reduce social tensions, polarization, and ultimately the tendency toward terrorism. I have always been dedicated to establishment of a servant society, even if I have not named it heretofore. You can count on me to oppose partisanship and narrow self interest strongly as long as I breathe air. I have no choice; partisanship is against my religion. Indeed, I think partisanship is against the spirit of all religion and against true human values, which have always called people to love and reconciliation. Let us continue building a political system based on reconciliation instead of confrontation, unity rather than strife, unity rather than partisanship. Thank you."

Will's image flickered, then disappeared from the screen. The audience on the patio clearly was very impressed; they applauded loudly, and some even stood. "Way to go, Commander!" exclaimed Kim Irion. Several other people made similar remarks. Will smiled and nodded, then finally stood to acknowledge the appreciation.

Back in Houston, Louisa Turner was several sentences into introducing the next speaker. "The applause in Houston was much more restrained and polite, Will," noted Ethel. "Clearly, we have a cultural difference."

"I'm not surprised. We've already been functioning partly along the lines I described. They haven't experienced it in Houston."

"Hey, did you see who walked out of the hall?" asked Roger, pointing at the screen. "Jeff Harrison, the White House representative, who is also a major functionary in the Democratic National Committee."

"Hum, then good news to our folks is controversial on Earth." Will shrugged. "Let it."

"It will be shocking," agreed Ethel. "Especially right now, after the bombing."

The morning panel, focusing on ways to prevent conflict and envision social change positively, generated a lot of discussion on the patio over lunch. Many people came to Will to ask questions about his statements, with half the outpost listening to the conversation. "Do you realize you basically said the partisanship that dominates modern politics is related to terrorism?" asked Kevin Dunbar skeptically.

"Yes, that's what I said," agreed Will. "I had just enough time to sneak a peek at my incoming messages before sitting down to eat. The Commission's office of public information has been busily categorizing and summarizing the media response to our conference. So far, my comments are dominating the news, for better or worse. I've been denounced by several people for saying that party politics is a form of terrorism, which I did *not* say. I've also been accused of going against the Constitution of the United States, a document that does not even mention political parties."

"Will's right," exclaimed Greg. "The more I think about your analysis, the more I agree. And this is a good time for the point to be made, with the dead still being counted in Paris."

"People will claim we're exploiting a tragedy," commented John Hunter.

"And no doubt I'll have to be interviewed by a dozen journalists, so I can clarify what my point was, defend myself, and have the privilege of being misquoted all over again," added Will. "But everyone here heard me. I'd like Mars to try a new and different way of governance. We really do have a chance to be an example to the rest of humanity. Our small size means we can develop new cultural conventions and values relatively easily, and our media prominence means we can offer them to all of humanity. We can be a leaven for human civilization."

"Lord knows that Earth could use it," exclaimed Martha. "Africa is getting poorer, wealth is concentrated in elites, petroleum production is declining sharply relative to demand, the world economy is inadequately regulated and unstable, the developed world has massive problems with illegal immigration and xenophobic reactions, much of the Islamic world is still profoundly anti-modern. . . it's a real mess."

"This afternoon I think we need to turn to the question of Mars governance," said Érico, looking at Alexandra. "We're scheduled to break into small groups to discuss the morning panel. We could still do that, but cut it short and reserve a longer time block for a sort of town meeting about governance."

"Don't say town meeting!" exclaimed Roger, rolling his eyes.

"That's part of the problem we have to deal with," agreed Alexandra. "People have had it with town meetings. We need fewer of them, and more digesting of ideas beforehand."

"A Borough Council," agreed Silvio. "That's in the proposal we've been drafting." Silvio was referring to bylaws for Mars that he had been drafting with the help of Alexandra, Érico, Ruhullah, Will, and some experts on Earth.

"What sort of Council?" asked Martha.

Silvio hesitated and looked at the large audience listening. "It's still rather preliminary. Each borough will elect a chair, clerk, and treasurer once per annum—Martian year—who will also serve as a Borough Council. The Council can appoint committees and must approve the budget, new ordinances, and other resolutions before they are ratified by the town meeting. That should reduce the town meeting's workload. Once a borough's population hits 100, it elects two additional members to the council. The additional members go to four when the borough population reaches 500, six when it reaches 1,000, and two more per two thousand thereafter, to a maximum of fifteen members. Mars will have a bicameral legislature; a Mars Council elected by the residents and a Mars Assembly elected by the land owners. The Mars Council will be selected proportionally and will have nine members plus two more for every additional thousand planetary residents. The Mars Governor will be appointed by the Mars Commission. We're debating whether to add that the people will elect a Prime Minister, whose duties will be specified by the Governor and legislature, but will be principally domestic in nature: education, health, etc. The Prime Minister will nominate judges to the legislature, which will approve them. I suspect for now, once we elect a Mars legislature and Prime Minister, the Aurorae government will have much less to do, because right now it is doing double duty."

"Why should land owners have a say in all of this?" asked Enlai, skeptically.

Silvio shrugged. "I don't particularly like that, either, but the reason is simple: property owners are pouring a lot of money into Mars, and thus should have a say in its

governance. Eventually millions of people who live on Mars will dominate land ownership and thus the Mars Assembly will be elected by Martians as well."

"But will the land owners have one vote each, or one vote per dollar invested?" asked Enlai, who was still concerned.

Silvio shrugged. "Who knows. That part isn't drafted, yet. I suppose the landowners will have to decide. I'd favor a 'graduated franchise'; in other words, ten square kilometers of land or less gives you one vote, one hundred square kilometers gives you ten, one thousand gives you fifty, ten thousand gives you one hundred. . . something like that."

"That'll be controversial," noted Érico. "But anything we propose will be controversial."

"Let us hope some of these decision making techniques can help resolve these issues," noted Martha. "Will, what does the Commission think of this?"

"Officially, Morgan's neutral, but he's very unhappy. The national space agencies are opposed to civil government here; they maintain there are plenty of laws already."

Roger scoffed. "They don't live here! Sure, one hundred people on a submarine don't need to elect anything; but they go home after six months. We're stuck here. Our families are here."

"We can make those points," said Will. "But we're going to have to watch public opinion on this and not move too fast."

"But if Morgan's not helping, that could take a while," objected Martha.

"Be thankful he's not against. He was against the idea until June, then came around. Louisa Turner is working on him and on the space agencies."

“How long, Will?” asked Yevgeny.

“Let’s take our time and get the ‘Fundamental Law’ or whatever it’s called, drafted. That’ll take a few months. Maybe the political situation will be better by then.”

“And what are we calling the entity we’re forming?” asked Kim. “We aren’t a ‘national’ government.”

Will smiled. “That’s the most controversial question of all. How about ‘the Commonwealth of Mars’? No one knows what that means, so we can define it ourselves.”

Several laughed. “Great idea!” exclaimed Greg.

11

Celebrations

early Jan. 2048

Riviera Biome was full of flowers. The clover made a soft carpet for the wedding of Ananda Thanarat and Kimberley Irion. The couple stood with a semicircle of readers of scriptural passages to the right and left of them, including Will, Ethel, Marshall, Enrique, Greg, and Martha. The ceremony culminated when the couple repeated the Bahá'í wedding vows: “We will, all, verily, abide by the Will of God.” Then Ananda and Kimberly signed the wedding license, followed by the witnesses—Will and Greg—while the audience, which included the vast majority of everyone on Mars, applauded.

A reception line formed to congratulate the couple, then everyone headed to Yalta for the wedding dinner, a sumptuous meal that was basically a very early supper. The wedding party stayed in Riviera for a while to take photographs, then entered Yalta to the applause of the assembled crowd. Clinking glasses forced the couple to kiss right away. Then everyone went through the buffet line and filled their plates.

“I’m amazed you’ve got this much good food!” exclaimed Gerhard Bach to Will, as he joined the commander at his table.

“We won’t be eating much meat for four sols, and the desserts won’t be very fancy either, until next weekend.”

“When the next weddings are scheduled.”

Will nodded. “Kevin Dunbar’s marrying Andrea Shelton at 1 on Satursol, then Arieh Freeman marries Sheila Burns at 2. We’ll have the reception at 3, as usual.”

“Plus the three weddings this weekend, and the two at Cassini last weekend and the weekend before; a lot of folks are tying the knot.”

“And Jennie Dunbar married Ernesto Gomes three weeks ago, and Cornelius Beyer married Tatiana Gavrilova last year. Columbus 6 has seen nine marriages! Which I suppose means that Columbus 7 and 8 will see about that many children.”

“It warms your heart, you sentimental fool,” exclaimed Ethel.

Will nodded. “It does.”

Gerhard pointed. “That’s Dan Shapiro, right? You’ve let him out for this event?”

“He’s been a model prisoner, so he got some time off for good behavior. He’s proved to be a very good Prospector driver from his quarters, and he runs them about fourteen hours a sol. Frankly, I wish we didn’t have to ship him back to Earth; he’s a very hard worker. He and Ruth would prefer to stay as well, but he can’t.”

“Will he spend time in prison?”

“That’s up to the judge after he arrives.”

Gerhard looked around. “But Stoughton’s not here?”

“No, he didn’t know the couple, they didn’t ask for him, and besides, he hasn’t been as cooperative. He’s gotten better in the last few months, but he’s still in a state of denial, even about aspects of the case for which there is indisputable evidence.”

Gerhard pointed to Emily Scoville and Muhammad Rahmani. “Those newlyweds seem to be doing well.”

“Yes. I’m glad they descended from the Dacha to attend this wedding.”

“I’m surprised Emily’s still wearing a headscarf.”

“It’s part of her new religion.”

“They came down from the dacha for Louise and Eliseo’s wedding yestersol. They’re flying back to Cassini on Monsol.”

“I’m glad you were able to get up here for both weddings, too,” added Will.

“Louise and Eliseo made an important contribution to Cassini, and besides, I wanted to get away and relax a bit. I plan to spend a few sols up at the dacha as well later in the week.”

“Congratulations on beating Consolidated, by the way.”

Gerhard smiled. “Thank you. It was a sweet victory! But we barely squeaked ahead, and their gold output may rise a bit faster than ours. It’ll be interesting to see what we can do during Columbus 7. The richest concentrations are exhausted so we may barely match our exports this year, even with twice as much equipment and staff.”

“Oh, you’ll do better than that, I think.” Will turned to Enlai Tang, who was approaching the table.

“Will, yestersol the sunwing brought us some very interesting samples from the fossil location in Schiaparelli Basin,” he said. “Daniel’s Prospector found them. It’s got three new species we’ve never identified before. It looks to me that Lake Schiaparelli was an isolated ecosystem for quite some time.”

“Let’s schedule a visit, then. It’s not far off the Circumnavigational.”

“Say, Enlai, what’s the scoop about all the Chinese leaving?” asked Gerhard. “Someone hinted to me the Chinese government recalled them.”

“I wouldn’t put it that way. The government prefers Chinese astronauts to stay here two columbiads only, then return home. But Li Qingtian and the Wangs will all tell you they decided to return anyway, and the Wangs have been here only one columbiad. I,

for one, plan to stay at least another columbiad. In my opinion, the government is short sighted. China has no shortage of experienced astronauts; they don't need to come here to acquire experience. If this place ever does gain significant size and cultural momentum, it's in China's interests to have its people involved. Otherwise Mars becomes more American looking; no offense meant, Will."

"Oh, I understand your point," replied Will.

"So do I," added Gerhard. "And I agree with you very much. We need more Chinese here."

"There are four coming on Columbus 7, all geologists and biologists."

"We'll talk about the Schiaparelli fossils on Monsol, Enlai. We'll schedule a visit then. I suppose you want to go along?"

"Most definitely!"

"Good, then you will."

"Thanks. See you Monsol, Will." Enlai waved and headed back to his table.

"I asked your question through channels and got even less than what you just got," Will said. "Out of seven flying back to Earth, three are Chinese."

"So, Columbus 7's forty people will include four more from Muller, five more from Consolidated, and six from Sibereco."

"Yes, plus thirteen mining support staff, six Americans supporting Bioarchive—three ecologists, two plastics fabricators and one generalist—and another two American nuclear engineers. The result is the least diverse flight we've had in a very long time. A lot of couples are coming; the governments and companies are planning long-term."

“The Bioarchive concept is catching on. I hear Russia wants to try it, and the Japanese are signed up for Columbus 8.”

“Yes, the idea has some momentum to it, surprisingly enough.”

“A shame Cassini won’t get a Bioarchive, though.”

Will smiled. “It will eventually. Aurorae has the most number of people and could use the extra space the most, but I’m sure we’ll put some at Cassini and Dawes as they grow.”

“That’s a relief. Not only does Cassini need the space and the redundancy; I need to look at more greenery!”

“I understand. For six years we only had greenhouses and it nearly drove us crazy.”

Will rose to get a second helping of the beef. He ran into Dr. Qingtian Li at the buffet table. “So, Qingtian, are you ready to command Columbus 6?”

“Thank you, I am feeling more confident. I plan to devote all of the next few weeks going over the systems again and training the crew. Commander, I want to include the two prisoners in the training.”

“I agree. It’d make them feel more a part of the team, will give them skills that might be essential in an emergency, and will improve their likelihood of being helpful.”

“I would prefer that.”

Will nodded. “I’ll talk to the Commission about it. They’ve already said they’re open to it.” He filled his plate. On his way back to his seat he stopped at Greg Harris’s table. “Father Greg, are you enjoying the reception?”

“Yes, even if there’s no alcohol! You Bahá'ís should change that rule.”

Will smiled. “No thanks. I guess people can be thankful they can drink from 7 p.m. Frisol to 3 a.m. Sunsol. I have my doubts whether even that’s wise.”

“I know what you mean,” agreed Greg. “We have too much high-tech equipment here. I suppose the new Mars Council can take up the matter.”

“If we can get it formed,” agreed Will. “It’s looking likely the land owners will settle their differences about representation in the next sol, so maybe we’ll have the last piece in place soon.”

“That’d be welcome news. We have a good design for governance. I think it’ll make people rethink their habits on Earth.”

“I hope so, but it hasn’t helped the land owners rethink their habits!”

Greg laughed. “I guess we had better work on them, next.”

Will continued toward his table. He stopped to chat with Lal and Radha; their baby smiled at him and reached out, so he gave her a kiss. Next was a visit with Eammon, Lisa, and their three kids; the twins were almost two years old and becoming very chatty. Last week Lisa had just discovered she was pregnant with their fourth child. Will spoke briefly to John Hunter, Sun-Hee Jung, and Susan Jung as well. Then he returned to his table.

Soon the buffet table was cleared away—the pigs would have particularly rich choices the next sol—and the wedding cake came out. Dancing followed; a live band provided the music.

At 5:30 p.m., the bride and groom waved goodbye and were showered with rice as they headed to Joseph Hall. As they were about to exit Yalta, Eammon began to wave his attaché. “Hey, there’s a news bulletin!” he shouted. “The landowners have struck a

compromise! They're forming two associations, one for individual landowners and one for corporate landowners!" He pushed on his earpiece to listen. "But they're electing twenty-five representatives to the Landowner's Assembly based on one vote per owner, and twenty-five based on one vote per share!"

"Good news!" exclaimed Greg.

"A compromise," added Érico.

Eammon raised his hand. "Oh, but they didn't approve the election of a Prime Minister!"

"They didn't?" exclaimed Will. "But they approved the rest?"

"Apparently," said Eammon. "We'll have to watch the tv to get all the details."

"Let's say goodbye to the bride and groom and get the big screen on," suggested Will.

"Good bye?" replied Kim Irion. "I'm not leaving yet, with news like this!"

"Spoken like the major Mars enthusiast that you are!" added Ananda.

"She stepped off the shuttle her first sol singing 'This Land is My Land,'" noted Will. "You've got time to get to the Dacha."

Everyone headed back to the patio, where the large screen was switched to the Mars cable channel. It was rebroadcasting the BBC coverage, which reiterated the news.

"It was premature to push for a Prime Minister," said Will, shrugging.

"Morgan was opposed, wasn't he?" stated Alexandra.

Will nodded slightly. "I think the owners felt that since they were on Earth, a Commission based on Earth was more likely to favor their interests than a Prime Minister elected and serving on Mars."

"Still, we have a planet-wide civil government; that's quite an achievement," exclaimed Érico. "Who would have thought we'd get that, twelve years after the first landing."

"It's historic," agreed Kim. She stood. "Let's sing!" she exclaimed, and immediately launched into the song Will and Roger had spontaneously created years earlier, though with a new stanza that had been circulating over the last few months:

This land is your land, this land is my land,

From Tharsis Montes to the Hellas Basin,

From the cratered highlands to the Mariner valleys,

This land was made for you and me.

As we were walking along the cliff edge

We saw above us, the twin moons shining

We saw below us the Aurorae Valley

This land was made for you and me

Everyone sang it a second time, then applauded quite enthusiastically. Will looked around, a bit surprised; he hadn't realized that the residents felt so positively about the development. But over three months had passed since the Mars Planning Conference. In that time there had been a lot of discussion on the Mars web forums and a lot of town meeting time to discuss progress. The town meetings of Aurorae and Cassini had ratified the "Fundamental Law" just two weeks earlier; the final hurdle had been approval by the landowners.

Until they acted, the vote by the residents had felt quite abstract. Now their act to define a system of self-government suddenly felt very real. Will found himself cheering

as well. He looked at Ethel; she was thrilled, too. He leaned over and kissed her. “This place has a future.”

“Did you ever doubt it?”

“No.”

Kim jumped on the stage below the television screen. “Let’s go outside and raise the Mars flag on the flagpole to celebrate the beginning of the Commonwealth of Mars!”

There were cheers at that idea, but many people immediately looked at the Commander, who was responsible for the American flag that had flown over the public park at the base of Face Rock for the last decade.

“We’ll lose a hundred million of Congressional support if we do this, won’t we, Will?” said Alexandra.

“Yes,” said Will. He smiled. “But this is a request from the bride. We should honor her request.”

There was a loud cheer and applause at that. Many turned toward the airlocks in Joseph Hall. Others headed toward Clarke Dome and habitats 1 and 3, which had spacesuit donning facilities and airlocks.

“Dad, can I go outside, too?” asked Marshall, excitedly.

Will looked at Ethel, who looked worried, but not opposed. He smiled. “Sure. Why not. This is an historic event.”

“There won’t be enough windows for the kids and their parents to watch through, if the kids all stay inside,” added Ethel. “I’ll stay in. Liz and I can watch from Renfrew Hall.”

Will nodded. “We’ve never had seventy or eighty people outside at once before! This should be interesting.”

“It’ll take an hour for everyone to get outside. Better hurry,” added Ethel.

Will nodded. He led Marshall toward Clark Dome. Kim saw him and hurried over. “I hope I haven’t started a revolution!”

“You have, but that’s alright.”

“Really?”

“Really. You’re right. The time has come to change the flag. If we all go outside, it’ll make quite a statement.”

“I’m afraid I’ve postponed the honeymoon,” she said to Ananda. He shrugged.

Will shook his head. “We’ll get you to the top of the Escarpment. We can send two rangers to accompany you, and they can accompany each other back down.”

They headed toward the airlocks. Marshall was soon plunged into the world of the male locker room, with a dozen half-dressed men trying to help him and Sammie to get into their bulky pressure suits. Everyone was testing backpacks, checking pressure seals, verifying the suits’ computers and their automated testing routines. Groups of five or six were clopping out of the locker room in their suits and squeezing into the airlock to exit.

By the time Will and Marshall got out, quite a crowd had formed. The sun was just minutes above the western horizon; a nearly full Phobos was high above the eastern horizon and dropping toward its setting in about an hour. The radio buzzed with a hundred conversations on the common channel. Will called Marshall’s cell phone, which was plugged into his suit, so they could talk privately and listen to the common buzz at the same time.

Kimberley and Ananda were nearly the last ones to emerge from Joseph Hall's airlock; a wedding gown took a long time to remove. Kim had put her veil back on outside the helmet. She was bearing the Mars flag she had brought from Earth. It was rusty red with white circles on the right and left sides representing the polar caps. Two yellow stars flew above the white circle where the flag rested along the flagpole, representing Phobos and Deimos. In the middle there had been a single green star representing Aurorae Outpost, but Kim had modified the flag at some point in the last two years, for it now bore two green stars.

She walked to the flagpole, ignoring the neat paths in the public park at the base of Face Rock and tramping directly on the geometric patterns Madhu had laid out with black basalt, reddish hematite, greenish malachite, yellowish sandstone, and white salt. Everyone followed her.

Kim reached the flagpole and untied the rope. She lowered the American flag and with great care and reverence and removed it. She and Roger carefully folded it according to proper flag etiquette while the others stood in a circle respectfully. Then she took the Mars flag from Ananda and hooked it on the rope. The two of them slowly raised it to the top of the pole, where it fluttered in the late afternoon breeze.

"To the Commonwealth of Mars!" Kim exclaimed.

A great cheer went up through the gathered crowd. The muffled sound of gloved applause echoed across the common channel and through the thin air. The crowd inside Renfrew Hall applauded as well. Will looked at Gerhard Bach and Bruce Curry nearby and both were clapping, though he wondered whether it was out of politeness. Will glanced at the crude profile of a human face that one could see in the silhouette of Face

Rock. He was surprised to notice that the evening sun, glancing across the side of the face, made it look almost like it was smiling. Mars itself seemed to be participating in the celebration as the inhabitants of Aurorae Outpost cheered the beginning of the Commonwealth's civil government.

Columbus 6:

Magellan 2 leaves Gateway Oct. 3, 2045. Should arrive at Venus Feb. 27, 2045, but can get there in late January 2045

Magellan 1 leaves Venus Nov. 2, 2045 and arrives at Earth 26 March 2046 [Hohmann; could be a month earlier]

Cargo leaves Gateway: Feb. 3, 2046 (normally 20 Jan., see arrival below)

Feb. 1, 2046: Marshall's sixth birthday

C6 Leaves Gateway: 17 Feb. 2046

Late Cargo leaves low earth orbit: 17 Mar. 2046 (delta-vee, 5.3 km/sec)

Magellan 1 reaches Earth: 26 Mar. 2046

Opposition: 17 April 2046

Late cargo arrives at Mars: 7 August 2046 (approach velocity, 8 km/sec)

Columbus 6 Arrives Mars: 17 Aug. 2046

Lands Mars: 27 Aug. 2046 (after maintenance visits to Phobos and Deimos)

Sept. 2046: Marshall starts first grade; MarTech open

Sept 2, 2047: Vernal Equinox

Cargo reaches Mars: 18 Oct. 2046

Nov. 1, 2046: Autumnal Equinox

Dust storm season begins: Dec. 21, 2046

Dust storm season ends: May 13, 2046

Magellan 3 leaves Earth May 9, 2047, arriving Venus Oct. 3, 2047 [Hohmann]

Magellan 2 leaves Venus June 8, 2047, arriving Earth Nov. 2, 2047 [Hohmann]

Conjunction: 31 May 2047

Columbus 6 leaves Mars: 3 Jan. 2048 (stays in Mars orbit a week)

Opposition: 3 June 2048

Columbus 6 reaches Earth: 10 July 2048

Plot Summary

A town meeting is held and many issues about justice and court procedures are discussed. Will and a group of associates discuss the implications of the town meeting; Mars-wide organization clearly is needed. The trial itself is swift. Will, Alexandra, and Silvio discuss the implications afterward.
DATE: late Dec. 2046

7. Proposals 90
The Secretary of the Interior calls Will to tell him about the Bioarchive project. He talks to Lisa about it. The next day he puts on the first pair of pants made on Mars; Marshall makes fun of them and asks probing questions about Bioarchive. Ruhullah offers his services for administration, as he plans to settle on Mars. Morgan says they will pursue Bioarchive as a way to develop capacities to make domes and solar cells, and the reactor project will have to wait a bit.
DATE: early March, 2047

8.Vacation 113
Will lobbies Senators to favor Bioarchive. Sebastian Langlais calls about coordinating the moon's needs for biomes with Mars's. Will replies that Phobos's carbon and nitrogen and Martian uranium are natural supports for the moon as well. But Bioarchive gets tied to building Dawes Outpost as well. Will notes the strange discrepancies in gold production and asks Yevgeny and Silvio to audit. At supper, they talk about vacation, and arrangements to run things in Will's absence. The next morning three families go to the Dacha. The boys go outside with parents to hike around. In the afternoon, while the kids are napping, the parents talk about the future. Meanwhile, down at the Outpost, communications with Earth collapse from overload because of conjunction, then internal communications collapse as well. At supper, Kevin makes a scene with Jennie over her new boyfriend. After dealing with that, Alexandra learns that Silvio has figured out that Dan Shapiro has been embezzling gold. Will finds out when he returns from vacation.
DATE: Conjunction (early June, 2047)

9. Organization 138
The trial raises issues of Mars's legal system, now that two boroughs exist. The Commission is upset with two criminal acts in six months; Mars now has a distopian reputation. Morgan pushes for exploration of Elysium and an asteroid mission. Will pushes for a constitutional convention. Morgan agrees to a Mars planning conference. Two weeks later, July 5, Will goes to Cassini. The residents agree to a borough government. The situation there is improved and gold production is strong.
DATE: late June, 2047

10. Conference 160
Will argues with Morgan and Turner about whether to postpone the conference again because the landowners are split. They agree to hold the conference and invite the corporate land owners to it. Will calls Heather Kimball and pushes her to push the land

owners to compromise. Will explains the problems among the land owners between the "utopians" of various stripes and the corporate landowners. Then a small nuke destroys a European Union building in the Defence, forcing evacuation of half of Paris. The next morning Will gives a speech condemning partisanship and terrorism. It is immensely controversial on Earth, but on Mars the residents think seriously about non-partisan ways of resolving differences and building a different model for civil authority.
DATE: late Sept. 2047

11. Celebrations 178
Ananda and Kim get married. Will talks about all the marriages being planned, the plans for Columbus7, and other matters. Then the news is announced that the land owners have settled their disputes and resolved their participation in the Mars Assembly. The Mars civil government is now complete. After everyone sings the informal anthem of Mars, Kim suggests they go outside and raise the Mars flag over the Outpost. The entire outpost suits up and goes out.
DATE: early Jan. 2048

Volume 6: The Commonwealth begun May 20, 2003 and finished July 6, 2003; Rewritten Oct. 16-Nov. 8, 2008

NOTE: The redback is equal to US$10 in 2046, which makes it equal to about US$1 in 2000. It that point $1 was also equal to about 1 euro.