THE MARS FRONTIER

Vol. 14

Debates About Independence

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Shackleton

May 3, 2063

The rolling, gray craters brought back memories. Not of March 2063, but of a March thirty years earlier, 2033, and a much smaller lunar lander bearing a soberly excited 32-year old Dr. Will Elliott on his first excursion to the moon.

Will looked at the complex of domes and prefabs of the Shackleton Station that spread out below him and focused on a small bump on the mountain's saddle just below the former peak, a bump representing the first inflatable hab anyone had ever erected on the moon. It was still there, even though the mountain peak was now gone and the terrain around it—once a gently undulating mix of craters and boulders mantled by a regolith of sand-sized particles—had been transformed so much as to be unrecognizable.

It brought a tear to his eye. His daughter, Lizzie Elliott, immediately noticed. "Dad, are you crying?" she whispered.

"I suppose I am." He gathered his thoughts to digest the emotion he was feeling. "Liz, I'm reminiscing about a time—well, it feels like a lifetime ago. When I look at Shackleton now, it makes me think of Rip van Winkle awaking from his sleep."

"I bet it looks really different."

"Different?" He chuckled and pointed. "You see that little tiny mound of reg? That's hab 1, planted on Mount Palmer in 2020. You can see the disturbed ground where a tunnel connects to hab 2, then 3, the 4, then a bigger hab 5. . . that was the entire station through most the 2030s. Then there's Jacaranda Biome, a fifty-meter enclosure like some of our older ones; it occupies the old peak of Palmer Pinnacle, and I remember climbing

it! We had it covered with solar arrays. Jacaranda was their main agricultural facility and gave them a bit of open space. Then jog to the left and you see a silver line in the reg; that's a line of buried greenhouses about 150 meters long with their mirrors on top to reflect in the horizontal rays of sunlight. It connects to Kimball Dome, occupying the former O'Keefe Pinnacle. You can't see the dome itself because it has a kevlar canopy over it to stop micrometeoroids, but under the canopy is a dome one hundred meters in diameter and fifty meters high. The inside of the dome has a silvered surface to bounce sunlight downward on the plants and buildings below. It's named for my old friend Heather Kimball, the first woman to walk on the moon, back in 2021."

"You knew her?"

"Pretty well. We were on two missions together, including my last one on the moon. She was the pilot who flew me up from Shackleton to Gateway for Columbus 1's flight to Mars. It's a shame she died of a heart attack last year; she was quite a woman.

"Anyway, Kimball Dome is located right on top of O'Keefe Pinnacle. It wasn't all that high; maybe twenty meters. But here at the south pole, perpetual sunlight's hard to find, and peaks are the places you find it. I remember climbing O'Keefe Pinnacle in 2033, I suppose it was May, not long before our departure. Now it's completely gone!"

"And there's a huge mast with solar panels rising next to the dome."

"Yes, whenever they need more power they add more height to the tower. In lunar gravity, they could easily go up a thousand meters if they had to."

"And what are those bumps over there?" She pointed to a rectangular of six buried habs near the first set of habs.

“That’s the old Chinese station. They still use it, but they also have a section of Kimball, next to the Hilton Hotel, I’m told.” He chuckled at the thought.

“We’ll have to get a walking tour.”

“Definitely. I’m sure we’ll have the time.” He shook his head. “If someone had told me in 2033 that thirty years later I’d be returning to the moon with my daughter, I’d have said they were crazy.”

“Well, here we are.”

“Indeed.” He leaned over and kissed her.

“Dad, you weren’t the first man to return to the moon, I know that; what number were you?”

“Thirty-third, after the original twelve Apollo astronauts that is. When we returned to the moon, almost all of them had died. I was there for four months in early 2027, in late 2028, early 2030, early 2033 for Mars training, then David Alaoui and I were stranded there an extra three months when a lifter lost an engine carrying your mother and three other Columbus 1 astronauts back to Gateway.”

“She told me about that; pretty frightening.”

“It was. There haven’t been any accidents since, thank God, even though there have now been three hundred fifty flights to the moon. Forty-five hundred people have been here, and most have been tourists!”

She craned her neck to look out of the porthole. “I wish I could see some of the ice in the permanent shadows.”

“We’ll have to go for a walk. I suspect all the shadow areas I visited have been strip mined by now! You can’t see the lunar interferometric radio telescope array from

here; it's fifty kilometers to the south on the back side, away from terrestrial radio signals. The hundred-meter optical telescope's there, too; it has to be away from Shackleton's air pollution! We can't see the platinum-group metal refining plants, either; there are three company facilities and they're fifteen to thirty kilometers away. Their folks live at Shackleton and commute or telecommute to work."

Just then the intercom crackled. "Prepare for the terminal burn in ten seconds."

"I was beginning to think we were getting pretty close," said Liz. "How big's Shackleton?"

"I think it now has five hundred, plus capacity for up to fifty tourists at a time."

Liz nodded. A moment later the engines came on and weight suddenly returned; one gee of deceleration, unpleasant for those used to Martian conditions. The ground, which had seemed far away, had begun to rush up on them faster and faster; Hab 1, which had been a speck at the beginning of their conversation, now was easy to see. They could see that the shuttle was aiming for a circular landing pad surrounded by flashing beacons, but within a few seconds the vehicle turned vertical to burn off their descent velocity and the pad was out of their line of sight; instead they were treated to a horizontal view of Shackleton as they descended below the level of the mountain top to a landing pad in the sunlight on one of the peak's broad shoulders.

The muffled roar of the engines began to throttle back, then they stopped and the ship touched down with the slightest jolt. The intercom crackled. "Ladies and gentlemen, welcome to Shackleton Outpost. You may now move about the cabin, but it will be fifteen minutes before the passenger transporter can complete docking. We will have complementary champagne ready for you in a minute."

There was a cheer from the tourists; the twenty-four acceleration couches in the two-level cabin were all full. “Tourists,” mumbled Will, though it was a comment on the champagne more than anything else. He shared their excitement. He and Liz unbuckled their seat belts and rose to stretch and enjoy lunar gravity, and he was soon telling old stories to people around him.

They could hear clanks as the passenger transporter maneuvered a docking tunnel in place, then locked it against the ship’s side. Everyone began to get their luggage from the storage lockers on the lower deck. The airlock opened and everyone passed through. Liz was disappointed to see that the transporter was just a conestoga, a mobile home-sized vehicle common on Mars as well. They sat, the tunnel was disconnected, and they began the six-kilometer ride to the outpost.

Twelve minutes later the conestoga drove into an airlock and entered Shackleton. The doors opened and everyone rose. A tourist stuck his head out of the door. “Dr. Elliott, you go first,” he suggested. Will nodded and he stepped out ahead of the others, followed by Liz.

A band suddenly began to play a song. Will was startled to see them; it was to welcome him. A welcoming party awaited him led by Dr. Richard Page, head of the Lunar Commission. Like Will, he was an American, aged 61, though he had less hair left on his head.

“Dr. Elliott, welcome back to the moon,” he said.

“Thanks.” They shook hands. “My goodness, I didn’t know you had a band!”

“We do! We don’t get veterans from the old Project Orion days very often any more, let alone veterans who are also head of the Mars Commission! We’re really glad to see you. Let me introduce you to Dr. Sridhar Pradhan, Commander of Shackleton.”

“Good to see you again, Sridhar, after all these years.”

“Thank you, Dr. Elliott; it’s been eighteen years since I left Mars on Columbus 4.” They shook hands.

“I forgot you were on Mars the columbiad after I was!” exclaimed Rick. “I know you know Dr. Ursula Grenander, she spent four years in Mars on the mid forties. She’s our Director of Resource Development.”

“Delighted to see you again, Ursula.”

“Thank you, it’s good to see you again also.” They shook hands.

“Let me introduce my daughter Elizabeth, who was able to arrange a grant from the Mars Arts Foundation to perform ballet here and meet your dancers.”

“Good to meet you. I’m afraid I left Mars a year before you were born,” said Rick.

But I remember a little baby,” said Sridhar, shaking Liz’s hand.

“I remember a little girl; you’ve grown up to be quite an athlete!” added Ursula.

“Thank you,” replied Liz.

“Let us give you a quick walking tour, then if you have the energy, we’ll meet in my office,” suggested Rick. “Sridhar has a cart for your luggage.”

“Then I’ll take Liz to the dance studio,” he said.

“We probably need something to eat pretty soon; they don’t feed you much on the flight from Gateway,” said Will, putting his luggage on the cart.

“We’ve ordered a nice lunch,” replied Rick. He started across the floor of arrival hall. “It’s pretty different from the last time you were here, eh Will?”

“I feel like a man who has gone through a time machine and emerged in the distant future. It’s disorienting; a sort of culture shock.”

“You’ll have to see hab 1; it’s now part of our museum. The rooms we slept and lived in are roped off and tourists can look in and imagine what the early days were like.”

Will laughed. “I’m not sure I want to see it! But we did the same thing to habs 1 and 2 at Aurorae. They’re filled with old spacecraft, including Viking 2 and Sojourner.”

“I’ll have to come as a tourist, if I can arrange it.” Rick led them out of the arrival hall and down a corridor. On the right were glass windows opening on Hudson’s, their transplanted Canadian department store. Rick pointed. “Half the stuff we sell in there is imported from Mars, especially clothing, Marjeeling tea, and Marabica coffee.”

“We’re delighted to have such a big export market, too,” said Will. “I’m sure your tourists like buying the stuff.”

“They do.” Rick pointed to the left. “Gym, complete with swimming pool and beauty salon. You should try diving in lunar gravity. We’re grateful the tourists bring services here that otherwise we wouldn’t have. Of course, there aren’t many tourists here now because the hotel is full of folks heading for Mars. The place is packed with a hundred extra people right now.”

“You’re really helping us out by accommodating so many. It’s logistically difficult to 900 people to Gateway for the Mars flight over a three-month period. It’s easier to ship some here for preliminary training, then fly them to Gateway after the ships have all arrived.”

“The business is welcome.”

They approached a door and it opened for them automatically, flooding the corridor with light. They walked onto Kimball Square and immediately had to squint from the bright sunlight. The dome surface above and behind them was brightly reflecting horizontal rays, which passed through chevron-shaped, aluminized kevlar sheets, to prevent micrometeoroids from entering.

“I don’t know if you’ve done a virtual reality tour of Kimball or not,” said Rick, mostly looking at Liz, whom he assumed did not know her way around. “We’re in the lowermost level, the central courtyard forty meters across, a lovely public space with the Hilton opposite us, the commercial center to the right, the hospital, gym, and science labs to the left, and an administrative facility behind us. Of course, there are residential areas around the courtyard as well. Looking up, you can see two stories above the square is the first balcony level, then five more above it. Each balcony is ten meters wide; five meters open directly to the dome and five meters are under the overhang of the next balcony. Because the sunlight is reflected off of so many dome surfaces twenty-four hours a day, the entire area under the overhangs get adequate light for agriculture. The balcony levels have offices, labs, and condos as well. We can house and feed 250 people in this dome.”

Will whistled. “Impressive! It’s packed full of farming and housing, but the height and openness gives it an immense spaciousness.”

“From the floor to the apex of the dome is seventy-eight meters. The dome captures a lot of light and directs it downward, especially toward the rings of agriculture; we try to keep the light intensity in the central courtyard at reasonable levels. The big

disadvantage of this facility compared to your domes is that we can't see stars overhead or the lunar terrain outside. And it's a shame because we're on top of a mountain!"

"This is really. . . awe inspiring," said Liz. "Only one of our domes is this high."

Rick leaned toward her. "Inspiring, yes, but it cost ten billion dollars. Mars spent its billions on importing manufacturing equipment; we had to haul the dome and much of its equipment from Earth. You have an atmosphere; that means you don't need a kevlar micrometeoroid shield. We had to haul in sixty tonnes of carbon from Mars and the Earth to make some of the items the dome needed because the moon lacks them. And you can exchange surplus heat with the Martian atmosphere; you should see the hectare of infrared radiators we had to set up to expel surplus heat! This dome receives a continuous 5,500 kilowatts of solar energy, almost all of which ends up as heat." He pointed. "Let's get you settled in the Hilton."

He led them across the courtyard—which was bright in spite of a ring of tall palm and citrus trees—and into the hotel. In two minutes, Will and Liz had their room keys and the solitary bellhop agreed to take their luggage to their rooms for them. Then Rick led Will and Ursula back across the courtyard to his own office, while Sridhar took Liz to the Shackleton Dance Academy.

Rick's office was on the second story and had huge windows overlooking the interior of the dome. Rick brought his chair out from behind the desk and the three of them sat around a table near the window, where they could admire the view. Rick's assistant had coffee, tea, sandwiches, and little pastries ready. "So, Will, what are the objectives of your trip?"

“There’s always fence-mending to do, especially with the Board of Trustees; they have a definite idea how things should be done and they’re a hundred million kilometers from operations, so things are never the way the trustees think they should be. Last time we had only two days of meetings; this time, it’s five days with an optional sixth day. Then there are fires to put out; the Spanish are still unhappy that we want to close the Seville agricultural support facility. And there’s a financial scandal in the Australian office that I have to investigate.”

“Don’t you hate that.”

“Embezzlement is the worst and it’s hard to prevent because national regulations dictate that you maintain financial records in a different way in each country, enforce a unique set of policies in each, etc. I hate national offices and would prefer to close as many of them as possible. But it’s politically impossible.”

“The Lunar Commission spends half a billion a year of the money given to it on nearly useless offices as well. What’s this rumor I hear about privatizing?”

“You’ve been following *Mars This Sol!* We’ve been considering it for years and privatizing whatever we could. But now that our population has hit 2,500 and will grow to almost 5,000 in the next two years, we need to consider privatizing other aspects of the Commission, such as energy distribution and communications.”

“What about construction and fabrication?”

Will shook his head. “That’s still politically impossible.”

“I’ve been following the controversy over the Mars Authority’s decision to spend a half billion redbacks to buy a used Hermes-class shuttle. Hard to believe they need it for constabulary work! The Commission already provides rescue capability.”

"It's really a prestige item; they're the domestic government of Mars, so they want a spacecraft. It'll pay for itself in leases for cargo transport. They have no plans to send out expeditions to Mars-crossing asteroids."

"Independence." Rick repeated the word slowly, clearly, and let the syllables flow from his tongue one at a time. "A very seductive idea, but it seems to me Mars really doesn't need it."

Will shrugged. "Depends on what you mean by 'need.' The Mars Residents Council and Mars Landowners Assembly set property taxes and decide how to spend the resulting income; the Mars Council alone sets export, import, and sales taxes and the expenditure thereof. As Commissioner I can veto changes in the taxation rates, but they can override me if they have 2/3 of the votes. The Chief Minister can veto the budget, since it's his responsibility to implement it, and in turn the legislative chambers can override his veto if they have 2/3 of the votes. Strange to say, I had no role in the shuttle decision; the Authority has been getting a revenue windfall from the huge surge in our exports, so they didn't have to change the export tax, and I have no say over the budget. It may fall outside the definition of 'domestic responsibilities' that are the sphere of the Authority, but the Fundamental Law doesn't say who decides what 'domestic responsibility' is or who enforces that clause!

"Many residents chafe at my role the Mars Authority; they feel it isn't right because I'm not elected. And there's 'national' pride: people want their flag to be official, their currency to be real money, they want Marsian passports and an ambassador to the United Nations. Those are not trivial matters; some people care very deeply about them."

"That's true." Rick looked at Ursula and Sridhar, who had just arrived. "Most of us are sympathetic to Marsian independence. Most of us have been there and a lot of us would like to go back. This place will never have independence. The longest serving staffer has been at Shackleton twenty-three months, and she heads back to Earth in a few weeks, where she'll undergo a month-long rehabilitation to adjust to the higher gravity."

"We divide into three groups, here," added Sridhar. "There are the post-university kids who come for a year or eighteen months, work their tails off in mining, maintenance, tech support, or tourist services, and get paid big bucks. Maybe after a year or so they'll do it again, or maybe they'll use their savings for grad school or to open a business. There are the older professionals who are childless and who stay long periods on a regular basis and spend their time on Earth providing support services or writing. And then there are the professionals who have families and who come here six months or less. Some are professors on leave from their university; others are full-time employees of the Lunar Commission who alternate between work here and Houston."

"And we're grateful to you for all three groups," replied Will. "Because our terrestrial support staff is now too small to provide a pool of experienced immigrants. A lot of those post-university kids come to Mars."

"And some of the other two groups as well. The moon has a constant personnel training problem," said Rick. "Fortunately, a *lot* of people want to work here."

"How have the Landowners Assembly and Residents Councils worked out?"

"They're anemic compared to yours. We've now got 50,000 individual land owners. They mostly own a hundred hectares fronting on the Shackleton to Aristarchus Highway. But only fifteen percent vote in elections."

“At least land values have been stable,” added Ursula. “Our big problem, of course, has been the cyclicity of the tourist market. The new enstatite chondrite deposits we found at Paranago hold out huge potential, because platinum-group metals are somewhat countercyclical in value.”

Will nodded. Lately jumps in the world price of petroleum had caused the terrestrial economy and lunar tourism to drop, but they had also pushed up demand for platinum and palladium needed for fuel cells. “I heard of the Paranago discovery a month ago. It’s a pretty remote spot to recover PGMs, though; it’s almost smack dab in the middle of the back side!”

“It’s two thousand kilometers from here,” replied Rick. “We’ll have a trail direct from here to Paranago finished in six months, and meanwhile we’re driving construction crews there via the Equatorial Trail or flying them in by hopper. Most of the PGM body is buried under a hundred meters of reg, but there’s enough on the surface for a few years, so we can get started without mining. We estimate the enstatite impactor was 1,600 meters in diameter, it was twelve percent metal inclusions, and half of it is recoverable; that a billion tonnes of metal, eighty percent of which is nickel. The nickel inclusions have 120 grams of platinum-group metals per tonne, so we’re talking about 120,000 tonnes of PGMs.”

“That’ll last quite a while,” said Will.

“Not as long as you think; maybe a century,” replied Ursula.

Will was startled by the implied production of over a thousand tonnes of PGMs per year. Rick nodded. “That’s one reason we want to talk to you. Last month the Lunar Commission got the survey report of Parenago, reviewed it, and decided to develop it to

the extent possible. As you know, terrestrial demand for platinum group metals is 1,000 tonnes per year. We suspect if you expand production to a thousand tonnes per year and we expand to a similar amount, prices will drop somewhat, but demand will expand to meet the output. The new fuel-cell economy needs platinum and palladium catalyst and some experts say that 2,000 tonnes per year can easily be consumed if prices fall to ten million per tonne."

"You're talking about a price one third what it is today."

"Yes, but everyone agrees the current price is absurdly high. It's driven by hoarding and speculation; the bubble will burst. When it does, half of Earth's producers will close up."

"Our workers will need food and consumer goods and Mars can supply them at sixty percent the price of Earth. We'll be buying half a billion dollars of stuff from you per year," added Ursula.

Will nodded. "That will help, and you'll need to import several hundred tonnes of carbon from Phobos to keep the processes going."

Rick shook his head. "No, Parenago won't need any carbon at all because the impactor was a few percent carbon."

That surprised Will; carbon was emerging as a major export to Earth orbit and the moon. "Where will you house the workers? Where will you get the power? You'll need a half million kilowatts of output. That's a big reactor."

"Equal to one year of production," replied Rick. "But we can do better with solar panels and a power storage system. Panels are incredibly cheap now. The impactor was several percent water, which we can use for power storage and for propellant. We might

lay a power line from here; it's a long way, but a telerobotic deployment system will save money. Power can be obtained. Most of the workers will work here."

"You have the same problem," noted Ursula.

"We don't have to store power for a two week nightspan."

"Just for a nine-month dust storm season."

"Well, we aren't even trying to do that. We concentrate on the low-energy aspects of the production cycle during storms and postpone the energy-intensive steps for later. I suppose you would do the same."

"When will your production at Uzboi peak?" asked Rick.

"We don't know. Our current output is three hundred tonnes per year, which is below our goal of four hundred. Uzboi already has two square kilometers of solar panels and it gets a nuclear reactor in another year to give it a significant level of base power. We didn't want to push output up any more because we didn't want to precipitate a decline in the price. But it looks like you've decided to precipitate such a price drop, so now we'll have to plan an expansion."

"Do you need the PGM production to achieve independence?" asked Rick.

"That's a good question. The numbers are all publicly available and are in redbacks rather than dollars; sorry about that, I can't convert quickly. In the last columbiad—twenty-six months—we produced five hundred tonnes of gold and five hundred tonnes of platinum-group metals, worth fourteen and twenty billion redbacks respectively. We get about seventy percent of that either as recovered salaries or payment for expenses or profit; thirty percent of the revenue is spent by private firms on Earth or becomes their profit. So of the total of thirty-four billion redbacks, we get twenty-four

billion. Other exports—caravels, water, nitrogen, methane, food, supplies—totaled 1.6 billion redbacks, and domestic consumption generates another 0.4 billion redbacks. We received government subsidies of eight billion redbacks. We had direct investment into Mars of two billion redbacks over the last two years. So that totals thirty-six billion redbacks. Our nominal budget over the columbiad was twenty-five billion redbacks. The difference is eleven billion redbacks."

"Where did the surplus go?" asked Rick.

"Some of the income comes next year because the PGMs and gold haven't reached Earth yet, some is in savings and investments, some has gone to supplemental purchases of manufacturing equipment, and some has gone into transportation improvements like purchase of more solar sailers. We'll receive six thousand tonnes of imports in the next three years. Some is a stockpile against future lean years and some is for expanding industrial capacity so the same people can make more."

"It sounds like you'll be in a strong position if you quadruple your PGM production and the price drops to a third, especially with increased exports to the moon," said Sridhar.

Will shrugged. "It's easier to say it than to do it."

"You can't say we didn't warn you," replied Rick defensively. "We have to make a living, too, and because the moon is close and boring, everyone expects it to pay its own way. Tourism's volatile. Two years ago you forced down the price of hydrogen and oxygen fuel, which undercut a big export market but made tourism more affordable. Science brings in a steady income, but it's rather small. We don't have the range of ores you have. PGMs are all we have."

"I know." Will paused to think about the situation. "We can raise the gold output somewhat, expand the PGM production as you recommend, and continue to develop other exports. We'll manage."

2.

Gateway

May 4-6, 2063

The rest of the afternoon, Will talked to Rick Page about other matters of common concern; the Mars and Lunar Commissions had many similar problems and had worked together often in the past. That evening he gave a public address that was attended by almost everyone at Shackleton.

The next day, he and Liz got a grand tour of the area. They were driven to see the interferometric radio telescope array and the fifty-meter optical telescope some sixty kilometers away, enormous, impressive scientific equipment that gave Shackleton immense astronomical importance. They came back to Shackleton past a private PGM extraction facility which was large, efficient, and impressive. Then they went for a walk through an area of permanent shadow so that Liz could see the frosty regolith that gave the polar region its chief resource: water ice, billions of tonnes of it scattered as a frost-dirt mix over thousand of square kilometers of shadowlands.

Day three took Liz into the Shackleton Dance Studio for intensive rehearsing for her dance recital, while Will took a hopper to LeMonnier Station in Mare Serenitatis on the lunar equator some 2,500 kilometers away. There he spoke to the Commander, got a tour of their tourist facilities, and was given a tour outside of the volcanic features that made LeMonnier a logical place to site a station. Volcanic materials there had a certain amount of water and the station extracted as much from them as possible. Otherwise it received a ten-tonne shipment of liquid hydrogen via robotic tanker every lunar nightspan, which it combined with locally obtained oxygen.

Day four he returned to Shackleton for more talks with Page and for a four-hour drive down the Aristarchus Highway to see their principal land transportation route to the equator. That evening Liz performed a piece she had developed, “Estival,” a celebration of Mars’s periodic eras of warmth, when the planet had a high axial inclination, warmed poles, no permanent polar caps, and extensive equatorial snowfall. It featured some very high jumps, made much higher in lunar gravity—fortunately the stage had an extremely high ceiling to allow the vertical expression of dance—and culminated with a leap that included five complete rotations in the air. The audience leaped to its feet and cheered when she finished.

Ursula looked over at Will and saw the pride on his face. “She’s really good.”

“She has developed a lot of confidence and ability in the last year.”

“And she hasn’t had much time to practice in lunar gravity!”

“She’s been practicing every day during the flight on a floor with lunar gravity, but with a low ceiling; no leaping. That’s what she’s perfected in four days.”

“She’s obviously picked up some techniques from our dancers. It’s too bad most of them aren’t here right now! Between Mars crew training and the Mercury crew training, we’ve had to rotate as many folks back to Earth as possible.”

“Yeah, talking to people around here, I get the impression almost half the staff are on their way to Mars!”

“That’s right. When your ship heads for Mars next month, this place will feel deserted.”

“Thank God you have so much capacity; it would be impossible for us to send so many people to Mars in such a short time otherwise.”

“The training they get here is good, too, and we make a hundred million.”

“Speaking of training, when does the Mercury crew get back? I want to talk to Olaf Norlander.”

“They’ve been down at Parenago doing construction and trail clearing for the last four months; it’s great training for Mercury. Norlander and a dozen others left there two weeks ago to drive to the near-polar regions where they can do geology and stay in the low-sun zone, just like on Mercury. Here, they’ll take over part of our life support and horticulture when those crews head for Mars. When the rest of the Mercury team gets here, they’ll be doing work in perpetual shadow zones.”

“And when do they get here?”

“Tomorrow afternoon.”

“That’s right, that’s what Olaf told me! We’ll have a few hours to talk before I head for Gateway.”

“They’re planning a big expansion of the gold recovery efforts at Caloris.”

“I know. It’s a bit depressing; the moon is undercutting our PGM sales and Mercury our gold sales!”

“I doubt Mercury will be able to change the price much, though; they’re too small and too far. The deuterium recovery system from the Venus atmosphere is a new threat.”

Will shook his head. “It won’t be economic to extract deuterium from Venus for a long time, if ever. The unmanned solar-powered deuterium recovery aircraft is pretty complex; it has to extract a tonne of deuterium from the Venus atmosphere plus enough hydrogen and carbon dioxide to fuel the recovery rocket while flying continuously for six months or a year, then the deuterium has to be flown to low Venus orbit and transferred

to a solar sailer and flown to Earth, where it can be sold for only ten million redbacks. . . the recovery rocket has to be refurbished and flown back down to the aircraft and reattached to it automatically, and has to be reused at least ten times. . . good luck!"

"It's pretty daunting, but the technology for Venus keeps getting better."

"Thank God for the commitment of the French and the Germans. Magellan Station's become a pretty sophisticated facility and the Venus science community is making real progress."

Ursula looked at the stage. A crowd of young men had gathered around Liz, though it was now thinning out. "She's really stirred up some excitement."

"And not just among ballet aficionados, judging from the fans!"

"Twenty, beautiful, and exotic."

"Marsian, and with an exotic skin color of uncertain racial background."

"That's right, you're partly African American, right?"

Will nodded. "We have a lot of multiracial and multiethnic kids on Mars. We're diverse and a lot of people married someone of another background. It's the wave of the future for Earth, too, but many folks haven't figured that out yet! And we have a great educational system, pretty good support for families. . . "

Ursula smiled. "Will, you're selling the place like I've never been there before!"

"Nonsense! I'm selling it to you because you can always come back! Why live a split existence, six months at Shackleton living underground, six months at Houston dealing with God-awful humidity and traffic jams. . . come to Mars, live in an open dome under a pink sky, find yourself a man, or even a woman if you prefer, settle down, take Geminale and have a set of twins and live happily ever after. . ."

Ursula threw her head back and laughed, a big, loud, belly laugh. Will was beginning to feel offended when she stopped. “Oh, you tempter! Who knows, maybe some day. . . I gather you have some pretty good fertility experts up there.”

“A fifty year old woman just had a child, six months ago.”

“Then there’s hope for me yet.” She looked back at Liz, who was now chatting with just one man; very handsome and dressed to match. She tapped Will’s shoulder. “He’s the station Romeo. He keeps count, and the number’s pretty big.”

“Then it’s time to express our appreciation to the star of the evening.” Will rose; Ursula followed.

“Romeo” saw him coming and immediately switched from suave to merely friendly. Will put a hand on Liz’s shoulder.

“You were really great; congratulations.”

“Thanks, dad. I’m told six rotations are possible and someone has done seven, but I guess five will do.”

“Next time you come here.” He smiled.

“I was really impressed,” added Ursula.

“Thanks. They holotaped it and I can’t wait to watch.” Liz pointed to the man next to her. “Lennie was just telling me how impressed he was. He just invited me to the lounge for a drink.”

Will nodded, interested in the way his daughter put it. She was too young to drink; the legal age on the moon was 21. And she didn’t drink anyway.

“Well, Ursula and I just came here to invite you to the lounge for ice cream and coffee. And Len’s welcome to come along.”

“Oh?” said Len. “Ah, thank you.”

The next morning was filled by meetings with former Marsians wanting to catch up with their former boss and with lunar personnel interested in switching jobs. Will could see that the moon would continue to experience a brain drain in favor of Mars, where exploration and family life could go together.

After a long lunch with two visitors, he returned to his room to pack quickly. He was beginning to think he’d miss Olaf completely when the Swede called to apologize and said he’d be right over. He was knocking on Will’s door four minutes later.

“Hey Olaf!” said Will as soon as he opened the door.

“Good sol, Will. Ah, that sounds good; I haven’t said ‘good sol’ in ages.”

“Good sol.” They shook hands vigorously. “It’s been twenty years.”

“It’s amazing, isn’t it? A long time. Here I am fifty-one years old.”

“And I’m sixty-one! Liz is twenty; she’s in her bedroom back there, you know.” He pointed to the rear of the suite. “She came to the moon with me. Marshall’s done with his undergraduate degree and is almost a year into his Master’s at MIT.”

“And when I left Mars, Marshall was a little baby; Liz wasn’t even born yet. My twins, Peter and Laura, are almost five; they’re on Mercury with Oxana.”

“How many kids on Mercury now?”

“Six.”

“Here, sit down.”

“Thanks. They gave you the nicest room in the hotel!”

“Yes; the Presidential Suite, and it costs accordingly.” They sat on chairs in the suite’s living room. “So, you get to the Earth occasionally?”

“Very rarely. I’m back this time because of the accident; it made sense to evacuate as many people from Concord as possible to decrease strain on life support while we got everything restored, and they wanted me back for the hearings. So I got back to Earth two months ago, finished up the hearings two weeks ago and got to the moon on the last available berth—your people have every berth full for the next five weeks!—and went down to Parenago. We fly to Mercury in two months. The cargo flights are bringing everything we need to build an entirely new dome, sixty meters across.”

“So you’ll have two; will they be close?”

“A hundred twenty meters. Concord’s built on a high plateau on a crater rim with perpetual sunlight, so we can put the second dome near the first and use mirrors to prevent either from shadowing the other. The disaster has had a silver lining; it accelerated the construction schedule. Concord-Beta will allow our population to expand to 70, and we’re set to get a third dome, Gamma, in three years that will expand Concord to one hundred.”

“Plus how many elsewhere?”

“Caloris has ten. South Pole has up to twelve, but they’re transient, and neither station has extensive horticulture. Concord’s it.”

“How’s the ‘home rule’ worked out?”

"Reasonably well," replied Olaf. "The Council has three members and is in charge of education and the arts. I'm in charge of everything else. We're so small, that's all the home rule we need."

"I hear you're expanding Caloris."

"Yes, that's one reason I wanted to talk to you. The plan is to push gold production up to twenty tonnes per year, with a goal of raising it to fifty tonnes per year in six years. That's not much competition for Mars. To make it possible we need to buy a lot of items from Mars, even some equipment, because you can make it and ship it to us cheaper than Earth can."

"We'll be glad to, even if it involves gold recovery. We already have a fairly regular cargo run to Mercury."

"I'd like to make it more regular, Will. The Commission has to finalize everything, but they give me a lot of say. Right now, you're shipping cargo to Mercury every 400 days. I'd like to make it every 300 days and raise the quantity from thirty tonnes to sixty. The main import would be food, but clothes and things like paper are needed, too. Your prices are much better than Earth's and the quality is pretty good."

"No problem. We'd love to strengthen our ties with Mercury."

"From an economic point of view, that's inevitable. You guys are even displacing terrestrial goods here at Shackleton. We may need some of your expertise in developing Caloris. Mercury poses some fundamental problems. Outside the polar regions, all habitations have to be buried against the long, hot dayspan. Expelling waste heat is literally impossible for two months so we have to store it in a rock reservoir that we cool off at night. Every drop of water has to hauled from Concord by robotic truck. Even

though Caloris's gold deposits are extraordinarily rich, they barely cover the costs of exploiting them.

"But I wanted to ask you about something else, too. What do you think about the Venus-Mercury Commission sponsoring a passenger flight involving Earth, Mercury, and Mars every two years?"

Will frowned. "Why, to exchange personnel between Mars and Mercury?"

Olaf nodded. "I think we can compete reasonably well; it won't be a one-way brain drain to Mars. Furthermore, more folks would be willing to come to Mercury if they could go to Mars easily, then come back."

"But it would be expensive stopping your caravels at Mercury, then sending them to Mars."

"That's not what I'm proposing. David will talk to you about this as well; I've discussed it thoroughly with him. Our caravels are equipped to fly up to twenty-five to Mercury, and with a total crew of seventy-five on the surface that's more capacity than we need. The flight two months from now will take only twenty folks. But passenger caravels can hold one hundred fifty. Once every twenty-six months there's a launch window from Earth to Mercury to Mars. There's a Mars to Mercury to Earth opportunity once every twenty-six months as well."

"How would crew get to Mercury, then?"

"The caravel would be accompanied by an interplanetary transit vehicle; ITVs accommodate twenty passengers on flights between the Earth and the moon. The caravel and ITV would be launched from Earth or from Mars using a pair of LOX-augmented nuclear engines. When approaching Mercury, the ITV would separate from the caravel,

dock to the nukes, and use them to rendezvous with Portal Station at the Sun-Mercury Lagrange 2 point. The passengers would transfer to a Hermes shuttle at Portal and land on Mercury. The Hermes would have just taken to Portal up to twenty people leaving Mercury; they would have gotten into another ITV with a pair of nukes and launched into a catch-up trajectory that would take them to the caravel."

"I see; we're talking about cycler of sorts."

"Exactly."

"And the caravels would aerobrake at Mars or the Earth?"

Olaf nodded. "The velocities are on the high side, but we aerobrake into Earth orbit returning from Mercury all the time. It'd be cheaper to fly our people to Mercury on a caravel flying 125 paying customers to Mars."

"So the plan would need four pairs of nuclear engines."

"Which the Mercury-Venus Commission already has."

"How long's the trip?"

"A hohmann trajectory Earth to Mercury is one hundred days and Mercury to Mars is 160. Not bad. The timing is excellent, too; the Mercury launch window opens several months after a caravel reaches Mars from Earth or Earth from Mars, so it allows a round trip. The delta-vs are less than the fast return trajectories you use now."

"Intriguing." Will considered. "The advantages are certainly to Mars; it means that two caravels that aren't ours and that aren't flying people to Mars will be available, reaching Mars at a time when we don't normally have people arriving."

"Exactly. Mercury have paying customers covering part of the flight costs and our nukes will have to do less work than currently because they won't have to put a caravel into Mercury orbit or send it to Earth. The plan saves us propellant."

"Your caravels are equipped for the solar heating and radiation, too."

"And flying 150 people improves that as well, because the extra mass of consumables makes the shielding even better."

"The risk is that maneuvers at the Mercury end have to be performed on time. If something anomalous occurs, you can't delay departure by a day; you either take the chance and go, or wait two years."

"Yes, but the equipment we're using dates back to Columbus 1, with steady improvements in the thirty years since. It's highly reliable. We'd use a pair of nukes for redundancy. And if we're flying two caravels, they could pass Mercury a few days apart, which would give a second chance."

Will nodded. "It's a plan whose time has come. It would not have been possible ten years ago; nuclear propulsion and propellant were too expensive, thermal protection at Mercury distance was too uncertain, and the technology wasn't ready. But it is now."

"I think so. I'll tell David we discussed it, and we'll email the details to you."

"Good, and copy Louise Tremblay, who's in charge of Mars's spaceports."

Three hours later, Will and Liz were on board the lunar shuttle *Clavius* when its engines ignited and it headed for Gateway Station, poised on the gravitational watershed between the Earth and the moon. A day later they were closing on the facility fifty thousand kilometers above the moon.

It was now even busier than it had been when they had stopped briefly six days earlier, for the Mercury-bound and Venus-bound caravels were docked there as well. Gateway, like Mars's Embarcadero, consisted of a long tube made out of cylinders twenty meters long and ten in diameter, stiffened by two parallel backbones of steel latticework and punctuated by docking ports. The central tube was stuffed with supplies destined for Mars or the trip to Dusty Red, some of which had come from Mars; it also was full of Martian and terrestrial goods heading for the moon, Mercury, and Venus. The fueling complex floated a dozen kilometers away. Other facilities floated hundreds or thousands of kilometers away; the Earth-moon lagrange point was really a large area.

The *Clavius* was going no farther than Gateway; as soon as it discharged its twenty-four Mars-bound passengers it would head back to the moon for another load of future Marsians. Will and Liz planned to board the shuttle *California* for their flight to the Kennedy Center in Florida, which remained the United States' major spaceport; but during their three hours at Gateway, Will had a ceremony to attend.

One of Gateway's docking units was next to its gym module, so the caravel *Xi* was docked there. About fifty people came to the gym and floated, arms or legs anchored to the gym's cylindrical walls, to watch. The camera focused on Will Elliott and Samantha Nader, NASA's representative, and on the American flag and the door behind them, which looked like the entrance to the caravel. Over the door it said "Caravel Xi/George Washington."

Samantha fiddled with the bobby pins in her hair to make it look like it wasn't floating every which way in the zero gee. Once Will and Samantha were anchored behind the podium so they looked like they were standing, the broadcast began. "This is an

occasion of great happiness," began Will. "The Mars Commission is delighted to be turning over this caravel to the National Aeronautics and Space Administration. It has a long history behind it. We proposed caravels to NASA twelve years ago and they thought the spacecraft was an excellent suggestion. The Commission received financial support from NASA, various governments, and various Commissions—in particular the Venus-Mercury and Asteroid Belt Commissions—to design and build caravels. We have now completed sixteen caravels, including intentionally partial vehicles permanently parked on Phobos and Deimos to house crews living there. Our seventeenth caravel, the *Sigma*, will be finished sufficiently in two months to be launched to Earth with the returning *Aldebaran* and *Rigel*, which will soon deliver 270 migrants and 35 tourists to Mars. The *Sigma* will become the property of Brazil and will perform a shakedown cruise to Venus.

"The *George Washington*, as the *Rho* is now renamed, has a distinguished career ahead of it. It is scheduled for a shakedown cruise to a near-Earth asteroid early next year, then will undergo final outfitting for a cruise to Callisto. If all goes well, its trip to Jupiter will serve as a shakedown cruise for the grandest voyage of discovery yet: the first human mission to the Saturnian system and its fascinating daughter world, Titan. Titan is the greatest destination remaining in our solar system, and Mars is proud to be centrally involved in an effort that culminates with exploration of that world.

"Therefore, I feel honored to turn the ownership of the *Washington* to the government of the United States of America." He held high a fancy certificate of title, then handed it to Samantha Nader while the audience applauded.

Dr. Nader took the title. "Thank you, Commissioner Elliott. I accept the caravel from the Mars Commission with a joyful heart, grateful for the dedication and hard work

of your people. The United States never shies away from a challenge, and space exploration is the ultimate challenge for the human spirit. We look forward to taking this vessel and its successors to Jupiter, Saturn, and beyond. By advancing American science and technology, we will advance human capacities and ultimately strengthen democracy, freedom, and the rule of law for all. We are eager for the next steps in competition with our Chinese brothers and sisters and look forward to exploring the Jovian system with them. This spacecraft will be a worthy vessel for our endeavors. Thank you."

Everyone applauded again. Will and Samantha shook hands and smiled for the camera. They held the pose for about ten seconds, then separated.

Samantha reached back into the field of view to grab the American flag. "Dr. Elliott," she said. "Thank you. Good speech. My crew and I have been over every inch; she's a beautiful ship."

"Thank you. When a ship is built by people who are actually flying in it, they tend to be very careful."

"I can see that." She sighed. "It's a shame she'll never get to Jupiter. We'll probably end up selling or leasing her back to you."

"I wouldn't be so hasty. I'm hoping she'll get to Callisto and eventually to Titan. Congress has already approved most of the money needed to get there."

"But the Chinese landing will be a huge blow, and you know the rumor that the Brazilian caravel is destined for Jupiter as well. If *Brazil* beats the U.S., the humiliation will be hard to overcome!"

“It won’t be the first humiliation the United States has suffered, nor will it be the last. If the U.S. lays down and plays dead, it won’t gain anything. It has to stay in the game. Otherwise other nations will take up the torch, including Mars.”

“What do you mean?”

“It’s simple enough, isn’t it? We have three thousand people and will soon have almost five. We can make a caravel capable of going to Jupiter already; the *Piazzi’s* flight to Ceres and back lasted long enough. We can buy solid-core nuclear engines from the United States or China, just as Brazil is rumored to be doing. So Mars can mount expeditions to Jupiter, if it desires. As for Saturn, the life support systems need to last seven years instead of five; that’s not hard to do, or expensive to design. We have plenty of experience. Gas-core nuclear engines are ideal for the flight, and if the United States pulls the plug on the research, Mars is in an ideal position to pick it up; the American workers are on Mars and wouldn’t return to Earth, and the theoretical work is finished.”

Nader raised her eyebrows. It was a good show. “You would do that?”

“Of course we would. What would be the point of idling top researchers? Right now we have billions in surplus revenue and we have a population dedicated to exploration.”

Nader looked very uneasy. “Don’t you think that would be poaching?”

“It would be poaching if the United States funded gas core research and we bought away the workers, but if the United States dropped funding, it would be a form of unemployment insurance.”

“Dr. Elliott, if I may be frank, are you an American or not?”

“Of course I’m an American, Dr. Nader! And I have the needs of my country at heart. But what’s best for my country is that it be treated by the same standards of fairness as any other country, because it can excel and succeed under those circumstances. Don’t you agree?”

She was startled and turned away without replying. Will turned away as well and headed for the docking port where the *California* awaited them.

“Dad, was that a wise thing to say?” whispered Liz as they floated down the corridor.

“I didn’t say anything they don’t know in Washington. All I did is reiterate the bargaining position we’ve been taking for months. No doubt Dr. Nader will report it to them, and they’ll have to think about it again.”

3

New England

May 10-14, 2063

Three days floating in the shuttle *California.* An awe-inspiring fall toward the Earth, followed by a blaze through the atmosphere, the deployment of a parafoil, and a soft landing at the Kennedy Space Center. Greetings, a press conference, a formal speech, then a private flight to White Plains, N.Y., where Will and Liz were greeted by Ethel, Marshall, and Molly.

"There they are," said Will, as he stepped out of the plane, with Liz right behind. He walked carefully and wobbled a bit in the gravity, but headed straight to his son, whom he hadn't see in four years. "It's good to see you."

Marshall had changed: now 23, he had the demeanor of a man. His face had filled out; his sideburns were thicker and darker. His arms had bigger muscles and more hair than when the 19-year old had landed on Earth. Will embraced him.

"Hi, dad," said Marshall, his voice wobbling a bit from emotion.

"Hi." Will turned next to Ethel and gave her a kiss. "How are you?"

"Good; we have a lot to talk about, as usual."

"I'm sure." Will turned to his sister. "Mollie." He hugged and kissed her.

Meanwhile, Liz was greeting her brother. "Hey."

"Hey, give me a hug."

The siblings hugged. "How's Earth for you?" he asked.

"Hard; I can't walk in a straight line and my muscles all seem to hurt, and I'm in good shape!"

"Wait till you start to get the cold germs. It took me a year to adjust."

"I had about fifty vaccinations to prevent that!"

Molly reached over and put an arm on the niece she had never met before. Liz turned to her. "Hi, Aunt Molly. Good to meet you face to face."

"Yes, after a lifetime of videomails!" They hugged. Greetings continued for a few more moments.

"Okay, let's pack up and get going," said Molly, finally. "Mom's waiting."

"How is she?" asked Will.

"Really frail; she can't leave the nursing home like she did four years ago. She gets around only with a walker. But she's still pretty sharp. Not as sharp as she was a year or two ago, but pretty good."

"I guess at 94, she's doing pretty well."

"Definitely." Molly pointed to the van she had driven into the private hanger. Marshall grabbed both Will's and Liz's suitcases, since neither of them could carry theirs easily. They all climbed in.

"You heard about the terror warning?" asked Will.

"Of course; an F.B.I. agent came to the house yesterday morning," replied Molly. "We immediately moved into a hotel, and we've hired a security guard." She pointed to a car parked discretely nearby.

"Good. I'm sorry this affects you, Molly."

"Who knows whether it's a serious threat, but it has to be accommodated. We don't want all of you kidnapped." She slipped into the driver's seat and fastened her seat

belt. Once everyone was settled in, she drove out of the hanger and onto the street, the security guard following closely behind.

It was a lovely early spring day, with sun and bright green grass and the bare trees beginning to show signs of life. Will rolled down his window. “Ah, the smell of spring!” he said.

“It’s soooo nice,” agreed Ethel.

“”It’s been a very pleasant winter,” noted Molly. “About like North Carolina’s is supposed to be. It’s our third year in a row of El Niño. Global warming.”

“At least it makes the winters more pleasant. Scotland has had a beautiful winter.” Ethel looked at Liz. “You look tired.”

“It’s the gravity; I can’t believe it!”

“It still wears me out, and I’ve been here a week. Don’t worry, it’ll get better after a few days.”

“But I’m young and a ballet dancer! I’m in good shape! And I’ll never dance under these circumstances!”

“Your leaps won’t be very high,” replied Marshall. “Don’t worry, Liz, you will adjust.”

“Jeez, I don’t know!”

Ethel smiled slightly and turned to her husband seated next to her. She took his hand. “How was the moon?”

“Almost as exhausting as the Earth has been. Everyone in space is scrambling for exports.”

“All I heard about on my trip to mining company headquarters was Parenago.”

“Exactly. It sounds like they’ll get production of PGMs to one thousand tonnes per year over four or five years; they’re transferring the mining infrastructure from Shackleton, where it produces only one sixth as much. They estimate the price will drop to one third of the current value.”

Ethel scowled. “Or lower; Muller Mining is estimating a drop to one quarter the present price. No one can predict political stability or economic growth.”

“At any rate, it’s bad news for Mars. Mercury will continue to expand gold production, though they are limited by the conditions. Precious metals will see a decline in price. At least exports of food, nitrogen, and simple manufactured goods are expanding.”

“The Hudson’s at Shackleton sold Shalbatana chocolates,” added Liz, giving an example.

“But Parenago will also make the moon self-sufficient in carbon, which means cheaper methane and hydrogen in Earth orbit and lower exports for us,” added Will.

“I heard. The mining companies were all panicking and planning their investments in lunar PGM recovery,” continued Ethel. “It sounds like the days of huge profits are over.”

“Did you see the landing of a PGM capsule?” Liz asked Ethel.

She nodded. “It wasn’t anything that spectacular. We drove from Consolidated Mining’s World Headquarters—actually, they use the term ‘Interplanetary Headquarters’—up to the Nevada Air Force Reservation. The PGM capsule left Mars sixteen months ago by solar sailer. There was nothing spectacular about the arrival; the capsule hit the Earth’s atmosphere at over 40,000 kilometers per hour and because it was

small and filled with very dense metals it didn't decelerate a lot until it was in pretty dense air, then it slowed at up to twenty gees. It was daylight so there was nothing to see until the drone parachute deployed, then the main parachutes. It hit the ground at 300 kilometers per hour, the capsule broke open, and the whole thing burrowed a meter into the ground."

"Did something fail?" asked Liz.

Ethel shook her head. "No, that's just the cheapest way to recover ten tonnes of PGMs! No reason to do orbital rendezvous and recovery when the metal can be picked up out of the mud more cheaply."

"Will the price decline affect the drive to independence?" asked Marshall.

Will shrugged. "If our export revenue goes down I doubt we can expect the nations funding the Commission to make up the difference, so maybe it's irrelevant. We need to save for lean times."

"But that means the Board of Trustees has to approve some arrangements."

"If I can convince them. If not, we'll keep putting the surplus in the bank, especially Silvio's bank."

"Can you convince them to set a timetable for independence, dad?"

"I'm not here to set a timetable, Marshall. We're not at that point."

"Why not? I understand Mars made more money this columbiad than it spent."

"That's true, but there's no guarantee that'll continue, we could use the government subsidies, and we need the governments' good will."

"Why can't the governments give us the support as foreign aid?"

“If you can convince them! It’s a question of politics, Marshall.” He was surprised his son, who hadn’t been on Mars four years, had such a strong opinion. “What do your friends at MIT think about an independent Mars?”

“They assume it’s inevitable and wonder when it’ll happen. The emails I get from Mars suggest the young people there feel the same way, too.”

“In three months, Mars will see its fourth high school graduation; we’ll have ten high school graduates on Mars,” added Liz. “All of us assume we’ll be citizens of a new nation real soon.”

“You’ll live to see it, I’m sure,” said Will. “But whether it’ll be five years or ten, I don’t know.”

“Ten!” said Marshall. “In ten years, Mars will have how many people; thirteen or fourteen thousand? How could we not be self-sufficient then? We’ll have five times as big an economy!”

“Not necessarily, and that’s part of the uncertainty,” replied Will. “Exports are not a function of population, but of transportation and prices.”

“But we’ve been expanding the transportation steadily, and it’s getting cheaper,” replied Marshall. “We’ve been buying so much stuff over the last year, all the cargo shuttles to low earth orbit are full; there’s even a backlog! I hear we bargained a ten percent discount.”

“We did; we’re hauling more stuff to Mars over a three year period than ever before. And by paying cash, we’ve reduced import costs twenty percent. But we don’t know what the future holds, Marshall. We have to be careful.”

“Okay, dad,” said Marshall, backing off.

The van was silent for a moment. Ethel glanced at her adult son and her husband nervously. No one had expected an argument.

Molly had taken an unusual route back to Stamford, as was recommended by the terrorism experts. They turned to routine matters and talked about the flight, news from Mars, and Ethel's stop to visit her sister in Scotland. Soon they reached the nursing home.

Katherine Elliott was ready for them, dressed in her best clothes, her hair just right, makeup covering some of the worst age spots on her face. When they walked into her room she beamed in her chair.

"You made it! Excuse me for not getting up!"

"That's okay, mom." Will walked over, got down on his knees so he was the same height as his mother, and kissed her. "How are you?"

She shrugged slightly. "I'm 94; that's the best answer, I think. Let me see my granddaughter. Will, move over. Liz, come close, I can't see or hear as well as I used to."

"Okay, grandma." Liz came down to her grandmother's level and kissed her, slightly hesitating; she had never seen someone old face-to-face.

"Oh, let me kiss you." Katherine reached out and pulled Liz close, much to her surprise—grandma was stronger than she thought—and gave her a kiss.

"Sorry, I'm still adjusting to Earth."

"I bet it's a bit of a shock, even if you've watching it on tv all your life."

"The gravity is really strong!"

"If there's anyone who can appreciate your observation, dear, it is I."

Liz didn't particularly like the comparison. "I. . . suppose you're right!"

They all laughed. Katherine turned to her son. “So, you decided to visit the moon before visiting your mother!”

Will chuckled at his mother’s light-hearted chide. “Yes, I did. Speaking of culture shock; when I was last there Shackleton was a collection of three buried inflatable habs; life there was like inside a submarine, cramped and closed in. When I returned I stayed in the Hilton Presidential Suite!”

“So many changes; it must have been a shock. Was it a good trip?”

Will shrugged. “As I was explaining on the drive over, the trip made it very clear that mining on the moon will soon increase steeply and one result will be a big drop in the price of our main exports. But we should be able to boost production enough to compensate.”

“That’s good. I gather independence may be possible soon.”

Will looked at his mother, startled. “Even my mother talks about it! Everyone on the moon asked, Marshall just asked. . . who knows. The nations running the Mars Commission are opposed, naturally, so it may be some time.”

“What will they lose?”

“Power. I think they can’t believe the idea is taken seriously. Mars only has 3,000 people. The United States, Canada, and Australia all needed millions of people and over a century to reach the point of independence.”

“They didn’t have a highly educated, independent population or the sense of isolation we have,” replied Marshall.

“Or the separate culture that our multinational population has created, or the monetary independence we’ve gained in the last two years,” added Will. “I’ll talk to the national representatives in Washington next week.”

“I hope you can move them,” replied Katherine. “At first I hoped to live until you returned to Earth, then until you all built a Bahá'í temple on Mars; now I suppose I have to live to see Marsian independence!”

“I wouldn’t be surprised, mom,” replied Will.

They spent most of the afternoon with Katherine, then left so she could rest. They drove to the hotel where they had reserved rooms, rested, and spent the rest of the day together talking. It was a pleasant evening so they went for a walk in a nearby mall, Will wearing sunglasses to disguise himself somewhat.

The next day they visited Katherine for two hours in the morning and two more in the afternoon, then headed to the hotel again. “Do you think grandma would mind if Liz and I visited her just in the morning, tomorrow?” asked Marshall. “Cause I’d like to show Liz around Cambridge.”

“Oh, I’d love to get back to MIT after all these years!” exclaimed Ethel.

“We could reserve a hotel room in Boston and spend the night,” suggested Will. “We’d visit grandma tomorrow morning and late afternoon the next day.”

“You plan that; mom won’t mind,” said Molly. “I’ll stay here.”

So the plan was set. The next morning after visiting Katherine early—she was always up before dawn—they rented a car, filled it with $90 per gallon gasoline, and Marshall—the only one with a drivers license—drove them to Cambridge. After an hour

of frustrated searching, they finally found a parking space. They walked around the campus of Massachusetts Institute of Technology, popping in unexpectedly on Marshall's professors, many of whom Will knew via correspondence. A public talk for Will was arranged for that night and the next day at noon. The evening one, publicized over the internet, drew a huge crowd; Will insisted that Ethel and Marshall, the family's two MIT alums, speak as well. It was followed by a pot luck reception at the home of Marshall's Masters thesis advisor, Dr. Joseph Colfax. A hundred students and profs managed to squeeze in: planetary scientists, engineers of various sorts, and Mars lovers.

Liz sat in a corner and observed. She had never seen such a crowd before; the clothes, the accents, and many of the topics of casual conversation were utterly new. Even the house, with its big glass windows, old plaster walls with wooden highlighting, seedy old furniture of wood and cloth, stacks of china and silverware, and a myriad nick-knacks—nothing of plastic or nickel-steel—was strange, unfamiliar, and intriguing.

Then her brother brought over a handsome blond with a rugged face, a quick smile, and flashing blue eyes. "Liz, this is my friend and fellow classmate, Mike Tobin; Mike, my sister Liz. You're unusually quiet and he can make anyone talk, so I thought I'd introduce you."

"Hi." Mike extended his hand. They shook.

She smiled. "Hi; nice to meet you."

Mike sat in the empty chair next to her and put his bottle of beer on the floor while Marshall hurried across the room to introduce his father to someone. "Marshall says you're a student at Martech." She looked at him, momentarily processing what she heard: "Mahshall says youwa a student at Mahtech."

“Ah. . . yes,” she said. “Sorry, I’m just not used to the English spoken here. Yes, I’m finishing up my junior year. Of course, this semester I’m not doing very much; I’m taking distance-learning courses and while I’m on Earth they’re on hold.”

“Juniah, huh? So am I.”

“Here at MIT?”

“No, at the little libewal ahts college three miles up the rivah.”

“Huh?”

“Hahvahd.”

“Huh?”

“Sorry; ‘Harvard.’ You’re probably being thrown by my Maine accent. We drop our r’s.” He pronounced his “r” very carefully from then on.

“Yes; I apologize. I’m not normally one to sit back and watch, but I’m still hurting a bit from the adjustment to terrestrial gravity—I suppose by the time I adjust, it’ll be time to leave!—and I’m in a bit of culture shock and just observing and absorbing.”

“Culture shock?”

“Sure. I’ve seen thousands of Hollywood movies and lots of American t.v. shows, but it’s not the same. That glass beer bottle. . . we don’t have glass bottles on Mars, but when I see a bottle on television I don’t know it’s really glass. These pictures on Dr. Colfax’s walls; they’re painted by someone, and they’re probably of real places. But at home, most pictures of, say, boats on the sea are printed by ink-jet printer and enclosed by nice frames of plastic or steel—not real wood—and until I saw them on his walls it never occurred to me that they might be pictures of real boats on a real sea!”

Mike laughed, jovially and kindly, not derisively. “I see what you mean. And when I look at the seascapes, I see a sea unlike the one I know; these are of the Mediterranean, I suppose, but up at Bar Harbor, where I come from, the sea looks different.”

“How?”

“Oh, the color’s a darker blue, I’d say; less green in the water. And the air doesn’t have the haze and aerosols that these seascapes have.”

“I see. So, are you an artist or a meteorologist?”

Mike laughed again. “No, no. I have taken an art history course; maybe that sensitized me. I’m a geophysicist.”

“At Harvard?”

“Sure! I can take courses here at MIT. But we do have physics at Harvard, pretty good physics, too! Just like MIT has reasonably good humanities.”

“I didn’t know that.”

“Oh, yes. What are you majoring in?”

“I’m double majoring: English literature and history. I’d major in dance, but that doesn’t exist at Martech. I’m a ballet dancer, otherwise.”

“Really? That must be spectacular in Martian gravity.”

“Ballet’s very different than here because you can stay in the air three times longer. But I can’t demonstrate because the higher gravity has given me sore muscles; I have to use muscles I don’t use as much up there. Besides, my reflexes are all thrown off! I have to be careful not to walk into walls!”

Mike laughed again, and she joined him; his laugh was contagious. “I’ll have to ask Marshall for a video. Or maybe I’ll be able to watch in person; I just applied for the fifteenth columbiad.”

“Really? How nice. Doing what?”

“Comparative geophysics. I’m interested in the evolution of planetary magnetic fields. Venus never had one; Mars lost its magnetic field early in its history; Mercury’s still exists, but is weak; and the Earth’s is going strong, at least most of the time, since it dies and reverses periodically. I’d like to do my Ph.D. on the Martian magnetic field.”

“Ah-hah. Spherical harmonics, fourier transforms, and all that jazz.”

He laughed. “You know a lot about geophysics, for a ballerina!”

“I’ve taken plenty of math and science as well! You can’t survive on Mars without them, and a bit of engineering as well. Do you know the principles of operation of a GMP-850 fuel cell?”

He laughed a bit. “I’m afraid only generally!”

“Well, take some basic engineering while you can, you’ll need it up there!”

“Alright, that’s good advice!” He smiled at her and she smiled back; they liked each other. “So, what do you plan to do when you graduate?”

“Hum. I’m not sure. I want to continue ballet, but I doubt I can earn a full-time living that way, so I could become a teacher—high school, maybe—or even a humanities prof, since Martech needs more of them. In short, I’ll be in school for a while longer.”

He nodded. “Me, too, but at least I’ll be switching to field work and research pretty soon. I’ve already started emailing Érico Lopes and Ruhullah Islami; they’ve published more on Martian geophysics than anyone else. They’ve both been helpful.”

“Good. They’re both busy as administrators, as you probably know. Érico’s Chief Minister of the Mars Commonwealth Authority and Ruhullah’s Clerk of the Borough of Aurorae.”

“Yes, I knew that, but what do the titles mean?”

“Well, ‘Chief Minister’ means ‘Prime Minister’ and ‘Clerk’ means ‘Mayor.’”

“Oh, they didn’t tell me!”

“No, they wouldn’t. We have understated titles for government officials.”

“I guess so!”

“We have some interesting ways of doing things, on Mars. This trip is making me think about them in new ways, appreciating some and wondering about others.”

“It sounds like an eye-opening experience.”

“Well, how would you like it if you were told you were, say, Chinese, but were raised in Bah Hahbah—or is that really Bar Harbor?—then after twenty years you were suddenly taken back to China for a month.”

“It’d be weird.”

“Exactly.”

“Does it make you think about, say, independence, differently?”

She looked at him. “Yes, in a way; it makes me realize I’m really not an American or a Scot, but a Marsian.”

“Ah.” He nodded. “That’s one thing that excites me about going to Mars; that I might be able to help build a brand new nation in a new land.”

“Interesting. I suppose that interests us, too, but mostly we think about who has a say over our lives and why. Not that we’re being oppressed or anything; my dad’s in charge, and no one on Mars particularly dislikes him. It’s a question of principle.”

Mike nodded eagerly. “Yes, I can understand that.”

Just then Will walked over. “How are you doing?”

“Oh, fine. Marshall introduced Mike to me and we’re talking.”

“Nice to meet you, Mike.” Will offered his hand to a startled Michael Tobin.

“Thank you, it’s good to meet you as well.” They shook hands.

“I just wanted to make sure you’re doing okay and you aren’t all worn out. I suspect we won’t get out of here for an hour or so.”

“No, that’s fine, dad!”

“Good.” Will smiled at his daughter and headed back across the room. He had seen her sitting in the corner a few minutes earlier and had been worried, but then someone called him into another room to ask a question. He walked back to that room to find the host, who had just finished up a conversation with one of his students. “Professor Colfax, this is one of the nicest, friendliest receptions I’ve been to in a long time.”

“Well, thank you, Will; and please call me Joe. There are few things we like better here than eating, especially if you can talk about science and engineering at the same time. Ethel will tell you that.”

“Yes, she has, and I know this place from forty years ago, anyway. When I was working on my PhD in planetary geology at Brown, I had a girlfriend here at MIT, so I got up a few times.”

“So you know the place. Good. You know, I have to tell you how much you should be proud of Marshall. Not only is he very bright and disciplined, but he’s pleasant to work with, honest, he never complains. . . you raised a really capable young man.”

“Thank you, I guess we were lucky! And we’re very proud of him.”

“I think there was more than luck going on. Seeing him gives me hope that maybe on Mars, humanity can do a bit better. It’s one reason I encourage my grad students to go there. It’s a good place to combine career and family. And as you said in your talk, there is a wide and deep relationship between MIT and Mars. A lot of our alums are up there.”

“Alums from many nations, too. You should consider retiring to Mars yourself, Joe. Martech could use some good, solid teachers with strong reputations in publishing. We have a lot of researchers at Martech, but not that many teachers; I think the quality of education is not as outstanding as we’d like it to be.”

“Interesting idea; I wonder what my wife would think of it. Maybe Ethel should work on her.”

Will looked across the room; Ethel was talking to his wife. “Maybe she is.”

Colfax smiled. “It is tempting, I must admit. The United States has no sense of purpose or direction; we’re a people adrift, sometimes drifting right, sometimes left, sometimes embracing the world, sometimes closing it out. Mars has a sense of direction.”

“Any place that has rapid growth has the illusion of direction, because it has movement. This is not to say we lack direction; we have a world to conquer and we are setting out to do it. That’s exciting. But the myth of Mars is that somehow we have solved Earth’s social problems. I promote the myth myself; I’m an idealist and an optimist. I think we have made some progress. But as any sober observer will tell you,

the main reason we appear to have made progress is because we're small. Mars has no murders, but is that because we have a superior social system? Maybe, but who can tell when the average rural American town of 3,000 people has only one murder every few decades? And we don't have alcohol or drug dependency—because those personalities are screened out—and we don't have guns, and we have the money to give everyone free counseling. Naturally we don't have any murders!"

"So the question is, what will Mars look like when it has a hundred thousand people?"

"Exactly. My message to you would be, come on up, settle down, help us make the place better, and find out personally."

Colfax chuckled. "I suppose that doesn't sell to the masses as well, but it has a certain appeal to me. I'm not sure what my wife would do up there, though. She's a curator at the Museum of Fine Art."

"We have a museum and will need a curator at some point, and it needs expansion, so who knows?"

Colfax smiled. "Who knows?"

4.

Washington, D.C.

May 10-15, 2063

"Liz, close the chat program!" exclaimed Will. "We're on our way to Washington!"

"Are you still chatting with Mike?" asked Marshall. "It's been three days, and that's all you do!"

"No, I chatted with him earlier. Now I'm chatting with Corrie. She's back at Cassini."

"Well, say 'good sol' for me."

"You're chatting or videophoning a lot, too," exclaimed Will. "And when will we meet your girlfriend?"

"Marisol's coming to Spain, so you'll meet her there."

"Not sooner. Let's get downstairs, everyone; the limo's waiting." He turned to Molly. "We'll see you at least one more time."

"If I can, I'll come down to D.C.," Molly replied. "Mom seems to be doing alright. Good luck in Spain, Beijing, and a few other places."

Thanks." Brother and sister kissed, then Will grabbed his suitcase and headed for the elevator. From the hotel lobby they all walked outside. A sleek, dark blue limo awaited them with the security car right behind.

The doormen helped everyone into the limo except Will, who turned to the security car. The rear door opened and a forty-ish woman with short-cropped brown hair wearing an expensive business outfit stepped out.

"Dr. Elliott, I presume?"

"Yes; Andrea Woods, I presume." They shook hands. She pointed to the back seat.

"It isn't as nice as your limo, but it's private. I'm surprised you're driving."

"To see the country. Liz has never been to the U.S. and this is one of her few chances. I could use the greenery and open spaces myself."

They both climbed in. Will nodded to Rodrigo, their security man, who spoke to the limo driver by walkie-talkie. Both vehicles headed away from the hotel and for interstate 95. Will watched downtown Stamford roll by for a moment, then turned to Andrea. "Okay, what does your consulting firm recommend?"

She pushed a button on her attaché and a flow chart appeared on the electronic paper spread out on the seat between them. "We're experts in privatization, mergers, split-ups, and the creation of public corporations, but we've never tackled a challenge like this one. Capital availability is hard to predict; profits are hard to predict; expenses are high; equipment is difficult to obtain and can be fickle; some operations make immense profits and others make none; operations involving export have to maintain huge inventories of goods in transit; etc. This is not exactly a standard exercise!

"But privatization of some of the Commission's operations can be attractive to investors for reasons other than immediate profit. Take your telecommunications sector: it's very small, handling the volume of communications of a small modern town; it has to use some very powerful, expensive, robust equipment, like orbiting satellites; it has a small staff; upgrading the equipment based solely on income from the customers is not feasible; profits are unpredictable and could impose a burden on essential services; yet a company might consider purchasing part of Marcomm, as you're calling it, because in the

future it could dominate the telecommunications of an entire planet. The situation with Margen, your proposed energy company, is the same way: it has to produce a lot of power from very expensive equipment or buy it from nuclear reactors run by someone else, it has to be totally reliable—life support can't handle a lengthy power failure—and its ability to make a profit is questionable."

"So are you recommending against privatization?"

"No, just that it has to go gradually, with phases that meet certain financial goals. Energy is an essential commodity, but it also has to be produced efficiently and the price paid for it needs to reflect the effort to produce it. Otherwise, it's an aspect of the Marsian economy that will be distorted, either because energy is being given away and wasted or because it's too expensive and growth is stifled. Both Margen and Marcomm would make excellent public corporations, with shares owned by workers, private investors, the Mars Commission, and possibly the Mars Authority. Partial private ownership guarantees that market forces and rules will apply, and the presence of the Commission on the Board will give confidence and provide a safety net."

"How long would this arrangement persist?"

"As long as the parties desire it. Anyone could sell their shares at any time. The down side, of course, is that the Commission loses control; decision making is more complex and potentially contentious; and some profits will return to Earth, which is a good thing from the point of view of future investors but may be controversial on Mars."

"People understand the role of corporations; it's not that serious a problem. What about the construction and manufacturing sectors?"

"They're much larger than communications and energy; sixty percent of the work force is in this sector of the economy, and much of the Commission's staff. There are several ways the sector can be subdivided: the maximum number of divisions would be spacecraft manufacture, enclosure and building manufacture, plastics and chemicals, metalworking, and light industry. Privatization has already taken over a major portion of the enclosure and building sector; of the 25% of the Marsian work force in this sector, 16% work for the Commission and 9% for three private builders. The light industry sector already makes clothing and other apparel, paper products, processed foods, furniture, building products, etc. Let that privatization continue; the companies are making a profit, they're beginning to produce for the export market, and there are no major barriers, like complex equipment, because most of the work is automated and performed inside a dome at standard temperatures and pressures.

"What about these other divisions?"

"Privatize them in the next few years. The spacecraft and space structures division already has strong sales; they'll only get stronger if it becomes a private outfit linked to terrestrial firms, with access to proprietary technology, and run in a similar way. The same is true of the plastics and chemicals division; if they were a partial subsidiary of Dupont or Mitsubishi and had access to proprietary technology, they'd be able to grow faster. Both these divisions have been highly productive as well, with a large number of patents; they're valuable assets for terrestrial companies and they're too small to survive on their own right now.

"The metal fabrication division is the least developed and most diverse operation. It may need considerable expansion and strengthening before it is spun off into one or

more corporations. The manufacture of surface vehicles will soon begin to be practical because of the immense costs of importing them and your rapidly expanding capacities to produce parts. Some of the new robotic technology developed in the last few years will revolutionize your capacities as well."

"We're looking into that. We've been making half of the parts for our conestogas and mobilhabs for a decade. If we can push the fraction up, we can save a million redbacks per vehicle."

"There's a potential export market to Mercury and the moon, too, once your prices come down. Partial ownership by the Commission will give the investors confidence; this is an area where profit is not guaranteed."

"What about spacecraft and plastics?"

"They're more stable and predictable, and the Commission has a stake in spacecraft by virtue of being a major customer. They could be completely privatized. The major barriers are political."

"You can say that again!" Will looked at the flow chart and considered the situation. "Right now, the forces against privatizing construction and fabrication are too strong. What we need is a clear statement of the benefits that could accrue."

"That's in the report," replied Andrea. "Access to proprietary technology and manufacturing methods could improve the efficiency of your operations by ten percent in four years. Right now your divisions, as well informed as they are, don't even know about some of the latest technology, and the owners of that technology have no stake in adapting it to Martian conditions. Your divisions also have very rudimentary marketing and market research operations, improvement of which could push up exports. With your

population expanding by a thousand workers per columbiad for the next few columbiads, all these divisions potentially could double in size, which would make them very respectable operations."

"And the population increase will allow us to import marketing experts. But I question your claim we can increase our efficiency by ten percent in four years. Your experts don't know our conditions; it isn't just a matter of importing a new 200 million dollar machine to do something. That machine has to be taken apart to fit into a shuttle, has to be certified for vibration and other flight conditions, has to be reassembled on Mars, has to use certain materials that we may or may not be able to make, the machine can't be serviced by the manufacturer because of the distance. . . importing equipment is a complicated, expensive, lengthy process."

"We understand that, but we had no experts in your situation. No one on Earth is."

"Not true; there are former Commission employees around. I wish you had hired some. The report will be controversial as a result." Will picked up the three-hundred page report. "I'll read this on the way to Washington; the trustees will ask me about it. Let's go through it together."

They reviewed the results in detail for several hours, then they left Woods at her home and Will joined his family in the limo. After settling into their hotel, they took a driving tour of the city, then walked around the Smithsonian several hours.

The next morning he arrived early and arranged the catered breakfast to his satisfaction. When the twenty-four governmental representatives and their aides arrived he was able to give each one coffee or tea and a plate. It was disarming for them to be

served by the Commissioner, and he knew it. It also broke the ice even for those who sought to be formal and distant.

They asked him about his family and chatted about the weather and politics over a sumptuous breakfast. As the plates gradually emptied, the trustees began to turn to their coffee and tea, and Will was pleased to see them serving each other. As he rose to get a second cup of tea, he noted that the Iranian trustee's cup was empty, so he brought him a cup as well, with three sugar cubes.

"You are too kind, Dr. Elliott," said Riaz Piazabadi.

"I know how much Iranians like their tea and qand." He used the Persian word for sugar cubes. "I had a saintly Iranian brother in law."

"Really?" said Piazabadi. No doubt he could guess the brother-in-law was a Bahá'í, but he was pleased anyway.

"Shall we convene?" asked Dr. Pete Zubko, who was both the American host of the meeting and the chair. He glanced at Will uncomfortably. "We are very pleased to spend four days with Dr. Elliott to survey where we've come and where we're going. Four years ago we had just one day together and it wasn't enough. Since then operations have gotten much more complex as Mars has more than doubled in size. Its growth is causing unexpected problems. We may want to slow its growth until we can get a better handle on them.

"Mars has always been changing; thirty years ago on the eve of Columbus 1's launching, no one could have imagined the situation today. Our twenty-four nations are privileged to sponsor the settlement of the Red Planet on behalf of humankind. We look

forward to Dr. Elliott's sage advice as we advance our deliberations." He turned to Will; everyone began to applaud.

"Good morning to all of you, and thank you. I'm delighted to meet with you to discuss where Mars has come and where it will go in the near future. I hope we can spend many hours together seeking to understand pressing issues, old and new.

"I won't summarize our rather lengthy history, except for the last twenty-six months. In the spring and summer of 2061, Mars saw the arrival of six spacecraft loaded with 825 migrants. With the birth of 272 children since, and the return to Earth of 120 workers, Mars now has slightly over 2,600 human beings, of whom 1,100 are children. Slightly more than half our population resides at Aurorae Outpost.

"The last two years concentrated on three goals. The first was a great expansion in production of platinum-group metals, or PGMs. This goal was slowed somewhat by the category-5 global dust storm—the worst kind we can have—but we still managed to produce 500 tonnes of PGMs in twenty-six months. We maintained gold production at 500 tonnes. The second was to increase exports. In this respect, the thirteenth columbiad saw a critical mass of capacity became available on Mars. We produced four caravels, a new record. We gained orders for half the moon's imported food, all of Venus's, and half of Mercury's. Our percentages of retail items—from tooth brushes to tampons—for those three destinations were only slightly less. Even Earth orbit is beginning to buy Martian. Exports of methane, argon, water, and nitrogen remain strong.

"Our third goal was a great expansion in science, which was accomplished by increasing scientific personnel fifty percent. We added a fourth goal late in the columbiad when it became clear we would have a large financial surplus: importing equipment for

future expansion. Because of the volume of Marsian imports—2,000 tonnes per year to low Earth orbit—the cost of shipping freight to orbit dropped ten percent, but we managed a twenty percent decrease.

"So, where do we stand? This columbiad, the fourteenth, six caravels fly to Mars with 900 people. With a projected 450 births this columbiad—an estimate higher than previously, thanks to the new fertility drug Geminale—Mars will have 3,800 people in the spring of 2065. The fifteenth columbiad may see immigration of 1,050, a return to Earth of 150, and 620 births, raising Mars to 5,320 in early summer 2067. The sixteenth columbiad could see growth to 7,100 people by early fall 2069. The seventheenth columbiad will push Mars to nine thousand people, at which point it will have achieved its migration goal of reaching one two-millionth the population of Earth. Our fifteen-year plan will have been achieved in twelve years.

"What will our thirty-eight hundred people be doing in two years? What will our nine thousand be doing in eight years? The huge reserves at Uzboi, the decline in transportation costs to Earth, and the demand for PGMs all suggest that we can export a thousand tonnes of PGMs per year, four times our current annual production. The moon plans to expand to a thousand tonnes per year as well. The market will be flooded and the price will drop at least three fold. Terrestrial production will drop as the price squeezes out the less productive operations. Martian gold output will also rise to perhaps five hundred tonnes per year.

"The Marsian population will continue to be occupied meeting the needs of migrants. Nearly half of our population is employed building housing, enclosing farmland, manufacturing furniture, producing methane and oxygen propellant, and doing

other tasks that make immigration possible. A significant fraction of our labor force will produce consumer goods. Some will be exported; Mars already has twice the population of the rest of space combined. Earth orbit, the moon, Venus, Mercury, the asteroid belt, Jupiter: all of them will order their coffee, shoes, rock hammers, and paper from Mars.

"A notable development in the next six years will be the design and first production of the caravel 2, able to accommodate 400 to 500 people at once. Phobos has grown to the point where a large, permanent, enclosed construction space can be utilized effectively, so we will create one. By 2075, if six of the larger caravels are used for passenger transport, Mars could receive twenty-five hundred to three thousand migrants per columbiad. Clearly, we have not reached a 'natural' limit for migration.

"Another conclusion we can draw is that the Marsian population will continue to produce goods and services roughly equal to their needs. This last columbiad Mars produced slightly more than it consumed before government subsidies are counted. This was the first time Mars achieved this significant milestone. Mars already has extensive home rule, with an elected legislature to set laws and approve a budget. The chief minister, who executes the laws and budget, is approved by the Mars Residents Council. But the Commissioner still retains the power to nominate the chief minister and to veto changes in tax rates. The Commission continues to employ about half the adult population.

"Privatization, which has already yielded fruit in the manufacturing and agricultural sectors, needs to continue; no society in history has had a major part of its work force employed by a single agency for long. The new study you have received suggests that we could achieve some major improvements in efficiency if we privatize

some sectors of the Marsian economy. If all the suggested areas of privatization were pursued over four to six years, the Commission would employ no more than ten percent of the Marsian population.

"Continued devolution of authority also seems inevitable. The Commonwealth Authority already has responsibility for higher education, health, culture, surface transportation, and law enforcement. The boroughs have responsibility for education through high school and many have responsibility over environmental management. At some point we will need to consider when responsibility over space transportation and customs should go to the Commonwealth. In the last two years, the United States and China have both brought shuttles to Mars and Lufthansa has decided to go into the Mars shuttle business as well. The Commonwealth is buying a shuttle with its tax surplus. Soon shuttle repair and maintenance can be privatized.

"So the Commission faces a dilemma: its role must shrink as Mars grows. Sooner or later the relevance of the Commission could become controversial. The Commission can solve this problem by expanding its role in some aspects of the Marsian economy as it moves out of other areas. One example is a major commitment to engineering, specifically to larger enclosures. A second is to climate modification. A third would be a commitment to new spacecraft, such as the caravel 2 and possibly support for gas-core nuclear engines if American financing ends. But the Marsian public will not find these commitments sufficient to continue the Commission's role in Marsian governance if all the money diverted to these ends already originates on Mars. Governments must continue their financial commitments if they expect a voice in Marsian governance."

Will finished his report and looked at the trustees, who were listening carefully. A few seemed upset; others pensive.

"In a sense, you are a closet Marxist, Dr. Elliott," quipped Dr. Cheng Weiming, the Chinese representative, not waiting for the chair to recognize him. "Marx predicted that governments would wither away."

Will smiled. "The Commission isn't a government. The United Nations Trusteeship Council no longer oversees the administration of nonsovereign territories because Earth has none. The nonsovereign territories are now the moon, Mars, and Mercury. The outer planets will see even more autonomy on the part of even smaller settlements because of the greater isolation."

"Dr. Elliott, there is an argument that makes sense on Earth and seems to make no sense on Mars," said Dubko. "Maybe you can explain why. Mars has only 3,000 people. In 2071, by your calculations, it might have 10,000 people. It's *too small* for independence. Explain the problem with that argument."

"There are over thirty members of the United Nations that have smaller gross domestic products than Mars. Having an entire planet's mineral deposits makes a huge difference in terms of natural wealth. And we are *isolated.* It's not a simple matter of communications delays; most large empires throughout human history had slower communication, and their transportation systems were barely faster. Our isolation is relative; someone living in Antarctica has far more access to home and family than we. Our isolation is also psychological: *we aren't on Earth,* and we can't be. We have sols and annums, not days and years. We have less gravity and more radiation. Everyone can use a pressure suit and no one can drive a car. We have our own land."

"Dr. Elliott, this is a difficult question for me to phrase; please excuse my English," said Dr. Tanya Pokorny, the Russian representative. "Mars has a certain mystique about it. It started in the nineteenth century with the claim it had canals. It has always been the world most like Earth and people have always projected utopian fantasies onto it. To what extent do the residents believe in utopian visions?"

Will pondered a moment. "I think I understand your question, which obviously is not about Perceval Lowell's canals or Edgar Rice Borough's novels, or about a thousand science fiction novels set on Mars. You are asking about the emotional and mythological content of our views of Mars. Even if most of us are scientists and engineers, we have emotional and mythological views of our world. All people are attached to their land. For Russians, mother Russia is a mythological concept of great power. It is steeped in history and in crucial events, like the supposed transfer of the Mother Church from Jerusalem to Rome, then when Rome fell to Constantinople, then when it fell to Moscow. For Americans, the American myth is also a myth of being a chosen people. For Chinese, it has to do with the idea of the Middle Kingdom being the cradle of civilization. For the French it has to do with being a center of civilization and refinement. For Iran it is the past history of great empires at the center of the world. Nations that lack a national myth are nations with an identity crisis, regardless of the education of their citizens.

"Mars has various national myths. For some, we are the place to which the torch has been passed; whether the torch goes from Mesopotamia to Greece to Rome to Britain to America and then to Mars, or whether it goes from Jerusalem to Rome to Constantinople to Moscow then to Mars, or whether it goes from China to Mars really doesn't matter. For some, Mars is humanity's second chance: we pillaged Earth and

created a wretched, unjust, exploitive society on its surface, and now we have a chance to do it right, or at least to do it better. For some, Mars is the beginning of the greatest nation humanity has ever created; we have as much land as all of Earth's continents and islands combined and some day we'll have a population to rival the mother world, but it'll be united under one government. For others, Mars is a place to do something really great; to be at the very beginning of an immense, historic enterprise, an enterprise that could culminate in the first interstellar journeys in a century or so. For some, Mars represents the continuation of the best of the human spirit: Earth has gotten tired, set in its ways, and risk adverse, while Mars will spearhead exploration and discovery from now on. Some residents favor one of these myths; some partially believe in two or three of them; but very few ignore all of them."

Pokorny nodded gratefully. "Dr. Elliott, how many residents feel they are Marsians first and French, or Chinese, or whatever, second?" asked Helene Dupont, the French representative.

"I would say the majority of residents have not asked themselves that question, so they have not made a choice. If they begin to ask that question, the majority will soon feel they are Marsian first, because that is where they are, and because often they went to Mars for idealistic reasons."

"This report recommending privatization could be seen as an effort at creeping independence," noted Dr. Rama Singh, the representative from India. "How will you handle that challenge?"

"It depends on our overall plan. If the Commission is expanding into new areas, it can move out of old ones without any loss of influence. Our mandate is to open Mars to

exploration and settlement, not to do all of the work ourselves. The history of space exploration shows that the role of governmental agencies is to blaze the way so that private enterprise can follow routinely and at lower cost."

"Dr. Elliott, how do we stop or postpone this drive toward independence?" exclaimed Zubko, suddenly and sharply.

"In my report I offered the best approach: the Commission must invest in new areas of work to keep itself relevant and it must provide new money. If it does those two things, it remains relevant to Marsians."

Zubko scowled. "So, we can't stop it through education or public relations?"

"We can try, but it won't have substance behind it without new spheres of work and new money."

"Dr. Elliott, what is your personal feeling about independence?"

There was a chill silence in the room. Zubko stared at Will intently, almost confrontationally. "I have been on Mars twenty-eight years, now, and have watched it grow from a small six-person crew to a complex society larger than some ethnic and linguistic groups. I see Mars growing quite large in the next century; it could have a million people in 2163. Its role in humanity, already noticeable and not insignificant, will become important. And it will be an independent nation. I don't know whether that will happen before I die. I am not trying to rush Marsian independence. Mars will grow best when it has the full collaboration of the nations of the Earth. My goal is to keep the synergy going between the residents, the governments of the Earth, and private corporations. That's what you all have hired me to do and that is my highest aspiration."

"So you are in favor of independence?"

"Of *eventual* independence. You will be hard-pressed to find someone on Mars who does not take that position. My position is not adequate to some residents on Mars, a number that is slowly growing. I have discovered to my surprise, in the last week, that it is not adequate even to my own son, who has been on Earth for the last four years."

That brought a few chuckles in the room. "Dr. Elliott, if we resisted an effort to achieve independence, would you anticipate violence?" asked Sonia Cassetta, the Italian representative.

"No, Marsians have nonviolence culturally imprinted in them. Our domes are too fragile. But if an independence movement acquired momentum it would be difficult to oppose. The Commission does not control the police; the boroughs do. If the Commission had a police force, using it against dissent would be the best way to stir up even more resistance. Someone would call for a web-based referendum. If it won a majority, Mars would be *de facto* independent. I don't think we'd want to send in troops to quell a rebellion."

"But nowadays half the trappings of nationalism mean nothing!" exclaimed Benigno Melos, the Brazilian representative. "Independence and sovereignty are abstract things. Almost half the sovereign nations no longer have national currencies. In Latin America, the latiñero has now replaced currencies all the way to the Rio Grande. Most of Africa will soon use the ebonia. The plans for a pacifica that will be money from New Zealand to Japan are well advanced."

"Dr. Melos, Mars can't join any of those regional groupings because we aren't geographically connected to them. The Marsian dollar—the redback—isn't an official currency, it's an accounting unit, but with independence it would become an official

currency. We've used dollars and euros; their fluctuations in value were a major problem for us, so a currency pegged to the value of a basket of currencies and to gold—our chief export—made more sense. As for the major trappings of independence having little meaning: they would have meaning for the Marsians. Flags and passports are powerful symbols."

"What would you say to the suggestion that we send 150 troops to Mars?" exclaimed Dr. Dubko.

"Is this the advice you'd give the British about Boston in 1775, Dr. Dubko? That would be provocative and would infuriate Marsian public opinion; a public that is still neutral. And what would the troops do? Shoot bullets through the domes? Fill our enclosures with tear gas? The British learned from their mistakes in America and treated the Canadians and Australians differently. Send 150 engineers, not troops."

"The British lost Canada and Australia."

"And you think they could have kept them? Should they have kept them?"

"This is a ridiculous exchange, Mr. Chairman," exclaimed Dr. Toru Otsu, the Japanese representative. "The public would never tolerate troops. They aren't needed; an import embargo would be highly effective."

Several heads around the table nodded. "Of course, it would be legally complicated; there aren't treaties for setting up an embargo," noted Dr. Sonia Cassetta, the Italian representative.

"What do you mean? There are treaties prohibiting traffic in drugs and handguns," replied Dubko.

“What if the Bahamas agreed to use its spaceport to launch Marsian cargo? How would you stop them?” said Cassetta.

“Diplomatic pressure.”

“And what would you do when the Marsians responded by stopping exports?” said Will. “That could shake up a lot of markets on Earth and would disrupt plans of several governments.”

“You’d do that?” exclaimed Cheng.

“Dr. Cheng, please don’t use ‘you.’ I’m not here as a representative of the Marsian independence movement; I am the Commissioner and I’m trying to keep our deliberations sane and reasonable. I think our discussions have gone rather far afield. Of course the Marsians would stop exporting PGMs and gold to countries that boycotted them. The Bahamas, Kenya, Ecuador, or Papua New Guinea could make a lot of money through their spaceports if they kept the pipeline open.”

“That would be complicated and messy for everyone,” exclaimed Dupont, shaking her head.

“A peaceful solution clearly is best,” replied Will. “That’s what I am advocating. Mars needs genuine support from the spacefaring nations, not resistance, and as long as they support Mars, they’ll have a voice in its affairs. Is that not reasonable? Some of you have representatives on Mars; talk to them to get their assessments. But the best way for the trustees to understand the situation on Mars is to visit it. I recommend that you appoint a group of trustees to go to Mars in 2065. It’ll take twelve months and you’ll have five weeks on Mars. During those five weeks we can have a lot of two-planet meetings, both private and public.”

"It could make things worse," objected Dubko.

"Or better," replied Will. "Dialogue and discussion are good in themselves."

Dubko glared at him, then wagged a finger at him. "Dr. Elliott, in my opinion, you are to blame for this situation."

"Dr. Dubko, I've made my position clear to this Board."

"And some of us are less than convinced by your rhetoric."

"Then I apologize if my efforts to communicate have been less than successful."

That seemed to mollify Dubko, or at least quiet him. "Mr. Chairman, I repeat, this is inappropriate," exclaimed Otsu more forcefully.

"Very well," replied Dubko, remembering he was chairman. "We've heard the report from Commissioner Elliott and we thank him for it. No doubt we will want to discuss it further. We now have reports from Assistant Commissioner Messier, Representative Cheng, Representative Singh, and myself."

Ethel was already in bed when Will finally returned to their room. She immediately sat up. "It's almost midnight and you look exhausted! What's been happening?"

"Very long and painful discussions." Will shook his head. "There are some representatives that don't trust me and never will. No matter what I say, some don't believe me. We have a vast communications gulf and we can't cross it. I'm beginning to wonder whether I should keep this job at all."

"What? Don't be ridiculous, no one would be trusted by everyone more than you are. If they replace you with a terrestrial politician, maybe the trustees would trust him or her, but the Marsians wouldn't."

“I’m in a really impossible situation.”

“Never mind! You’re here on Earth only three more weeks, then you’re back to Mars where you only need major advice from them. They have to approve the budget, and you do the rest for the next two years. So no more talk of resigning!”

“Yes ma’am! But it was very, very difficult. One accused me of engineering the independence movement.”

“Well, in a way, you did.”

Will stared at her. “Not according to Marshall!”

“Marshall has no idea what’s going on. Will, two years ago you signaled to your heads of staff that we should aim for independence before the end of your term as Commissioner, and that set all sorts of plans and discussions in motion. Of course the subject is floating around Mars; you started it!”

“I thought I was responding to conditions.”

“Maybe you were, but you were the one initiating that particular response.”

Will sat in a chair, crestfallen. “I see your point, and there’s some truth in it.”

“Look, let’s at least be honest with each other in this room. We want to see an independent Mars.”

“Yes, you’re right. And I can’t say that publicly.”

“Well, at least you sounded so genuine to them, you believed it yourself!”

“I’m not sure that’s so good. Fooling oneself about something is one of the most dangerous types of lying one can engage in.”

“So, now what?”

“I’ll continue my line of argument, but more cautiously. I really wasn’t untruthful, just partially truthful. I talked about how I was dedicated to keep the residents, the governments, and the investors happy.”

“That’s definitely true. And partially truthful is about all one can expect to manage, when one is involved with politics.”

“I know, and I hate it. Soften the truth and get a billion bucks.”

“Well, you’ll have some additional opportunities to earn your keep. Have you read email at all today?”

“No, nor listened to any news; why?”

“You got a call from a Senator Jerry Armstrong tonight; we chatted for ten or fifteen minutes. He’s sent you an email as well. You’ll receive an official subpoena tomorrow to testify before some Senate Committee. They’re investigating Project Odyssey, with an eye to its continued relevance and cost effectiveness.”

“Oh?” Will smiled. “Good! I have lots to say about that. When?”

“Four days from now. It sounds like you’ll have to rearrange your schedule.”

“That’s the last day of the meeting of the Trustees. I doubt they would want to meet with me more than an hour or two. I was planning to spend most of that day with my heads of staff.”

“You can shift those discussions to Granada.”

“Exactly.” He looked at her. “How was your day?”

“Marshall, Liz, and I made the official tour of the Air and Space Museum; it’s spectacular!—then spoke at the press conference. Then we had a private lunch with a few staffers, half of whom want to go to Mars, then went to the National Zoo. We’re going to

Mount Vernon tomorrow morning, and Senator Armstrong's arranging a tour of the Capitol for us for the afternoon."

"He's a nice guy." Will sighed. "I had better go brush my teeth."

"Yes, then come to bed. I can help you feel better."

5

Granada

May 15-20, 2063

A distinguished looking, grand building loomed in front of the limousine carrying Will, Ethel, Marshall, and Liz. “What a beautiful hotel!” exclaimed Ethel.

“And what a beautiful setting, nestled in a forested mountain valley,” added Will. “Very impressive.”

“Only thirty kilometers from Granada, too,” added Ethel.

“And only forty kilometers from a ski area; how fortunate,” added Marshall. “He tapped Liz’s shoulder. “I’m teaching you to ski.”

“Why not go with Marisol?”

“She refused to learn; I don’t know why. But I won’t spend all my time with her.”

“Well, you won’t spend the night with her, to begin with.”

“Oh, mom! That’s not what I meant.”

“Good. You’ll spend plenty of time with Marisol, so definitely give your sister some time while here on Earth.”

“I don’t know whether I want to learn to ski.”

“Why not?” asked Marshall.

“Well. . . first of all, I’d like to think I’m coordinated, but I know I won’t learn to ski in a week. . . second, this gravity still has me all thrown off. . . third, I don’t want to break something.”

“Oh, don’t worry about that,” replied Will. “You could fly back to Mars with most simple breaks, like an ankle or arm or leg. But I doubt you’d break anything as a

beginner because you'll be too terrified to go fast enough. Now *I* could break something; if I go skiing, I'd try to do it as I remembered it when I was twenty-five, but with sixty-one year old bones weakened from Martian gravity, and muddled reflexes, and I would *not* have the terror of a beginner."

"But I don't want to be terrorized."

"It isn't that bad; dad's exaggerating," replied Marshall. "Skiing is mildly frightening the first time, and that makes you cautious."

"Well put," agreed Will.

Just then the limo pulled up to the hotel's grand entrance. The security man seated in front got out and opened the trunk while the doorman opened the limo's doors for them. They strolled into the grand lobby.

An older woman and man were seated in comfortable chairs reading the *Herald-Tribune* as they entered. They rose and walked over. Will looked closely.

"Laura!" he said.

Ethel turned as well. "Laura!" she exclaimed more loudly. She turned and the two women embraced.

"Harold, it's great to see you as well," added Will.

"It's great to see you after all these years, also," replied Harold Lassen, and the men shook hands warmly.

Will and Laura embraced warmly, though with a bit of hesitation. Then they turned to the kids, who waited patiently. "I'm not sure I need to introduce all of you, but I will," said Will. "Our children, Marshall and Liz; all grown up. Laura Stillwell was

commander of Columbus 1 and Harold Lassen was head of Mars Operations, then head of NASA."

The four greeted each other warmly. "Wow; it's been twenty-six years," said Laura, looking at Will and Ethel.

"It's been twenty-nine years since I saw them," added Harold. "When you all left for Mars, I thought—I hoped!—I'd see you again two and a half years later. Who could have known."

"In 2035, Harold, what would have NASA's guess for the population of Mars in 2063 have been?" asked Ethel.

He shrugged. "We would have been too scientific to offer a guess! But the plan called for six Columbus missions, with expansion of the transit crew to eight in Columbus 3 and the first stay-over crew—of three—in Columbus 4. By Columbus 6 we would have had six people staying over and twelve going back and forth every columbiad. The projection was to raise Aurorae to a permanent outpost with twelve, then twenty-four by Columbus 12, if the funding continued, of course."

Marshall laughed. "Twenty-four? I left Mars on Columbus 12 and we had almost a thousand."

"That's partly because of you," said Harold, gently. "When your parents decided to stay and get married, that was a revolution; but when you were born, that was the *real* revolution. It made Mars a serious long term commitment. You are responsible for billions of dollars in extra investment in Mars."

"And none for me," quipped Marshall.

“The arrival of the Swift shuttle was key, also,” added Laura. “Launch costs to low Earth orbit dropped sixfold. The countries in the Mars partnership were prepared to cut their commitments in half, but then there was a baby on Mars, so they raised their commitments slightly and began to get about eight times as much done as before.”

“The four of us accomplished some pretty amazing things,” added Harold.

“Well, y’all have to register,” said Laura. “Settle into your rooms, then come down and hang out by the swimming pool. David and Sergei are here, too. I’ll tell them to meet us there.”

“Outside? Won’t that be chilly?” asked Ethel.

Laura smiled. “You’ll see.”

The family continued to the front desk, where the security officer had already checked them in. They headed up to their rooms and quickly unpacked. Marshall’s room faced the back of the hotel. “The pool area is covered by a dome!” he said, as he came to his parent’s room.

“Mars-like, huh?” said Ethel. “That explains it. Well, let’s go down.”

They descended to the lobby, then exited through the back door into the enclosure, a long rectangle with a restaurant eating area, a patio, and a pool. The plastic was supported by a series of metal hoops and was tinted to reduce the sun’s glare. A transparent air duct ran along the crest of the enclosure; it sucked off the hottest air and ran it under the swimming pool to heat the water. Discretely placed vents admitted outside air to keep the interior temperature comfortable.

The veterans were waiting for them in a circle of chairs by the pool. Sergei Landsberg was 69, with a shock of white hair on his head, but otherwise he was healthy

and trim; his third wife, Ludmilla, sat next to him. David Alaoui, also white-haired, 64, and Louisa Turner, 74 and looking a bit frail, sat with them. Laura was 68, Harold 71; none of them were spring chickens, Will reflected.

Marshall pulled over more chairs while the old-timers hugged and shook hands. Will headed straight to his old friend David. “Twice in four years, David.”

“Pretty good, Moon man.” They hugged. Will turned to Louisa. “It’s great you could make it. I’m sorry you’ve retired; we need you.”

“Well, all good things must come to an end, eh?” She kissed him on both cheeks.

“Sergei, it’s been too long.”

“I’m sorry I missed you four years ago, but I was still in Santiago.”

“I know; Russian ambassador to Chile.” They hugged. “And this is Ludmilla.”

“Excuse my limited English,” she replied with a smile.

“It sounds perfect!” He offered his hand and they shook.

“Oh, I’m afraid not!”

“She apologizes about her fluent Spanish, too,” said Sergei.

“So, the two of you have been married twelve years?” asked Ethel, shaking hands with Ludmilla.

“Yes, that is correct. I got his best years,” replied Ludmilla.

“And Laura and Harold; you’ve been married fifteen, right?” asked Sergei.

Laura nodded as they all sat in the chairs Marshall had added to the circle. “Yes, Harold and I went through one other marriage to other people, then decided to give matrimony one more try.”

“And this time it worked out pretty well,” added Harold.

Will looked around. “This is quite a nice place! Quaint, but not tiny; old, but not decrepit; and the price is good for the heads of staff meeting as well.”

“I love this place,” said Harold. “I heard about it when I was President of Emory University. It’s in a nice location, it has lots of things for young people, and it has good security and privacy.”

“As you can see over there,” added Louisa, pointing to a party on the other side of the pool.

“Who are they?” asked Will.

Louisa looked at the others, including Marshall and Liz. “Oh, all of you are hopeless, you know nothing about popular culture! He’s Jon Nathan, a famous Hollywood actor, and she’s Ashley Ponzoni, a famous New York model.”

“I wish you had made it yesterday,” David said to Will. “We missed you, and now we have fewer days before your heads of staff arrive.”

“We’ll still have three days of relaxation. I hear I missed the rain.”

“And snow, up on Mulhacen in the Sierra Nevada.” David pointed to the white peak in the distance. “Great skiing. I heard some of your testimony before Congress.”

“I told them what I thought: that Jupiter is an extremely significant human destination and the United States had to go there, even if the Chinese will land in three months. The Brazilians are leading the Latin Americans there, after all. The U.S. shouldn’t worry about being number three; they should use Jupiter as practice for Saturn, and should aim to go to Saturn in five or six years.”

“Five or six?” said Harold, surprised.

“Yes, of course. Titan is the one really interesting destination left in the solar system. The only thing the Americans lack for a voyage to Saturn is the propulsion system. Caravels are big enough and their life support systems are robust enough. The technology for exploring Titan robotically is well advanced, with three rovers and two balloons running there. The Americans are ninety percent finished with their gas-core nuclear engine. They can have it ready for a Saturn flight in five years and no one can beat them. Meanwhile, they should launch a crew to Callisto next year using regular solid-core nuclear engines. As they say, it ain’t rocket science. If they want to save money they should go from Mars, just like the Chinese did last year and will again next year. An American crew on Callisto will accumulate excellent experience.”

“What was the reception?” asked Sergei.

“It’s hard to say. The White House immediately felt compelled to do damage control and defend Odyssey.”

“Which in my opinion is impossible,” added Ethel. “Will spent most of his time emphasizing that a space program only makes sense when it is objective driven; otherwise it consists of people spending tens of billions of dollars doing projects lacking a common focus. Odyssey has changed directions so many times, it’s ridiculous.”

“I hear you said Mars would go to Titan with gas core if the United States didn’t,” said Louisa.

“I did,” agreed Will. “I said it’d probably be in ten years, or we’d tackle Uranus or Neptune in fifteen to twenty. Mars would do them practically and in a cost-conscious way. We won’t spend billions on all sorts of ancillary projects that might or might not improve the mission. We need a vehicle, life support, a science payload, and a propulsion

system. We know how to do these things already and we're improving the systems all the time. The remaining gas-core research is being done at New Hanford Reservation on Mars and at the American nuclear testing range on Deimos. If Congress doesn't want to fund those operations any more, the people aren't planning to go back to Earth, so the Commission or the Authority could take over the funding instead."

"What did the Congressmen think of that?" asked Louisa.

"They weren't pleased. I assured them we wouldn't steal equipment, but with the brains we'd be able to make new equipment in a few years unless they struck up a bargain with us to sell it at a reasonable price."

Harold laughed. "Did they believe you?"

"I assured them that Mars soon would have the resources; we have plenty of money right now, and our population is growing at about a thousand per year on average. We have also already proved our ability to work as a multinational agency without passing proprietary secrets on to the sponsoring governments."

"That's true," said Sergei. "You should be sure to talk to the folks at the Latin American Space Agency, even if it's by videophone, Will. I think you can convince them to work with Mars as well."

"We are in touch. They want to send their Callisto mission to Mars first."

"Excellent. Latin America is really coming together as a force, right now. The decades of flirting with each other are over. The common currency is a huge step and the unified foreign policy is taking shape. They want to make an impact in the world and know they can only do that together."

“It’s the fruit of forty years of naïve, arrogant American foreign policy,” said Harold. “I never would have admitted that twenty years ago! Latin America has been pushed around by the United States for two centuries and they’ve gotten tired of it. Their unity is the product of anti-Americanism, just as the European Union was first pushed by fear of the old Soviet Union.”

“And then by fear of American domination,” added David. “Now, Will, I can’t imagine the national trustees endorsed a plan to fund gas-core research if the Americans dropped it.”

“No, they didn’t,” agreed Will. “But I didn’t ask. The trustees meet once a year unless there’s some sort of emergency. They can’t and don’t manage the Commission. They approve the budget. But when there’s a funding shortfall I have to figure out what to cut. I’ve done that several times. When there are emergency needs, I do a certain amount of reallocation. And when there’s a funding surplus I allocate the surplus. Of course, I let them know; I approve a report to the trustees every Monsol morning. The reports are thorough, too. If they object they write me and each other, and they occasionally try to overrule me. Right now, with the rapid expansion of platinum group metal production at Uzboi, a financial surplus is virtually guaranteed.”

“I understand,” said David. “I wish I had the luxury! Venus-Mercury’s budget is now up to. . . let’s see, two billion redbacks per year, and expenses are predictable.”

“Hey dad,” said Marshall, interrupting. “Liz and I want to walk around the pool and hotel.” He stood up.

“Sure,” replied Will. Brother and sister walked off.

“They look healthy and bright,” said Laura. “Mars didn’t do them any harm.”

“Marshall’s cardiovascular capacity was ninety percent of normal when he came to Earth,” said Ethel. “His lung capacity was above normal because the air in our outposts has about three quarters the oxygen of sea-level air. But apparently his heart has adjusted over the last four years and is closer to normal.”

“He was scrawny four years ago, too,” added Will. “He’s filled out, and I mean with muscle. Now Liz, as a ballerina, she’s always been in top physical shape. She’s medically above average.”

“And Marshall’s a good geologist,” added David. “We’ve spent time together in Boston and Paris. He’s a bright young man and a very capable scientist. He’ll go far.”

“What does Liz want to do?” asked Laura.

“Right now she’s not sure,” replied Ethel. “Probably she’ll earn her living as a teacher—elementary or high school—and dance. She’s majoring in English and history.”

“Mars could use the humanities, I’m sure,” said Harold.

“Well, it’s 11 a.m.,” noted Laura. “Tomorrow afternoon we have tickets to tour the Alhambra. Ludmilla and I have been talking, Ethel. We want to go into Granada this afternoon to shop. There are some great antiques places Harold and I know.”

“Antiques?” asked Ethel. She looked at Will. “We’ve been thinking about buying some antiques on this trip.”

“To ship back to Mars?” asked Harold.

“Yes,” said Will. “They’d be a good investment; their value won’t go down. Mars needs classy things and they have to be imported privately. We might even will them to the Chief Minister’s residence.”

“How much to fly them to Mars?” asked Sergei, startled.

“Oh, about 650 redbacks per kilogram, so we’re talking about spending maybe half a million on transportation,” said Will. “And there’s the customs inspection; it won’t be cheap to check wooden furniture for microorganisms and insects. Possibly the story will get out and will become a minor scandal. But never mind. We’ll spend it.”

“It was said of the Puritans when they came to Massachusetts from England, that they had come to do good, and they did well,” commented Laura.

“That’s true of us as well,” said Ethel. “For the first ten years our salaries mostly accumulated in investments. When gold mining began, then PGM production, we put our money into them.”

“And the stocks took off,” added Laura. “I put a lot into those companies, too.”

“For us, it was a question of demonstrating our commitment and trust in the face of risk,” said Will. “Let’s go to Granada this afternoon and do some shopping.”

While the youngsters kept jetlag at bay by skiing, the oldsters headed to Granada to walk, reminisce, and shop. They ate supper at a restaurant by the old cathedral and listened to a free concert in the square; an evening reminiscent of Mars’s Andalus Square.

They returned to the resort early so Will and Ethel could rest. Late the next morning, Marisol Santos flew in. The entire family went to the airport to meet her. Marshall was almost vibrating, waiting for her to appear. When she came out of the secure area, he waved and walked over.

“Good morning.”

“Good morning.” He put his arms around her and kissed her; she pulled back a bit and kissed him back, a reaction that surprised him.

“How was the flight?”

“Whew. . . very long, Caracas to Miami, Miami to Madrid, Madrid to Granada. . . I’m exhausted.”

“I bet. We had a long flight yesterday and we’re still recovering. Let me introduce you around.” He turned to his family. “This is Marisol; my mom, dad, and sister.”

“Very pleased to meet you, dear,” said Ethel. She leaned over to give her a kiss. “Welcome to the family, or at least soon.”

“Thank you; you’re very kind.” Marisol turned to Will, who extended a hand.

“It’s very good to meet you, we’ve heard a lot about you.”

“And Marshall’s told me a lot about you as well.” She shook Will’s hand, a bit hesitatingly, not sure what to make of a famous future father in law.

“It’s good to meet you,” added Liz, embracing her future sister-in-law.

“Thanks, good to meet you as well.” The young women smiled at each other.

“Let’s get your luggage,” said Marshall. They headed to the carousel, where suitcases were already available. They grabbed Marisol’s bag and headed for the limousine.

“So, the two of you met through friends?” noted Ethel.

“Sort of,” replied Marisol. “We met at a meeting of MIT’s chapter of the Mars Colonization Society.”

“I was a member of it as well when I was there,” said Ethel.

“I heard. Marshall made it even more active. I was asked to write software for a project he was running for the Society, so we worked together a lot.”

“And discovered other interests,” added Marshall.

“You’re finishing up a Masters in robotics, I understand?” asked Will.

She nodded. “Yes, and Mars is just about the best place to use such a degree.”

“We have almost a thousand robots arriving this year,” added Will. “Genies, spiders, prospectors, entos, elfs; all the standard makes.”

“I know the Elf 150 and Genie 250 the best, and I hear you have them doing assembly line stuff, lathe and loom operation, clothing and shoe assembly . . . all sorts of stuff that’s rarely tried on Earth because of the unions.”

“We have such a labor shortage, we have to use them to replace laborers,” replied Will. They all reached the limo and climbed in. In a matter of moments they were seated inside and off to the resort.

“Are you excited about the flight?” asked Liz.

Marisol nodded and her eyes flashed with excitement. “I really can’t wait; Mars has been a dream all my life.”

“Just remember once you get there that it’s a real place, not a dream,” said Will.

“Oh, Will! Don’t lose your enthusiasm, Marisol,” countered Ethel.

“Definitely don’t,” agreed Will, quickly. “What I mean is that we aren’t a utopia and we need all the energy and enthusiasm of our people to move Mars forward.”

“And it is moving forward, unlike Earth; that’s why it’s exciting.”

“Yes, we are moving, but we must think very carefully whether it is forward or just sideways,” quipped Will. “Because sideways is exciting, too.”

“Depends on how you define ‘forward,’” replied Marshall. “Because net growth in size is positive.”

“Yes, and for most people that’s ‘forward,’” replied Will. “But consider that true progress is creating a society where the limitless potentialities of human consciousness can be expressed, not just a society that is larger and richer.”

“But Mars is more creative,” said Marisol, though she ended her sentence with an upward tone that almost converted it into a question.

“By and large, I think so,” replied Will. “But we work very long hours and that hurts family life. Our divorce rate isn’t too bad, but we screen people psychologically and make a lot of free counseling available, so are our marriages happier because of Marsian culture or is it a product of selection and counseling?”

“And a lot of people find out things about themselves as a result of the psychological testing and counseling,” added Ethel. “That helps a lot. In some cases marriages that are being considered never take place because the couple realizes they aren’t ready to tackle marriage together. And if you don’t have friends, Mars can be lonely. It’s a planet of fairly friendly people, but some folks isolate themselves and have trouble making friends. So they are lonely.”

“And it’s financially stressful,” added Liz. “At least for the first few years.”

“That’s improved lately,” replied Will. “Starting salaries have gone up a bit and migrants start out with mortgages that pay just the interest for the first two years.”

“That’d be depressing,” remarked Marisol.

“When do you plan to get married, anyway?” asked Ethel.

Marshall looked at Marisol, a bit embarrassed, since they had originally planned to marry in Cambridge. “Some time after we arrive,” Marisol replied. “Everyone says it’s a big cultural transition and a bad time for a wedding.”

"Yes, that's correct," replied Will. "It's better to marry several months before arrival, or several months after."

They returned to the hotel, Marisol unpacked, they had lunch, then they all drove to the Alhambra in several taxis. Will and Ethel had heard that some of its architectural features were echoed in the Gallerie and the buildings around Andalus Square, and they quickly saw that it was true; the richly stuccoed Moorish columns, the bulbous arches, the ubiquitous geometric tile work, and other Moorish elements were common to both, as were elements from the European Renaissance that were added to the Alhambra and other Moorish buildings after the reconquista.

The day of walking was followed by a day of quiet at the hotel. Liz talked on the videophone and practiced her ballet a bit for the first time in terrestrial gravity; Marshall and Marisol hung out around the pool, swam, and talked; the oldsters sat and chatted, as if in a few days they could catch up on almost thirty years of each others' lives.

That afternoon and evening the dozen heads of staff of the Mars Commission and their families began to arrive for a four-day of retreat. Mars was not only reasonably close to Earth, but Aurorae's clocks matched Granada's quite well, allowing the heads of staff on Dusty Red to participate by video as well. The retreat was scheduled for 10 a.m. to 4 p.m. only; the rest of the day the staffers spent relaxing. It was a good chance for everyone to get to know each other better and for the Mars Commission to review every aspect of its work.

On the third night of the retreat, when many of the old timers and a few staffers were gathered on the patio under blossoming orange trees to enjoy their heady scent and

the light of a full moon, David turned to Will and said “I’ll have to try a retreat like this with the heads of staff of the Venus-Mercury Commission.”

“It’s proved to be a good idea. We had to schedule it a year in advance in order to accommodate everyone’s schedules, and Spain hasn’t worked out well for everyone—some families would prefer an English-speaking location—but we have been able to examine our entire operation with a fine-toothed comb.”

“Are you creating a plan?”

“Yes, a six-year plan. The next two are already planned, so we are refining the plans, concentrating on the two years after that, and outlining goals for two more; those are the years after my term as Commissioner ends, so the next Commissioner will have a plan ready-made.”

“It’s been quite a process,” said Ethel, who had been invited to half the sessions. “Communication between the two worlds has been the bottleneck. It’s very hard to create consensus when you have two separate groups brainstorming at once. Will’s been reading and reviewing recorded discussions for hours to keep everyone on the same page.”

“Well, not just me; that’s why we have an official secretary for each group and a ‘representative’ of each group on the other planet, who’s supposed to be completely familiar with the other group’s ideas and thoughts. That usually takes the representative three hours a day!”

“What sort of plans are emerging?” Harold asked Will, curious.

“Well, we can use your advice about them, but then you’ll need to help with the implementation in Washington!” teased Will.

"I doubt I'm of much help to you any more; I really don't have that many contacts left in Washington. Louisa's the person with the perpetually renewing rolodex."

Louisa smiled. "Will already knows I hate to be retired, but I can't offer as much time as I could before!"

"We miss you, Louisa," replied Will. "This is all confidential, of course; nothing leaves this group. We started with a seemingly endless round of reports, then batted around a lot of ideas almost randomly, some of which potentially contradict each other: for example, privatization of spacecraft construction versus launching a new line of spacecraft. We looked at immigration and growth of human resources, possible growth of export and financial resources, and looked at where resources had to go. We had input from more than just heads of staff; Ethel was involved in the discussions about exports as Vice President of Operations for Mars Metals, Inc. All three of the vice presidents of operations for our gold mining companies participated in that discussion. Then today we began to organize ideas into categories and prioritize them. One main organizing principle we recognized is the economic sustainability of Mars."

"Is that a way to say 'self sufficiency' without using a term that is loaded with implications of independence?" asked Sergei.

Will shook his head. "No. It makes no sense for Mars to strive to be self sufficient. We can never make shuttles, nuclear reactors, or vaccines more cheaply than importing them. Economic sustainability means that Mars is no longer dependent on financial subsidies from Earth. If we receive such subsidies anyway, that's fine; we'll use them to grow. But Mars is now at the point where, for the first time, it is covering all its expenses. We think it is a valuable principle of autonomy and responsibility to maintain

the situation. Furthermore, the situation on Earth is not completely predictable. In the last twenty years there have been several major economic recessions and there was almost a war between China and the United States. Petroleum prices and energy supplies remain uncertain. We need stability."

"I can understand that," agreed Sergei. "The international economic situation is changing, but it isn't improving. There appears to be an increased tendency for the world to organize in opposition to the United States, which is polarizing the politics."

"Earth needs central coordination, and there are too many people afraid of it," said Will. "You can't run a world economy efficiently or ensure its stability without regulations and central coordination. That partly explains the tendency toward regional blocs and the increased tendency of the blocs to coordinate things among and between themselves. It puts Africa and the Arab world, with their weaker regional organizations, at yet another disadvantage. And it weakens the United States because the regional blocs increasingly can act as economic rivals to the U.S. Mars is put in a very awkward position by being dependent on all these countries and blocs."

"So, exports," said Laura.

Will nodded. "Yes, we need more of our own income. Gold has held its value, the moon can't produce any, and Mercury so far hasn't been able to produce much, so we plan to recover more of it; we can probably export 500 tonnes per year, which would make us twice as large a producer as South Africa. Of course, that kind of volume will require a huge investment because the richest sources have now been mined, but right now we're in the position to make that investment, and there's plenty of terrestrial money

available. PGMs are the next obvious export, even though the moon has set a goal of exporting a thousand tonnes per year."

"A thousand tonnes?" said David. "That'll depress the price!"

"We have no choice but do the same and aim for a thousand tonnes of exports per year, which is four times our current production, but at least our total income from platinum group metals should stay the same or even grow slightly. Uzboi can produce that much if it triples in size. The gold producing outposts will grow as well, so Aurorae will continue to shrink relative to them, probably to about a third of Mars's population. We may also have to open two or three new outposts, since Mars has gold elsewhere."

"That means expanding the roads and air transportation," noted Laura.

"But we can afford to do that. We have more resources than we had ten years ago when we cleared the Meridiani Trail," replied Will. "It appears very likely we can push our total economy up to forty to fifty billion redbacks per columbiad. So the question then becomes, what do we do with the money? Some has to be invested in infrastructure to make the exports possible. Some has to support scientific study of Mars, which is one of the reasons we're there. Tentatively, we want to start a new research focus on recent Mars; we've been studying planetary formation, establishment and loss of a magnetic field, the origin, evolution, and loss of Martian life, and all sorts of interesting questions, but now we need to characterize the recent past in order to understand the livability of the planet and the possibilities of climate modification."

"Terraformation," injected Sergei.

"We aren't using that term yet, but we're moving in that direction. Terraforming won't make sense until Mars is much bigger; why pour hundreds of billions into

thickening the atmosphere a percent or two and pushing the average temperature up from frigid to less frigid, when the same money could dome over more land than the population needs? As expensive as domes are, they'll be cheaper than terraformation for a long time. No, characterizing the recent climatic and geologic past involves 'livability' issues: seismic dangers, frequency of dust storms, the climatic trend over the next thousand years—which appears to be toward a warmer and wetter equatorial region—etc. That's the likely scientific priority.

"The technological priorities will involve the concept of 'key technologies': what technological capacities do we need to enhance sustainability? We're still working through that, but some priorities are clear. We need more nuclear reactors to guarantee a minimum power level during global dust storms. That's already underway. We need a larger spacecraft, which we were calling 'caravel B' but we're now calling the 'galleon class'; it'll be three times larger than the caravel and able to transport 500 to 600 people between Earth and Mars."

David whistled. "We'll never need anything that big for Venus or Mercury!"

"True, but galleons are a good size for expeditions to Saturn, Uranus, and Neptune; two of them could hold one hundred people each for up to a decade. The outer planets will need expeditions that are instant colonies, because of the very long travel times. Galleons are also a good size for low Earth orbit hotels; we've received several inquiries just in the last few months. Phobos could use galleon-class vehicles for housing if it continues to expand. We'll do much of the galleon construction there."

"Let's say you have six galleons, each flying five hundred people to Mars over a six month period," said Harold. "How would you ever get all those people to Gateway?"

“We’d leave two galleons in low Earth orbit docked to a tourist hotel,” replied Will. “We’d fill them and the hotel, then those galleons would depart for Gateway with a thousand people each. They’d transfer half their passengers to other galleons at Gateway, refuel, and head for Mars.”

“That’s what we’re doing with caravels this time,” added Ethel. “We don’t have the capacity to move nine hundred people to Gateway in six months, but the capacity to put tourists in low earth orbit is big enough to fill caravels there.”

“What are your other technological priorities?” asked David.

“Parts for pressure suits, surface vehicles, and a wide range of life support related equipment. Those are expensive imports. In six years we should be able to do the bulk of the work making them, and more of the tasks for making life support equipment for caravels and galleons.”

“What about consumer goods?” asked Laura. “It seems to me that’s the other logical priority.”

Will nodded. “It’s an economic priority, not a technological one. We have a lot of the machinery to make consumer goods, just not the staff or the demand to make them cheaply. We plan to set up an Office for Private Enterprise to focus on two things: privatization and establishment of new small to medium sized businesses. We’re now big enough to make most of the items the average consumer needs; we really shouldn’t import consumer goods.”

“Except antiques?” asked Laura provocatively.

Will smiled. “And Barbie dolls, cellos, golf clubs, and a zillion other items people will want even if we can make decent substitutes. We’ll always be importing from Earth. But we’d like to be in the position where we can do without if we need to.”

“You’re going to capture the consumer markets on the moon, Venus, and Mercury, too,” said David. “That boosts your volume.”

“The increase in lunar PGM production will push up the moon’s population, increasing our market. The solar sailers cut shipping costs and thereby opened the market to us four years ago, but most buyers didn’t want to plan their orders two or three years in advance, so they continued to buy from Earth. It was a frustrating situation. So we started to stockpile goods at Gateway that we could use on the passenger flights to Mars, and we had spare stock. It turns out if you have an inventory at Gateway and can deliver it in two or three months, people will buy!”

“It’s very convenient for us,” agreed David. “Any Venus or Mercury mission that needs consumables can get them up to the day before departure from Gateway.”

Harold sighed. “Sometimes I wish I were still young. The changes that are happening are really unbelievable. Low earth orbit manufacturing is finally beginning to show some promise. That can only cut the cost of launching to LEO further and speed up the settlement of Mars.”

“And Venus and Mercury, and the opening of the outer solar system,” agreed Will. “I’d like to be able to come back in a century. I can’t imagine what it’ll be like.”

“It’ll certainly feature Marsian independence,” said Louisa. “But from the sound of it, Will, independence won’t be far off. You’re laying the groundwork.”

“I’m not pushing independence, but I think it’s inevitable. That’s an important distinction. It’s a question of history. In four to six years, with expanded exports and a larger population, Mars will have the capacity for independence.”

“Why do Marsians want to be independent?” asked Sergei.

“Right now, most don’t. Maybe ten percent of the population is in favor, often the younger, more idealistic residents. The reasons are the usual ones you see on Earth: an identity as a people emerges, and the people then feel the need for autonomy and self-determination. It’s not hard to see why a Marsian identity is emerging: we are isolated, we live in 0.38 gee, we live through a 24.6-hour sol, we have a 668-sol seasonal cycle, we have a common experience of the land, etc. Couple these common experiences and an emerging common culture with a sense of critical mass and financial independence and you have an independence movement.”

“But only three thousand people?” exclaimed Sergei.

“It’s three thousand now, but it’s growing almost a thousand per year between immigration and reproduction. In four years we’ll be seven thousand; in six years, nine thousand. After that we’ll be growing even faster. And we already have a budget of thirty-six billion redbacks per columbiad.”

Sergei nodded. “I understand, but I still question the idea of inevitability. This is not an oppressed population. They already have home rule and a flag. Why do they need a passport and citizenship?”

“I think the answer is that they are inevitable aspects of self-determination, and you don’t have to be oppressed to aspire to self-determination.”

Sergei shrugged. “Why? You’re quoting vague ideas about nationalism. What about ‘glory not in this, that you love your country; glory in this, that you love mankind’?”

Will was startled to hear a quotation from Bahá'í scripture on the lips of his thoroughly secular friend. “That quotation isn’t meant to say you shouldn’t love your country, just that you should love humanity more. I think most Marsians have some feeling for this; they live in a multicultural and multi-ethnic society, maybe the first one that is not a universalized version of a single ethnic culture. And we are not rejecting a call for a coordinating body for all humanity; just a few minutes ago I said it was needed. But just as humanity needs a coordinating entity, so similarly does Mars, and it needs recognition as one such entity among others.”

“Do Lichtenstein or Andorra need full independence?” asked Harold.

“But they’re small entities bordering on much larger nation states. We don’t border on anyone; we’re more like Kiribati or Nauru, island states that are isolated from neighbors. Maybe Mauritania is an even better example: a very large country with a small population, isolated from neighbors by the Sahara.”

“But even Mauritania has millions of people,” replied Harold.

“But they don’t have a gross domestic product in the tens of billions and a fifty-million kilometer moat between them and the rest of humanity.”

“He doesn’t get it,” Sergei said to the others. “Will Elliott is a patriot.”

“I am not pushing Marsian independence!” exclaimed Will, forcefully. “I’m seeking to go with the flow, not force the flow along.”

“The Chinese trustee called his view Marxian,” quipped Pierre Messier. “Because Marx spoke of various inevitabilities as well, like the withering away of the state.”

“He was speculating,” replied Will, irritated.

Sergei laughed. “He doesn’t get it, he really doesn’t!” He looked at Ethel, who smiled.

“He doesn’t,” she confirmed.

“Get what?”

“Will, are you an American or a Marsian?” asked Sergei.

“Both.”

“Were the men gathered in 1776 to declare the United States independent both American and British?”

“I suppose they were until they declared themselves independent.”

“Technically correct,” replied Sergei. “But we know where their hearts were!”

“Remember, this is the man who coined the Marsian words to ‘This Land is Your Land,’” added Ethel.

“The man who first used ‘Good sol,’” added Laura. “I thought he was making a joke.”

“The ‘Moon man’ who loved Mars so much, he wouldn’t leave,” added David.

“The man who is responsible for Mars having 3,000 people, instead of fifty,” noted Harold. “Though Ethel had something to do with that, and Marshall, and Shinji.”

“So Will, don’t worry about being a patriot; we understand,” exclaimed Sergei.

"Alright," replied Will, irritated by his friends' pressure. "I'm a patriot. I admit it. But you have to agree that being a patriot and the Commissioner puts me in an awkward position."

"Well, don't worry about that too much," said Ethel. "Because we'll help. Every single one of us here will help."

"We will," agreed Harold, with David, Louisa, Sergei, and Laura nodding.

Marshall ate an early breakfast the next morning because he and Liz wanted to make ski plans. About the time they finished, Marisol came down from her room to have breakfast.

"Good morning," said Marshall, standing to give her a kiss on the cheek.

"Good morning," she replied, sitting at the table with them.

Just then Liz rose. "I still have to finish washing, Marshall; half an hour?"

"Okay. See ya." He watched his sister go, then turned to his fiancée. "Liz and I were talking about another trip up to the ski resort this morning or afternoon for half a day of skiing. This is just about her last chance."

"I suppose, but I was hoping you'd spend the day with me in Granada. We don't have much time for that, either."

"How about late this afternoon and evening in Granada? And come up to the ski resort with us. Even if you don't ski, you can look around; it's interesting."

She shook her head. "No, ski resorts really don't interest me. I wish you could spend the day with me. I don't have anyone else here to hang out with."

"My mom's available. Go for a walk with her."

Marisol shook her head.

"What's wrong, anyway?" asked Marshall. "You've been rather distant for the last few days."

"Well, so have you. I had hoped you'd visit my room a few times."

"My parents are opposed to that sort of thing, and they're paying for our lodging."

"Awfully old fashioned!"

"Is that what's really bothering you?"

"Well. . . not altogether."

"Then what?"

Marisol looked at him. "I'm not quite sure how to say this, Marshall. Seeing you with your family, you're different than around the university. I'm not quite sure how. . . you're deferential to your parents, and even to your sister."

"Well, aren't they deferential in return?"

"I suppose. . . it's just so different from the way I want to live. It's so old fashioned and dependent; it makes me feel very awkward, even inadequate. I want to be free. On top of that, meeting all these oldtimer astronauts has made reality crash down on me. I really am leaving Earth, going to Mars, I don't know when I'll be back, I'm not sure whether I'll like my work there or how I'll further my education, I don't know whether I'll ever see my home town again, I'm going to be imbedded in a family I am not comfortable with, and I'm going with this man whom I really don't know so well. . ."

"It's a big leap," agreed Marshall. "Everyone who goes has second thoughts both before and after departure."

"Yes, but my second thoughts are not just about the trip, but about whether we should get married. . . or even whether I really love you."

That startled Marshall. “Well, what should we do? I can’t change myself, I am what I am and my family is what it is. We’ve had this conversation before. You were very uncomfortable about the idea of Bahá'ís needing permission from all living parents to get married. That’s why we didn’t get married in Cambridge.”

“I know. I. . . I think it’s probably best to call off our engagement for a while. Maybe we will get married, but right now I’m just too uncertain.” She shook her head, then lowered it, upset she had said what she had said.

“Call it off?” Marshall was shocked; the suggestion had come without warning. “Alright, Marisol. . . if that’s what you want.”

She nodded, then began to cry. “I think so.”

“Alright, we can do that. . .” He sat and let the shock seep through him. “Maybe we should talk more about this. . . maybe tonight?”

“Yes. I’ve been wracking my brains about it for three days, Marshall. I love my family, but I really want to be away from them, and I really don’t want another family as a substitute, not now at least. The idea of marrying a man and moving with him to Mars is appealing, but when the in-laws come along for the ride. . .”

“Well, you knew they were on Mars.”

“Yes, I did, but they were abstract before.”

Marshall looked at her, uncertain whether to be angry at her or to cry. “Well, let’s talk more tonight,” he said. He stood and walked away, wondering whether he should go tell Liz or go for a walk first. He decided to walk around the hotel grounds.

6

Callisto

July, 2063

Marisol changed her plane reservation and flew home to Venezuela the next afternoon. She changed her flight to Earth orbit from Kennedy to the new Ecuador National Spaceport, where an old Swift Shuttle carried Latin Americans to the *Prospect*, which was waiting in low Earth orbit. She was on it when it flew to Gateway. She managed to change her berth from the *Intrepid* to the *Courageous* so she didn't have to encounter Marshall on the flight to Mars.

Her departure cast a pall over the rest of the Elliott family's visit to Earth. They went to Scotland for three days to visit Ethel's family. Marshall, Liz, and Ethel remained there while Will flew to Moscow, New Delhi, and Beijing for two weeks of talks. They reunited for two days more in Connecticut for one last visit with Molly and Katherine. Then they flew to Kennedy, where a shuttle carried them to low Earth orbit and an ITV carried them to Gateway. They boarded the *Intrepid* two days before departure.

A LANTR rocket its engine and pushed the *Intrepid* onto a trajectory that sent the caravel on a three-day course to Earth. As they were approaching the top of the atmosphere the LANTR fired its nuclear engines, kicked in its oxygen afterburners, and expelled several hundred tonnes of hydrogen and oxygen, sending the vehicle on a fast trajectory to Mars.

At almost exactly the same time the *Courageous* was performing the same maneuver. Once the burns ended, the two LANTRS slowed themselves down and headed back to Gateway. The two caravels approached each other and, after three days, docked

together, forming an interplanetary community of three hundred people. Connecting them together were two large inflatable zero-gravity gymnasiums and a complex of rooms.

The vehicles soon settled into a standard routine. The residents were divided into three time zones, 8.2 hours apart—for they were now on 24.6 hour sols, not terrestrial days—to spread out the demand on the cafeterias, classrooms, gyms, and other common areas. Minicourses on dozens of topics—pressure suits, life support systems, celestial navigation, Martian geology and biology, climatology, Marsian culture and civics, and horticulture—began. Teams for the intramural and intership zero-g volleyball tournament formed. The *Intrepid* Orchestra began to practice for their first of three concerts and the *Courgeous* Players rehearsed the first of their three plays.

Marshall was a veteran of zero-g volleyball and emerged as a star player. After one of the intramural games between teams on the *Intrepid*, Marisol came up to him.

"Hi."

He hadn't seen her coming and was surprised. "Oh, hi. How are you doing?"

"Oh, pretty good. How about you?"

"Pretty good, at least now."

"I hurt you. I'm sorry about that."

"Yeah, I was hurting a lot for a month or so. You left pretty abruptly and we never had a chance to talk."

"I know, I couldn't talk then. There's really not much to say even now. I went home, saw my parents for a while, then left early, went to Ecuador for launch, then had to wait at Gateway for two weeks. Lots of time to be alone and think."

"Was it good?"

“Yes. I’m glad I’m going to Mars, though maybe I’ll stay just two years.”

“And us?”

“Well . . . I think it won’t hurt me so much to see you, but I think it’ll hurt you, so I advise we wait.”

“Then. . . it’s over?”

She nodded. “I think so.”

“Well . . . we had some good times together, so I’m glad for that.”

“So am I.”

He looked at her, then nodded and turned away before the tears came. She floated away from him. Liz, who had seen the conversation, floated over. “What did she say?”

“That it’s over.”

“Oh, I’m sorry.”

“So am I,” said Marshall, shrugging. Tears accumulated on his eyeballs—a zero gee hazard that blurred eyesight—so he wiped them away so he could see. Liz put her arm on his shoulder.

“Let’s go home.”

He nodded and they floated across the zero-g gym, then into the hub of the caravel. They floated into an elevator, the doors closed, it descended, and gravity returned. “You were a good player today,” Liz added.

“Thanks.”

The elevator stopped at the bottom floor and they stepped out. A short walk brought them to an alcove off the corridor with a few chairs. Marshall and Liz shared a small room there next to Will and Ethel’s. There were several other rooms in the area, but

the inhabitants were on a different schedule and thus were sleeping or attending classes. Sitting in the alcove with Will and Ethel sharing a pot of tea and some cookies were Martha and Charles Vickers and Brian Stark. Marshall and Liz saw the conversation was well established, so they disappeared into their room.

"I'm pretty sure we secured the funding for the Trojan expedition," Charles was saying. "The scientific value of exploring the Trojans is pretty well established; the three unmanned probes have confirmed they're made of the same stuff as Jupiter."

"How many worlds will the expedition visit?" asked Will.

"Still undetermined, but L4 has 2,000 significant bodies; it's a third the size of the asteroid belt. We'll probably start at Achilles; its 112 kilometers in diameter and chondritic, so we're sure we can make fuel. We'd like to visit Agamemnon and Hektor, though the latter would be tricky; it's a contact binary. If it's a six year expedition, it'll have three and a half years at L4, so it could probably visit four or five. We've got the time to launch probes with prospectors to another dozen. We may be able to return samples from half of those."

"What propulsion system?" asked Brian.

"Lox-augmented nuclear thermal. It gives more efficient use of fuel, better flexibility and safety, and we'll need the power; solar's too diffuse out there."

"And this'll launch in 2068?" asked Will. "Basically, Mars launches again to Jupiter. Cool."

"The Chinese launch their second Jovian mission from Mars next year," noted Brian. "And the U.S. mission will go via Mars in 2066."

“And both of you will probably launch from Mars in 2068,” added Will. “Sounds like we’ll host three big launches that year.”

“Can you fuel that many?” asked Charles.

“Not now, but we’ll be sure to have the capacity then. Our hydrogen is and always will be the cheapest in the inner solar system because it’s surplus from methane and oxygen production.”

“Are you sure you can use that much methane?” asked Brian.

Will laughed. “That might be the bigger problem! If three missions need a total of a thousand tonnes of liquid hydrogen we’ll have to manufacture fifteen or twenty thousand tonnes of methane and oxygen. We can make water ice and dry ice for shipment to Gateway, but in two or three years carbon production at Parenago on the lunar far side will undercut that market. There’s a region of Phobos that’s rich in long-chain hydrocarbons; if we tap it, we’ll get more hydrogen.”

“The moon’s surplus oxygen problem will go away, once they have carbon,” agreed Brian. “Charles, about 2066 we’ll acquire the ability to load uranium fuel assemblies into solid core nuclear engines. Keep that in mind. We’ll set up the facility on Deimos.”

“Good. The engines will probably be fueled by uranium from New Hanford anyway. Are you planning a radioactive disposal facility on Deimos?”

“Of course! It has to go somewhere. We’re talking to the Chinese about a joint underground facility on the Deimosian equator.” Brian glanced at his watch. “Well, I have to give a class, believe it or not; the civics class is learning about New Hanford.”

“We should go, too,” said Martha. “I have appointments starting in half an hour.”

“Well, come back tomorrow afternoon,” exclaimed Will. “We can watch the Callisto landing together.”

Brian groaned. “I don’t know if I want to.”

“Come watch it in the company of friends,” said Ethel with a smile.

“I’m providing the refreshments,” added Will.

“And I can offer grief counseling,” noted Martha.

“Thaaanks, Maaartha,” replied Brian.

“Did I tell you I got a videomail from Enlai last week?” said Will. “They had just gone into orbit around Callisto after their harrowing flight through Jupiter’s radiation belts. He was in a good mood and said ‘We’ve been here several hours and still have not spotted a monolith.’”

“Monolith?” said Brian, puzzled.

Martha laughed. Charles looked at her quizzically, then laughed too. “My 94-year old mother got it immediately,” said Will. “But then, as a teenager she watched *2001: A Space Odyssey* twenty times.”

“Oh. Monolith.” Brian nodded.

“Explains your interest in space,” added Martha. She waved. “Have a good sol. See you tomorrow.” They all exchanged goodbyes and the guests departed.

Will began to pick up the leftover refreshments. Before he finished, Marshall and Liz came out of their room. “We saw Marisol,” said Marshall. “She said our relationship was over.”

“Oh, I’m sorry, hon,” exclaimed Ethel. She hugged her son.

“That’s hard,” said Will. He kissed Marshall’s head, since the rest of him was covered by Ethel. “We all experience this. Love has a down side; the pain of separation.”

“And it has to be a free and willing exchange,” added Ethel. “If Marisol doesn’t think she’s the right one for you, then she’s isn’t.”

“I know,” said Marshall, smiling and grimacing at the same time.

“She strikes me as a bit self-centered,” exclaimed Liz.

“Never mind,” replied Ethel. “She has her path.”

The next afternoon, all activity on the *Intrepid* and the *Courageous*—not to mention on Mars, Phobos, Deimos, the moon, Venus, and Mercury—came to a virtual stop and everyone sat before their screens to watch the Chinese crew land on Callisto. The landing site was a broad, flat plain—a geologically young surface recently flooded by water “lava” from a nearby cryovolcano—named Beijing. Two automated cargo lifters had left reactors and a fleet of rovers scattered across the plain, their cameras pointing upward at the descending caravel, the data being transmitted to the international Jupiter communications satellite network and riding on laser beams to both Earth and Mars.

“Altitude ten thousand meters,” reported Commander Li Xiaoqiu in computer-translated English. “Range, fifty kilometers. Time to landing, one hundred five seconds.”

“Do you see it, yet?” asked Will, squinting at the screen.

“Up there, I think.” Charles Vickers pointed at the top of the screen, where there was a tiny, moving point of light. Just then the image zoomed in and the point became a tiny disc. In its center were five glowing spots; the descent engines, which were burning hydrogen and oxygen. The bluish flames were almost invisible.

"Ah," said Will. "Looks like our ship."

"They're decelerating at what? One gee?" asked Martha.

"About that," agreed Charles.

"It should be an American ship," complained Brian.

"Shall I massage your shoulders?" offered Martha, half seriously.

Brian gave her a look.

"It's almost boring, visually," said Marshall. "No dramatic flames or anything."

"No, reality is never as interesting as fiction," replied Will. He glanced at the chronometer; they were now forty seconds to touchdown. The scene shifted to a view of the Beijing Plain from a rover located on a crater rim near its edge. In the foreground the surface was rough; the water had come out, boiled and instantly frozen, then the plates of ice had been carried around and jumbled by the swelling waters. Finally, condensing frost and water "volcanic ash" had buried the flood with a meter of ice particles that were now hard as rock. Plates of pack ice still partially stuck up above the frost.

"Ah, we can see the flames now," said Charles. Sure enough, Will could see the jet of glowing water vapor extending downward from the *Tienan.*

"You have good eyesight."

"And I've never had Lasik or a cataract replacement," boasted Charles.

The camera angled shifted back to the view from the hill, but now, above the Beijing Plain, they could see the *Tienan* approaching. It was moving quickly but its velocity was rapidly diminishing as well. Then a mist began to rise from the plain as the blue-hot jet of water vapor impacted the icy plain in a vacuum, creating a temporary atmosphere of water-gas that solidified into snow almost as fast as it formed. In a few

seconds as the *Tienan* descended to within a hundred meters of the surface, it disappeared into a fog bank.

"Thank God they have radar-guided landing," noted Charles.

Will turned to Marshall. "That's pretty dramatic, wouldn't you say?"

"Dramatic, yes, but not very photogenic!"

"We are approaching the surface," reported Commander Li. "Twenty meters. . . ten meters . . . five . . two. . . . engine cutoff, and touchdown! The *Tienan* has landed on Callisto."

They could hear applause over the audio channel and Will joined in spontaneously. Even Brian began to clap. "A tremendous achievement," Will said.

"It is," Brian admitted.

"Did you ever think you'd see people on a moon of Jupiter, dad?" asked Liz.

"Hum. I suppose by 2030 I was wondering if I would. Many experts were saying that the moon-Mars technology would get us half way to Jupiter and the next leap outward would take less effort than Project Columbus. There were even projections that people would reach Jovian space by 2065 or so."

"Venus and Mercury were more of a surprise to me," added Ethel. "No one bothered to predict when people would reach them. Venus was easy to accomplish with Project Columbus technology, and Mercury didn't take much additional development."

"But no one would have said China would get to Jove first," noted Brian.

"No one in the west," Will hastened to add.

The fog bank began to clear as the ice crystal mist began to settle. In a minute they could see the *Tienan* resting on its six legs on the Beijing Plain about a half

kilometer away. The Chinese flag was very prominently blazoned on its side, with a red *Tienan* in both Chinese and Roman characters. They listened to the sounds of the post-landing checkout as the propulsion system was deactivated.

Will looked at the room around them. “Now they have to turn the entire ship’s quarters ninety degrees to be horizontal in Callisto’s gravity. They turned half the bathrooms while in orbit.”

“Wise move,” said Martha. “I hope the ship isn’t laid out like this one!”

“No,” replied Will. “Everything—corridors, rooms, bathrooms—is laid out to be 2.5 meters high and 2.5 meters wide but various lengths, so the width can become the height and vice versa; or it is designed so that the walls can be moved easily.”

“They can’t spin the inside fast enough to overcome Callisto’s gravity?” asked Liz.

Will shook his head. “Callisto has 1/7 gravity; a bit less than Luna. If they spun the interior at six revolutions per minute, the rim would have a centrifugal gravity of 0.5 gees, so the floor would have to be partially tilted to appear flat in the combined force regimes. That’s too complicated.”

“What a pain,” noted Brian. “I suppose in the future there will be a permanent base on Callisto’s surface and the caravels will stay in orbit.”

“Probably,” replied Charles.

They listened to the banter between Beijing Ground Control, secondary control at the Chinese base on Mars, and the *Tienan.* As soon as the vehicle landed, the commander and three crew—Dr. Enlai Tang, an exobiologist, Dr. Xiaopeng Cai, a geologist, and Dr. Lin Wang, an engineer—headed for the airlock to suit up. They were anxious to get outside,

the modern suits were fairly fast to put on, and the ship's landing systems were safely deactivated quickly. Within half an hour of landing, the long-range cameras focused on astronauts walking around on the flattish top of the caravel. They extended a wide ramp from the top and were soon descending it to the ground.

Commander Li was the first to extend his boot onto the icy regolith of Jupiter's farthest galilean moon. The zoom-in closeup clearly revealed his foot touching down; they even heard the crunch of the regolith through his spacesuit microphone. "We come in peace to open the Jovian system to human exploration," he announced. "China is proud to lead humanity to the King of the Planets and the miniature solar system in orbit around it. We come in search of life, of new knowledge, of resources, and of land for an expanding humanity. May this world be the mother of many generations." He raised his right hand, in which he carried a Chinese flag on a flagpole, high. The other three astronauts, still on the ramp, stopped to applaud. Then they descended one by one—Enlai being next—and each offered their own first words.

They walked to a low mound a dozen meters away and planted the Chinese flag in the loose ice regolith. They saluted and the Chinese national anthem began to play on board the caravel, carrying the tune to billions watching on Earth. Brian groaned.

"Lord, they're milking this for all its worth."

"The U.S. would do the same," replied Ethel, her Scottish burr a bit stronger than usual, perhaps to remind Brian she was the one non-American present.

"I suppose, Ethel, but think what this is doing! The world will see the Chinese in the lead! The U.S. isn't even going to be number two! This will have grave implications."

"The Chinese have something to crow about," agreed Will. "So they will crow, and they should. The U.S. has no one to blame but themselves. There could have been Americans on Callisto two or three years ago. The technology the Chinese used is not new."

"I know, it was our quest for new technology that sank us. The tortoise was faster than the hare this time. But a loss is a loss."

"Brian, the U.S. can't dominate the world like it could in the 1940s or 1990s," said Ethel. "The Chinese and Indian economies are both almost as large as the US. The European economy is larger. Even the Latin American economy, now that they have a single currency, is half the size of the U.S. The U.S. share of the world economy has declined from a third to a sixth. This isn't because the U.S. has done something wrong, but because it has five percent of the Earth's population and everyone else is imitating them!"

"But who do you want to be the perceived leader, the United States or China?"

"Most of the world would say neither," replied Ethel. "So a situation where they balance each other is welcomed."

"More than one hyperpower?" asked Brian, shaking his head. "God help us."

"No," persisted Ethel. "We're moving toward a world with no hyperpower, and the European diplomatic approach is getting more and more powerful and effective, especially as economic integration proceeds."

"Maybe," replied Brian. "Or maybe the world will fall into chaos without a leader."

"Do you think the U.S. will set up its Callisto base near the Chinese?" Will asked.

Brian shook his head. "When I was in Washington, that was not the prevailing feeling. Everyone seemed to feel that there were better locations, from a scientific point of view, and that science should determine the location, not politics."

"That's crap," exclaimed Charles, rather forcefully.

"It is," agreed Will. "Brian, when I was there I talked to the Odyssey people and about a hundred NASA administrators, and most said the same thing. If there's anyone who can make a difference, it's you. They listen to you; I know, they told me. The Beijing Plain is one of the top two or three landing sites on Callisto; it's surrounded by old and recent cryovolcanoes, it's excavated by several recent impacts, it's known to have organics in its ice, and it has both chondritic and nickel-iron deposits. It's also well located where the moon's passage through the Jovian magnetospheric tail is concerned. The Latin American/Brazilian expedition is setting up their outpost there; the whole moon's accessible and there will be mutual rescue capacity. People in Washington don't want to land there because of politics and national pride."

"Think how stupid they'll look if they have an accident and Chinese help arrives too late because they're a thousand kilometers away," said Ethel.

"I know," agreed Brian. "The U.S. doesn't want to join the Jupiter Commission the Chinese are proposing. It's foolish, I agree. But I only have so much political capital and have to spend it wisely to keep Odyssey on track for Saturn."

"Brian, you need to say something," persisted Will. "The rescue issue is important; all astronauts will agree. It transcends national pride. And the Jupiter Commission is important because there's going to be a Saturn Commission and Washington will initiate it; don't they want the Chinese in? Wouldn't they like the Chinese outpost on Titan to be able to rescue and support the American outpost?"

"This is very important," agreed Charles. "I talked to a lot of people in Washington, too. I couldn't persuaded them. We could start a media campaign, but it could make the entire matter rather ugly. You can be a voice of reason."

Brian nodded. "I try, you know! I have to be a bridge between Mars and Washington, so I represent Washington's position when I'm on Mars and Mars's position when I'm in Washington. Don't think I'm just a one-sided lobbyist for the American military and U.S. power."

"But will you try?" asked Will. He pointed at the screen; the Chinese astronauts were walking around the landing site, rock hammers out, taking samples and dictating descriptions of what they saw. Robotic helpers were following behind with sample bags, extra tools, and scientific instruments. The screen had split into fourths to allow three different helmet cameras display their occupants' work. "Look what they're doing. It's magnificent. Magnificent science and magnificent exploration."

Brian looked at the activity, then nodded. "Okay, I'll see what I can do. You're right, there are some Odyssey-centered arguments to make. Cooperation is an important safety issue."

7

Arrival

early Dec. 2063

The hundred-seventy-five sol flight between planets ended with four minutes of blazing passage through the Martian atmosphere. When the two caravels exited the atmosphere, their velocity had dropped to 5.3 kilometers per second relative to the Martian surface, a speed that put them in an elliptical orbit that flew over 30,000 kilometers from Mars before falling back. They were in the orbit of Embarcadero, their interplanetary transit facility.

Within a sol they were closing on Embarcadero, a long space station festooned with docking ports, one of which was occupied by a partially completed caravel. As they approached, Will, Ethel, Marshall, and Liz watched the rendezvous on the large-screen television in the lounge outside their rooms.

"There's the *Spirit of Mars*," said Marshall, and as he said it his voice broke a bit from the emotion of seeing the enormous inflated statue of reddish Mylar, its two outstretched arms flung open in welcome, a blazing flame extending downward from its feet to symbolize the rocket mode of transport they had just used.

"Are you crying?" Liz asked her brother derisively.

"Well, maybe a little. I haven't seen the *Spirit of Mars* in four years, remember."

"It says 'welcome home,'" said Will. "Home, sweet home."

"What's that light?" said Liz, pointing to a bright flower-like object on the screen.

"A solar sailer," replied Will. "It's probably thirty kilometers away, but they're more than a kilometer across, so at that distance they're twice as big and twenty times brighter than a full Phobos."

“Look closely; you can even see that it’s rotating,” noted Ethel.

Liz nodded. They could see the very slow rotation that kept the gossamer-thin sails stiff against the steady one pound of force produced by reflected sunlight. The rotation had to be slow because otherwise the centrifugal force would rip the sails apart; they were only a thousandth of a millimeter thick. “Are coming or going?” asked Liz.

“Right after opposition, more should be arriving than departing,” replied Ethel.

“It’s becoming unusual to see them here, though,” said Will. “We’re shifting cargo loading and unloading to Deimos. We have enough crew there, we have fuel, and it’s easier for the solar sailers.”

“How many do we have, now?” asked Marshall.

“Over one hundred,” replied Will. “They can make a round trip between Gateway and Mars in eighteen to twenty-four months, giving us an interplanetary transport capability of about two thousand tonnes per columbiad. They’re inexpensive and light in weight.”

“And the propellant is free,” reflected Marshall. “And we fly some to Mercury and Venus?”

“With Mercury, it’s a triangle trade,” replied Will. “Food and nitrogen from here to Mercury; gold, Mercury to Earth; imported goods, Earth to Mars. We’re running two sailers per year. Venus receives two per year and sends them back empty. When our sailers reach the vicinity of Earth they use a gravity assist from the moon to go to Gateway or to fling their gold and PGM cargo straight to Earth.”

“They’re beautiful,” added Liz. “Their sails look like petals.”

“They’re pretty at night when they fly over Aurorae, too,” agreed Ethel.

"You know what strikes me, though," said Will. "Sooner or later, we'll take the entire system for granted. It'll be there, it'll work, and it'll be ordinary. We have a twenty-billion redback transportation system between the planets; a lot, but most nations have invested far more than that in roads and bridges. In that sense, what we have is not that unusual."

Within hours of their arrival at Embarcadero, passengers began to board three shuttles for their flights to Aurorae and Dawes Spaceports. Each shuttle carried twenty-four passengers, so the three hundred people on the two caravels required thirteen flights, scheduled a sol apart.

The next sol, Will and Liz boarded a passenger ferry for Phobos with twenty-two others, mostly geologists heading for the moon for a training exercise that would help certify them for asteroid exploration. While Will conducted business and assisted with the field trip, Liz did a dance recital. On the flight back from Earth she had gotten her "Mars legs" back.

Phobos Outpost was impressively large. One hundred inflated cylindrical greenhouses stretched in four parallel lines of partially-buried sausages northward from the two buried habitats—caravels without heat shields and propulsion systems—that constituted the main facility. The greenhouses could feed four hundred people, the one hundred twenty living on Phobos and two hundred eighty more elsewhere in the solar system, mostly on the moon. The two buried caravels housed twenty agricultural workers, twenty outpost maintenance specialists, a dozen scientists, a handful of support staff—including a daycare teacher and a storekeeper who doubled as a hair stylist and

beautician—and sixty construction workers. A third caravel would soon be added to the facility, followed by a cavernous drydock for spacecraft construction and repair.

After an inspection tour, a talk to the outpost personnel, meetings with the commander and the Borough Council—for Phobos was an incorporated locality as well—and numerous geology field trips, a passenger shuttle flew from the Martian surface to Phobos to carry the geologists, Will, and Liz to Aurorae. It was a fast six-hour flight culminating in a wild six-minute ride through the Martian atmosphere as the ship burned off most of its five kilometers per second of velocity, followed by the jerk of the drogue chute, inflation of the main chutes, and finally the roar of the shuttle's engines as it guided the vehicle to a safe landing at pad 12.

"Home, sweet home," said Will, as the shuttle bumped to a stop. The rest of the crowd cheered and some of the new migrants began to sing "This Land is Your Land," Mars's unofficial anthem.

"It's good to be back safely," agreed Liz, above the din. She turned to the man in the couch next to her. "Welcome to Mars."

"Thank you, and welcome home to you!" he replied, excited. He gazed at the rolling, ruddy stonescape outside the little porthole nearby. "I can't wait to go outside!"

"The Hiking Club has blazed some excellent trails."

"So I heard in orientation. There's so much to assimilate; I'm sure most of it will have to be repeated to me one or two more times in the next month!"

"There's a certain culture shock to overcome," Liz agreed. "I had one going to Earth, so I suppose everyone else has one coming here!"

“Yes; sols, redbacks, rangers, mobilhabs, biomes. . . it sounds rather exotic at first.”

She nodded, thinking how exotic Earth had been for her entire five weeks there.

Everyone began to unstrap themselves from their couches and try to stand up in the packed space. They could see, outside the portholes, a Mobilhab approaching the vehicle. It circled the shuttle to image its propulsion system and any venting, then when permission came, it approached and began to dock to the shuttle’s lower pressure door. A series of clanks marked the latching process and the pressure tunnel between vehicles began to fill with air. Then the door opened and they began to exit.

It was a bit chaotic as everyone headed slowly toward the exit—Will and Liz were on the upper level, so they had to descend a very steep spiral stair—grabbed their luggage with forty kilograms of possessions, and lugged them through the tunnel into the Mobilhab. There, many passengers left their luggage on the lower level and ascended to the vehicle’s top level, where the view was better. The air was electric with excitement; almost everyone coming to Mars was self-selected, determined, bright, and talented, often motivated by what could only be called patriotism for a world and society they had never seen before.

“Welcome, welcome,” Will said to many of the people around him. “We’re so glad to have you here. We need your energy and creativity, your diversity and determination.”

It was almost forty-five minutes after touchdown before the mobilhab detached from the shuttle and headed for the outpost. It followed the road along the airstrip—Aurorae had a three thousand meter runway for sunwings, jetwings, and other aircraft—

then turned north toward the mesas. It threaded through “the Notch” between Layercake Mesa and Boat Rock and suddenly the soaring domes of Aurorae sprang into view. The vehicle turned east and drove along progressively smaller and lower domes toward the old heart of the outpost until it reached Arrival Hall, a hulking low duricrete structure. The mobilhab pulled alongside a pressure door and docked, and the chaos of entering the vehicle was reversed as everyone walked into Aurorae Outpost.

The departing passengers poured into Arrival Hall, luggage in hand, looking for their “buddy,” a local person tasked to be their guide and advisor for the first week or two. Will and Liz were looking instead for Marshall, who was meeting them. He waved and they pushed through the crowd to him, exchanging “Welcome home” and “thank you” with many of the residents.

“How was the flight?” exclaimed Marshall, mouthing the usual question.

“Normal,” replied Will. “And that means we’re starved, of course.” He gave his son a hug. Marshall hugged him and exchanged greetings and hugs with his sister.

“Let me help with your luggage,” Marshall replied. He already had a robotic luggage cart waiting patiently next to him. He took the four suitcases—two for each of them—and piled them on the cart until it was heaping and wobbly. Then they all headed for home, the cart dutifully following on its own.

“So, you’ve been back a week; how’s it been?” asked Will.

“Really great. Sam and I spent about eight hours talking the first two sols; we had a lot of catching up to do. Corrie’s around, too; we had supper one night. I hung around with Silvio one afternoon and he tried to hire me. Did you know he’s selling the store chain to El Corte Inglès, the Spanish Department Store chain?”

“I heard,” said Will. “Do they have new signs up, yet?”

“No, the stores are still ‘Silvios’ for another two months, and they’ll retain the name after the sale anyway, just in small print. I’m really impressed by how big his operation has become. He has two stores just in Aurorae now!”

“Where’s the other one?” asked Liz, surprised.

“El Dorado Dome. I spent half the first week just exploring Aurorae! It’s twice as big as when I left! The new domes are spectacular!”

“It makes you wonder what we’ll be doing in ten years,” agreed Will. “How is everyone?”

“Good. I ran into Ruhullah and Nadia and saw their baby Maryam, who’s three and really looks like Corrie and Sam! It was strange looking at her. Paul and Jacaranda are doing well, their twins are now a year old and walking, or maybe I should say running. Helmut is happy; it was good to see him and Clara again and to meet their little boy Oskar, and to see Charlie after four years. He’s a real character, he loves to make jokes. Kristoff has really settled down; I had a chance to talk to him and Irma, whom I had never met. Their boys are almost three. Sebastian says hello, and everyone says “we want Will back’!”

“Well, I’m back, and no doubt will have a lot of interesting discussions in the next few sols.”

“I gather you have a lot of new ideas.”

“They know most of them, too, but it’s one thing to read an email and another thing to be able to argue with the boss about them face to face.”

“Change is hard,” agreed Liz. “Have you seen Marisol?” she asked Marshall.

“From a distance, in the Gallerie and Andalus Square. We haven’t talked. Everyone keeps asking me ‘so, where’s your fiancée?’ and I explain we broke up. Then some of those people meet Marisol and they hear her version. . . it’s awkward.”

“Is she saying something unfair?” asked Will.

“Not that I know of, but this is a small place.”

Will nodded. “It’s a big village. Maybe that’ll be good for her; she’ll see how embedded people usually are in relationships.”

“Speaking of relationships; when does mom fly home?” asked Liz.

“Tomorrow,” replied Marshall. “I talked to her this morning. Uzboi has taken longer than she thought. Everyone’s in shock that they’re aiming to quadruple PGM production over six years.”

“Yuri’s scrambling to update the outpost master plan,” said Will. “Uzboi will grow to 600 or 700 people. The gold-mining outposts and Phobos will all grow, too. Aurorae grows less.”

“In a few years the population will be more evenly spread,” noted Liz.

They continued to chat as they walked westward along South Main Tunnel until they reached the exit for Andalus Square. They followed it, passed through airlocks, and were soon blinking in bright sunshine. It was a Tuesol morning, a time the square was normally quiet, but the hundreds of new arrivals livened up the place.

They turned up the alley leading to their house and entered the tunnel to “Andalus Southwest,” a dome owned by the Bahá'ís of Mars and filled by a small House of Worship and gardens. But before they reached the end of the tunnel they turned right and opened the airlock door to their house. The robotic luggage cart followed a minute later.

They unpacked and raided the refrigerator; Ethel had sent a grocery list to Silvio's and the groceries had arrived by robotic cart that morning. Then Marshall and Liz headed to Yalta Biome and the university, where their friends usually hung out. Will headed for his office, a dusty space with a heap of unread electronic paper reports that had been accumulating for nine months.

Huma Mubarak, the Mars Commission's only live secretary on Mars, greeted her boss warmly and brought him a cup of tea. People dropped in to say hello and chat. Ruhullah Islami and Alexandra Lescov, respectively the Clerk of Aurorae Outpost—Mayor—and head of the Construction Department, walked into his office half an hour after he had arrived.

"Welcome back," said Alexandra.

"Thank you," Will rose from behind his desk to hug them both.

"Good trip?" asked Ruhullah.

"Overall, yes. I managed to squeeze in about two weeks of vacation with family and old friends, plus a lot of meetings for the Commission."

"Your visit to the moon was particularly illuminating," said Alexandra.

"How's your mother?" asked Ruhullah.

"It's unbelievable; she's still pretty strong at age 94. We spent part of a week with her at the beginning of the trip and three sols—no, sorry, days—at the end. My trip to Phobos was good as well. Alexandra, the new twenty by forty meter cylinders are really impressive. So spacious! They use one—buried, of course—for a volleyball court."

"Did you see the agricultural cylinders? They've been adding two a month, lately. I visited two months ago and was amazed by how lush they were."

“Yes, they’ve definitely solved the problems we had at first with the low gravity and poor nutrient balances. I pushed through a cylinder full of corn and was completely lost in it. It was hard to believe I was on Phobos.”

“Both Deseret Construction and Afigbo Construction has started using them,” added Ruhullah. “With eight hundred square meters of area and height for four stories, they’re packing a lot of housing into each one. For the first time ever, we actually have a small housing surplus.”

“Cassini, Meridiani, Dawes, and Uzboi need to use them; they’ll grow a lot.”

“I was surprised the new plans have Aurorae growing so little,” said Ruhullah. “We’re getting 400 of the 900 arrivals this columbiad and 450 of the 1050 arrivals next columbiad, while the other boroughs will grow substantially.”

“Aurorae will remain the central outpost on Mars, but it won’t be as dominant as it was in the past,” replied Will. “It wasn’t placed near a gold deposit or a rich source of PGMs. Its advantage is that it’s the oldest, so it’s more developed. It’s not getting 400 of the 900 arrivals; in actual fact, it’ll get only about 100 of them, and 400 people from the last columbiad will move to Aurorae because they prefer to live here.”

“Good point; this is where people prefer to raise a family. It’s more comfortable. But that’s eroding too, Will. There are more kids at the other outposts all the time.”

“Of course; a lot of people are loyal to the other outposts and want to live there.”

“I suppose we can’t complain too much,” said Alexandra. “Some of the surplus will go to brand new outposts.”

“Yes, we’ll probably establish two more boroughs this columbiad near known gold supplies.”

“Our goal is to raise output to a thousand tonnes per columbiad?” asked Ruhullah, skeptically.

“If we can. It’ll take six to ten years.”

Ruhullah nodded. “At least the galleon is approved,” said Alexandra.

“Yes, the trustees did not object to the budget. We have a budget surplus from PGM production; we have to use it somehow. And your cost estimates look quite reasonable, Alexandra.”

“The technology is not that difficult; it’s basically an expanded caravel. The biggest costs to us will be the construction of facilities here and on Phobos. I assume since we’re moving forward on the galleon, the issue of privatizing parts of construction have been laid to rest.”

Will shook his head. “I wouldn’t say that. But privatizing construction isn’t in the current plan.”

“Good. Because as you know, I am and will always be strongly opposed to the move. I don’t buy the capitalistic arguments that privatizing will raise our efficiency. It will either lower efficiency or raise it at the expense of our loyal workers. Right now we have smooth vertical integration; the caravel manufacturing department and the housing construction departments both use some of the same materials, which are produced by the fabrication department as needed. If we break those departments into separate companies, coordination will be lost. The company heads will have to worry about profits rather than filling orders. I don’t want to work with three boards of trustees, either.”

“I hear you, Alexandra,” said Will, impatiently. He was beginning to feel like his two top aides had ambushed him. “Look, that argument didn’t protect agriculture and the

cafeteria. Separating them didn't decrease the quantity or quality of food. What do you think of privatizing the energy supply?"

She shrugged. "Different boroughs get their energy different ways and are dependent on different sources already, so it's worth a try."

"Good, because we will privatize energy, and if it goes well, communications. And if they both go well, Alexandra, we have to consider privatizing some parts of construction. About a third of our housing market is now filled by Deseret and Afigbo. Competition against them and between them has been good for the quality and price. Why should the Commission build housing?"

"And by that logic, what will be left of the Commission?" asked Alexandra.

"Things private industry can't do. The role of governmental agencies is to blaze the way, open the path, but then they have to get out of the way. That's one reason space exploration has taken so long to mature technologically. The Commission needs to develop new space vehicles for our own use, and needs to develop new construction materials and techniques. If we do that, Alexandra, the Commission will always need a construction department, and Aurorae will always need more people."

8.

Four Year Plans

Dec. 2063

Ethel came out of their bedroom and walked into Will's office, where she found her husband hunched over a piece of electronic paper. "Will, it's 3 a.m.," she said, a bit insistently.

He looked up. "I'll be done in a little while; maybe fifteen minutes."

"That's what you usually say. Look, since you came back from Earth you've been pushing yourself too hard. You aren't as young as you used to be."

"I'm fine! The trip made me realize I only have four years left as Commissioner. Now it's three and a half years."

"I don't recommend getting four hours of sleep per night as a solution. What are you doing? Writing something on privatization?"

"No, that's done. The meetings with our energy workers are finished; as many of them have been persuaded as can be; the major objections can be accommodated reasonably; and I have two pieces on the topic for *Mars This Sol* that are going through the last round of editing on Earth. We won't try to privatize communications for at least a year; one privatization per year is enough."

"Alexandra will be relieved."

"For two or three years! Housing and dome construction will be next. Private firms already do much of it. After that, materials fabrication. We'll keep spacecraft manufacturing for last, or maybe we'll never spin it off."

She rubbed his shoulders. “You feel tense.” She leaned over to see the electronic paper. His handwriting was being converted into neat rows of type, word by word, as he composed. “Oh; elections.”

“They worry me, and every time I go to Earth I worry about our election process more. I want to lay out the arguments for sticking to issue-centered discussions well in advance of elections next month.”

“With tensions rising over independence, even issue-centered elections could get personal.”

“That worries me, too. We’ve entered a difficult period. I also need to think about the speech I’m giving on Satursol, after the last group of arrivals land from the *Vista* and *Prospect.*”

“Well, you can’t solve the world’s problems between now and dawn, and the bed’s cold without you.”

“Alright, that’s a good argument.” He saved the text and rose.

They headed for their bedroom, but as they walked across the house they noticed a light coming from Lizzie’s room as well, so they detoured up the hallway to her room. There was a voice inside as well. They looked in and saw Liz on her attaché, listening to a video message from Mike Tobin. His Maine accent was unmistakable.

When she saw them standing in her door, she was a bit startled. “It’s a message from Mike. I got up to use the bathroom, remembered it’s 8 a.m. in Boston now, and turned on my attaché to see whether he had sent me a message.”

“How’s he doing?” asked Ethel.

“Pretty good. He’s getting ready for finals and is getting excited about his trip next semester to Antarctica in two months.”

“To the Dry Valleys?” asked Will.

“The class is going to McMurdo about January 1, then the south magnetic pole for some observations, then the Dry Valleys, then back to MIT in March to write it all up. Three quarters of the graduate students on the trip are coming to Mars next columbiad.”

“That’s a really good course,” said Will. “But meanwhile, you’ve got a twenty-page paper due on Frisol for Nineteenth Century British Literature and a lot of demanding classes this week, so I suggest you get some sleep.”

“I will, dad; ten minutes, I promise! I just want to reply real quick.”

“Okay, but I’ll stop by and check after I brush my teeth.”

Liz didn’t like that, but didn’t complain. Will and Ethel headed to their room. “Let’s not treat her like a child; she just turned twenty-one,” said Ethel.

“I know. I just don’t want her to get burned, like Marshall was.”

“Nor I, but I like Mike; he seems mature, and has a good sense of humor.”

“Yes, he left a good first impression. Better than Marisol.”

“Yes, I wasn’t impressed when I met her. I was worried they’d get divorced.”

“You should have said something!”

“I know, but I didn’t know how to. I suppose this can’t get too serious with Mike, since he won’t be here for at least two years.”

“I don’t know; video romances can get pretty serious in their own way, which makes everything go faster when they finally can be together.” Will shrugged. “It’s late. I’d better go to bed. I won’t look in on her.”

The next morning, a shuttle roared down from Embarcadero and landed with twenty-four passengers from the *Vista*, which along with the *Prospect* had arrived December 15. Will went to Arrival Hall to greet the new migrants; the twenty-minute task had been a pleasant duty for the last eight sols and he had one more morning to go. When he was finished he headed back to his office in Andalus Dome. Half way across the square, he saw Lyle Quincy, chair of the Independence Club, setting up an information table. Quincy waved at him. “Good sol, Commissioner Will.”

“Good sol.” Will didn’t particularly want to see Quincy, who was a trouble maker, but he also didn’t want to seem impolite, so he changed course and approached. “Informing the new arrivals?”

“Yes. The orientation program on the flight out doesn’t mention our club, though it mentions the Hiking Club and the Golf Club.”

“Are you comparing your club to them?”

“No! We’re a bit more important to Mars’s future, so it stands to reason we should be mentioned as well, if not more prominently.”

“Politics can be controversial; this way you can shape the impression.”

“True.” Lyle could see he wasn’t getting any farther with Will about that subject. “Will independence come up in your speech this weekend?”

“I haven’t drafted it yet, but remember it is for a terrestrial audience as well as a Marsian one, and my job is to bring together Marsians, businesses, and terrestrial governments.”

“We’re very appreciative of your efforts with business, Mr. Commissioner. I suppose our concern would be to convince the terrestrial governments to continue their financial support, but as foreign aid.”

“People often suggest that, but they don’t realize how complicated that suggestion is. Nations give foreign aid to countries trying to establish basic services, not to those doing advanced research or putting in place complex infrastructure elements.”

“But it’s worth a try. It’s not clear we need governmental subsidies any more.”

“It’s clear that last columbiad we had no need for their money at all. But the price of PGMs is at an all time high. It would be irresponsible to assume that will continue. We may need governmental subsidies for a few years, yet.”

“Or we could be bold and do without; there will always be enough export income to pay salaries. We’d just cutback on migration and imports.”

“About a third of our workforce is devoted to preparation for migrants. They’d be unemployed. It isn’t simple and straightforward.”

“If we embrace change, we’ll find ways to accommodate it.”

“That’s not an answer, that’s a platitude. It’s always good to talk, Lyle.”

“Go to our website and see our petition,” urged Quincy. “And read the discussion boards. It’ll give you a good sense of where people are coming from.”

“I’ll do that. Have a good sol.” He threw Lyle a parting salute and headed into the Gallerie building.

Just as Will left, a group of three men with priestly collars walked past the table. Father Greg was in the lead, followed by Father Karol Miller, chief priest of the Catholic parishes on Mars, who was talking to their newest arrival, Father Javier Santiago.

“Independence Club?” said Javier, stopping. Karol and Greg stopped as well, the former somewhat reluctantly.

“Yes, Father; it’s a club that argues in favor of independence,” replied Lyle.

“I see; not a political party? But I guess we don’t have parties.”

“No, we’re still small, and there’s a longstanding custom here that people don’t run for election. They can stand and talk generally about what they think Mars should be doing, or not doing, but they can’t say ‘vote for me’ or ‘don’t vote for the other guy.’”

“Interesting way to make elections a bit less nasty.”

“And make them adhere more to issues,” added Greg.

“Do you favor immediate independence?” asked Javier.

“Pretty much,” replied Lyle. “Within a few years, as opposed to decades. It doesn’t have to be tomorrow; we’ll wait a week or two!”

Javier smiled; Karol did not. “But don’t you think Mars is too small?”

“We’re the biggest nation in terms of land area and there are thirty nations in the United Nations that have smaller gross domestic products. Our population is growing faster than any other nation.”

“That’s true. Thank you; do you have any literature?” He looked at various sheets of electronic paper laying on the table with different pages of text and graphics on them.

“Our website; here.” He handed the Father a card with the address. “We were giving out electronic paper with the website stored on it, but a lot of people were just grabbing the paper and reprogramming it.”

“You need some real-paper literature, then.”

“We’re working on that; probably in a week or two.”

"Good. Thank you. Have a good sol."

"Ciao."

Javier nodded and the three priests continued walking toward El Dorado Square. "I'd be careful with those people," noted Karol. "They strike me as a bit fanatical."

"Perhaps, but on the flight out there was constant talk of independence," replied Javier. "I don't know what's going on. Maybe it was because the flight was full of young folks, right out of grad school, and idealistic. All of them were assuming that Mars should and soon would be independent."

"That position's spreading here as well," agreed Greg. "The financial statistics had a huge impact on public opinion; we covered our own expenses last columbiad."

"I think you'll find less talk of independence at Uzboi, though," exclaimed Karol. "I get there only once every five or six weeks, but I haven't heard much discussion about independence there. Nor in Cassini, Dawes, or Meridiani."

"Perhaps the outlying boroughs are less focused on the subject," said Javier. "But I wonder whether that will last? Most of the folks on the *Vista* and *Prospect* were heading to the outlying boroughs. I gather the earlier flights focused first on construction workers, then scientists and support personnel, and the last flights brought the miners. Many of the people at the outliers are now rotating back to Aurorae with their families, where the stores and schools are better. I think Uzboi will be more radical than before."

"You may be right," replied Karol. "But we have to be very careful. Our goal, after attracting people to Christ and the mother church, is to get our parishes set up properly. The Vatican has made it clear they will not establish a diocese and appoint a bishop unless we have at least three, preferably four, active and functioning parishes.

Now we have three priests, and with you at Uzboi we'll have two strong parishes. With Greg anchoring Aurorae, I can focus on Dawes and Meridiani, since they're close enough to each other to handle together. That'll give us four parishes."

Greg mentally noted that Karol would be bishop. "We've made some good progress," he said. "The cathedral has raised attendance, even if it hasn't increased official membership, and our visibility in Marsian society is much better."

"People are coming to the cathedral for marriages, instead of the evangelical church or the Bahá'í temple," exclaimed Karol. "This is not the time to push a narrow church agenda. We're considered a missionary operation, so we can maintain laxer standards and tighten them up later when the community is ready for them."

"If it is ever ready for them," quipped Greg.

"When can I get a church in Uzboi?" asked Javier.

"We're working on it," replied Karol. "Uzboi's still finalizing its new central space. Everyone on the planning task force knows we want a church site and will pay for it. Churches go up pretty quick, since they're basically a tent of plastic and metal sheets."

"If anything, they're too flimsy," said Greg. "You can hear the mass outside as easily as inside!"

"The sound proofing will fix that, and wait until the art arrives next month," replied Karol. "The cathedral will be incredible. Uzboi will have a church in two years, don't worry."

The House of Worship was half full for the special gathering of the Bahá'í community. Looking around, Will was amazed at the number of Bahá'ís Mars had. The latest count

was 121, of whom 90 lived in Aurorae; most of them were in attendance, as were a dozen more from Uzboi, Dawes, and Cassini. Mars was three percent Bahá'í, which reflected the terrestrial Bahá'í community's continued interest in science and technology.

The devotional program was relatively short, as usual, and focused on the word of God, as was customary for Bahá'í programs. Several passages from the Bahá'í scriptures on "thanksgiving" were followed by a brief hymn by the choir—not a very good choir, Will sadly reflected—followed by a Psalm and a passage from the Qurán, then another rendition by the choir, followed by two Bahá'í prayers. Like the rest of the audience, Will mostly kept his eyes closed, tried to meditate on the meanings of the texts, and spent a certain amount of the time silently praying his own prayers.

When the last reader finished her text and sat, the crowd rose and headed downstairs to the meeting hall. The upstairs auditorium could only be used for reading scripture and acapella singing; the meeting hall, on the other hand, was the place for eating and talking. Refreshments were already spread out on several tables, and Bahá'ís liked to eat.

Noisy chaos soon enveloped the meeting hall as everyone began to exchange news of jobs, children, and other life events. A young woman with coppery skin approached Will as he loaded a small plate with carrots and a cupcake. "Dr. Elliott, I'm Rosa Bell. We exchanged emails about five years ago."

Will frowned a moment, then nodded. "Oh, yes, you asked me for career advice, and I said come to Mars! Pleased to meet you. Did you have a good flight?"

"It was reasonably pleasant, though I had a long wait up at Embarcadero; four weeks. I was on the last flight down yestersol."

“Well, someone has to be last. Think of the extra flight pay you earned!”

She chuckled. “I guess the cloud has a silver lining. I want to thank you for taking the time to write me when I was finalizing my major. I wouldn’t be here otherwise.”

“Well, my mother is very persuasive, and as you may know, she delights in encouraging young Bahá'ís to go into the sciences and apply to go to Mars. She’s responsible for maybe ten percent of Bahá'ís here. What’s your field?”

“Civil engineering, of the Martian variety: domes, airtight buildings, etc.”

“Where are you working? Construction?”

She nodded. “But just this sol I was reassigned to Uzboi to work on the new central dome. I leave next week.”

“Uzboi? Did you tell Ananda? He keeps track; Uzboi has eight Bahá'ís, so you may raise the number to nine.”

“Oh? That’d be great! They’d be our second spiritual assembly on Mars?”

“Yes, and we have a goal of electing another assembly. We’ve had the goal for some time, but the outlying boroughs just haven’t had enough Bahá'ís. But with all of them growing this columbiad, we think we can form several new assemblies. Let’s check with Ananda.” Will pointed to Ananda Thanarat across the room. The Thai mathematician had arrived on Mars with Columbus 6 in 2046 and had been appointed an Auxiliary Board member, a kind of Bahá'í consultant, four years later. He was standing with wife Kim, thirteen-year old son Mahidol, and ten-year old daughter Sirikit.

“Ananda, this is Rosa Bell, a new arrival. Next week she heads for Uzboi.”

“Nice to meet you, and delighted to hear about your assignment!” He reached out and shook her hand warmly. “You will be Bahá'í number nine there. That means the friends there will have to start preparing to elect a spiritual assembly.”

“Great! I served on an assembly in Kansas; I have some experience.”

“That will help. I think four of the Bahá'ís up there have served on assemblies. You’re sure of the assignment?”

“Yes, it’s definite; I’ll be there two years. I’m looking forward to it.”

“Good, then I should mention it in my remarks. I’m supposed to get the program started.” He looked around; the room had a stage with a podium on it. He excused himself and walked over to it, where he turned on the microphone. “Could I have everyone’s attention, please,” he said. He waited until the crowd quieted down. “Thank you, everyone. The Spiritual Assembly of the Bahá'ís of Aurorae has asked me to welcome everyone to the House of Worship on their behalf. We’re very excited to start the new columbiad with this devotional program and a meeting to discuss goals for the Marsian Bahá'í community over the next two years. The most important goal we wanted to discuss is one we were given years ago, and which apparently we will now achieve; the election of a second spiritual assembly. I was just informed by a newly arrived Bahá'í that she has been assigned to Uzboi, which raises the number of Bahá'ís there to nine.”

He paused for applause. “The election of a Spiritual Assembly is an immensely important event; it marks the point when a community is large enough and mature enough to organize and govern itself through the establishment of a divine institution. But the implications for all of Mars are equally important. Cassini and Dawes both have seven Bahá'ís; Meridiani has six. That is, those are the numbers I had as of last week. It

may be that the new wave of arrivals has already pushed one or more of them over nine as well. If not, we must make it a major goal to find Bahá'ís able to move to one or more of these boroughs and raise them to at least nine. The criterion for election of a national spiritual assembly—the National Spiritual Assembly of the Bahá'ís of Mars—is three local spiritual assemblies. We are very close, dear friends. We need just two Bahá'ís to move to, say, Cassini, and we will meet that requirement. The next two years are a time for preparation for a series of elections."

Andalus Square had never held such a crowd. From the head table near the entrance to the Gallerie, Will kept surveying the forest of dinner tables dotting the square. Rather than restricting the arrival dinner just to those who had migrated to Mars during the fourteenth columbiad, this year they had again flung the event open to the public. But rather than paying for everyone to eat all they wanted, the Commission had issued special prepaid meal cards to the arrivals. That way everyone could come if they wanted, but only the arrivals got a free supper. The Gallerie being too small, the event was moved to the square itself.

"Just about everyone has come!" Will said to Ethel. "It's phenomenal!"

"I hear the restaurants located outside Andalus Dome are encouraging people to bring their prepaid meal cards and carry the food here," said Ethel.

"Let's hope there's no emergency." Will knocked on the plastic table in lieu of wood.

"Are you ready with your speech?" Sebastian Langlais asked Will.

"Yes, I think so. How's retirement?"

Sebastian laughed. “I don’t feel very retired. I’ve been working on my memoirs and doing a lot of consulting work for the Asteroid Belt Commission.”

“Better busy than not busy. The Vesta mission has been so interesting.”

“Yes, it has proved well worth while. The south polar impact peeled away so much of the crust and outer mantle that a crew could spend a century walking across the layers and studying the cooling history of a single world-sized blob of magma.”

“It’s a volcanologist’s dream,” agreed Will. “Have you been following Callisto?”

“Of course! It’s a spectacular place; incredible geology and biology. Who would have thought it’d be so photogenic. En-lai must be pleased.”

“I got an email from him last week. They’ve now identified fifty discrete species on Callisto and a dozen more in the samples from Europa, though the lack of living species is a distinct disappointment.”

“It’s a matter of time; how long before they drill down to liquid water?”

“Maybe a year.”

“Did he give any sense of the crew morale? The Chinese are so tight-lipped about things like that.”

“I get the impression they’re doing fine as a crew. The ship that just arrived from Earth will carry only fifteen crew to Callisto; they plan leave the *Tienan* permanently on Callisto, since it’s been converted over, and fly the new ship straight back to Earth with the crew of the *Tienan* who want to return.”

“I gather the Latin American ship that leaves Earth in a few months will have a few Chinese on board as well. It’s a shame the U.S. didn’t swallow its pride and buy a berth or two.”

“I know, but it’s typical. At least the American launch to Callisto in 2065 is now finalized.”

“When will gas-core be used?” whispered Sebastian.

Will lowered his voice. “Probably 2066 or 2067; the tests are going well. They’ll do at least one unmanned launch to Jupiter and one to the Saturn system with gas core engines before launching people, so the Saturn mission appears set for 2069 or 2070. That also gives enough time to get advance supplies in place.”

Sebastian smiled. “Congratulations, Will. You’re the one who arranged for that face-saving plan.”

“Brian pulled it off; he has the contacts in Washington. But our lobbying in Washington has paid off where the U.S. joining the Jupiter Commission is concerned.”

“Really? Fantastic.”

“People listen to Brian because he completed the gas-core project under budget. It’s the only big nuclear technology project effort that hasn’t gone vastly over budget.”

They both chuckled at that. “What role will we have?”

“Host to most of the launches because of the cheaper hydrogen at Phobos. Crew training will be done at Phobos and the Martian south pole. Some of the crew will be selected from among the personnel here.” Will’s attaché beeped. He picked it up and looked. “Two minute warning. This year the speech is being broadcast, so I have to start on time. I better run, I have to glance at the text again.”

“Okay, thanks for the information.”

Will nodded at Sebastian and Ethel, then walked toward the podium. He paused to glance at his speech. Then with five seconds left, he walked to the podium, where his speech was already visible on the plexiglass panels of the teleprompter.

The crowd saw him go to the podium and fell silent. “Good sol to everyone,” he began. “I have had the pleasure to give this summary of our plans twelve times during the almost twenty-eight years that human beings have roamed the face of Mars. The first time I spoke, in 2040, Mars had twenty-three adults and one baby living here in a cluster of four habitats. Today, Mars has a population of 3,450, including 700 children living in nine outposts and a dozen scientific stations scattered across Mars, at Embarcadero, and on Phobos and Deimos. The progress we have made in the last three decades has been breathtaking, miraculous, awesome, unbelievable; it is difficult to find an adjective to express it adequately. We can project a population of 3,800 at the end of this columbiad and almost ten thousand in 2071. Mars is growing up.”

He paused for applause. “Beyond 2071, the crystal ball grows cloudy. The thirteenth columbiad saw Mars cover all its expenses for the first time because of the rapid expansion of platinum-group metal production. But the moon plans to expand its production to a thousand tonnes per year over several years. The price will drop. We have no choice but to expand our production as well, which will push the price down further. Even with a doubling of gold production, we don’t know is what our income will be in six or eight years from now. It may be less. All this reminds us that this is not time to contemplate independence from government subsidies.

“Uncertainty over our export income will drive our central priority in the next two years: a huge increase in production. It requires that we devote a large fraction of our

increased resources to new boroughs and importing additional refining equipment. Uzboi will more than double in size, a gold producing outpost will be established at Tithonium, and an outpost will probably be planted in gold fields north of Hellas. Staffing equivalent to nearly the entire cohort of migrants will be devoted to these tasks.

"Our other major priority is the expansion of our interplanetary transportation system. We will purchase the new, larger solar sailers able to transport twenty-five tonnes between Earth and Mars, nearly doubling our total transport capacity. Much of that increase will be devoted to moving water, oxygen, carbon monoxide, and methane to Gateway, because our growing passenger transport needs fuel; moving our arrivals from low Earth orbit to Mars consumed three thousand tonnes of hydrogen and oxygen.

"We will also develop a new, larger passenger vehicle, the *galleon.* It will be forty-seven meters in diameter and up to seventeen meters thick—fifty percent larger than the caravel—producing an interior volume three times greater and able to transport four hundred people between the planets. Galleons will make excellent tourist hotels in low earth orbit, large capacity facilities for industrial workers in low Earth orbit and on Phobos, vehicles for transporting colonies of one hundred persons to Saturn and beyond. Massing about six hundred tonnes each, depending on their configuration, they will be constructed in a large facility we will build on Phobos. The galleon will assure Mars primacy in space vehicle assembly for at least another decade and guarantee employment to a substantial fraction of our growing population."

He paused because the remark generated another round of applause. "Mars is expanding in several other important ways this columbiad. Dawes will see a major increase in power production when the Chinese 75,000 kilowatt reactor goes on line next

month. Uzboi will see the construction of a 100,000 kilowatt American reactor that will go on line in early 2065. These reactors will provide power to Margen, Mars's new semi-public energy company. Two more automated road graveling systems will go to work—we now have two functioning—allowing us to produce 1,200 kilometers of advanced roadway. Phobos will double its food production and exports. With the arrival of fifty more geologists, climatologists, and eobiologists, our study of Mars will undergo significant expansion, and will focus additionally on Mars's recent past. Our commitment to the arts increased when a combination of grants from business, the Commission, and the Commonwealth allowed two more full-time artists to be hired.

"The next two years are also a time for all of us to set personal goals, not only for our own lives, but for development of our adopted world. Mars has already emerged as a small but unique civilization. We have no extreme poverty, no oppressed minorities, no unemployment, no crime waves or drug addiction. We lack corruption in our government. So far, we have avoided extreme polarization over social issues. But we are a small place, a federation of one town and a few villages and hamlets. We must preserve our stable, peaceful, reasonably just, democratic way of life against forces that will erode our accomplishments. The main danger we face is selfishness and self-centeredness. Sacrificing for others will strengthen the bonds of our society. Modesty and humility will strengthen our social fabric. Developing our ability to listen to others will help prevent polarization. Creating a culture of leadership that is based on strength of character, wisdom, honesty, maturity, and a commitment to what is right rather than merely expedient or personally advantageous will guarantee wise governance, and that will do more to advance this world and prepare it for its eventual place in the community of

nations than anything else. It is my personal priority, over the next four years, to foster this culture of leadership. I ask our faith communities, our schools, and other institutions to discuss and debate the qualities of good leadership. I call on all of us, in our cafes and around our dinner tables, to consider what good leadership means. Sometimes the best way to arrive at a destination is not to argue about the means and the timetable, but to make sure the right kind of leadership is in place. For twenty-three years, since our first elections in 2040, we have been blessed by quality elected leadership. If we can assure this into the future, we will achieve something no terrestrial society has ever accomplished.

"This is the greatest goal we can set in the next two years. It is more enduring than PGM production, more important than gold nuggets, more prestigious than making galleons, and it can make a bigger impact on Earth than having a hundred thousand or a million Marsians. It is a goal I hope we think a lot about in the next month as we prepare for elections, and beyond the elections as we discuss this world's future. Thank you."

9

Election

Jan. 2064

Liberty Square was looking bright and clear in the early evening twilight. The Mormon Temple, boxy and white with a statue of the angel Moroni on top, anchored the northern end; the new Aurorae Marriott Hotel sprawled along its western side; and along the southern end of the square was a diminutive copy of the Statue of Liberty, an American flag flying from a pole at its base. Between the hotel entrance and the statue was the Texas Steakhouse Restaurant, the destination of Ramesh and Sarah Pradhan. The tables outside the restaurant's doors were empty, so Ramesh pointed. "Let's sit here. It'll make the restaurant look fuller."

"And it's pleasant out," agreed Sarah. She put down their son Rajiv Thomas Pradhan, now ten months old, and the little boy immediately began to run across the square laughing. His parents watched him go, smiling.

"Come on, Rajiv, come back," called Ramesh. The few people in the square stopped to watch the toddler, amused. Sarah sat with Ramesh and watched the little boy, who couldn't get lost. After running ten meters he turned and laughed at his parents, then started to walk back when they didn't chase him. Ramesh walked over to the outside wall of the restaurant to grab a high chair for the little boy.

A robotic cart was already rolling over to the table with glasses of water. "We're waiting for someone, so we'll need three glasses," Ramesh said to the cart, as he took the glasses. "Do you have any crackers for the baby?"

The image of the face of Mrs. Mary Oakton, the restaurant co-owner, appeared on a screen on top of the cart. “Take as many waters as you’d like,” “she” replied, though most likely it was the cart replying; it was hard to tell because her lips were moving naturally and the voice sounded right, but the software was very sophisticated. “There are baskets of bread underneath; crackers, too.”

“Thanks.” Ramesh grabbed some crackers and a basket of thick-sliced fresh bread. “Any specials today?”

“Yes, sure.” The face was replaced by a list with illustrations and Mrs. Oakton’s voice reviewed them.

Just then Lal Shankaraman walked up. “Sorry I’m a bit late; I got a call as I was leaving the house.” He looked skeptically at the restaurant.

“Don’t worry; they have chicken and fish,” replied Sarah, knowing Lal’s sensitivities toward anything coming from cows. “The blackened chicken special with baked potato and vegetables sounds quite good.”

“I’ll have that,” agreed Lal quickly, sitting. “With an Aurorae beer.”

“Not me,” replied Ramesh. “I’ll have a twelve-ounce t-bone steak and a beer.”

Lal raised an eyebrow.

“Hey, I’ve seen Muslims drinking alcohol here,” replied Ramesh. He turned to Sarah “My dear?”

“I’ll have the chef salad and a beef noodle soup with coffee,” replied Sarah, who as a Catholic had no problems with beef.

The order was added to the display. “And for the baby?” asked the robotic cart.

"Extra vegetables," replied Sarah. "He'll have some of my soup and potato. Bring him a milk, too."

"Very good. I'll bring the soups, salads, and drinks right away." Then the cart began to wheel back to the restaurant door.

"Well, how are all of you?" asked Lal, turning to his friends.

"Fine. You should see Rajiv run across the square," replied Ramesh.

"Really? He's been walking what? A month?"

"Yes," said Sarah, pulling out a plastic bottle of milk for the boy. "How's Radha and Aditi?"

"Oh, they're doing well. Aditi's out with some friends this afternoon."

"She can go out?" Ramesh was surprised.

"Sure, her friends are responsible. Her mental retardation is mild."

"Do they know whether the environment caused her Down Syndrome?"

Lal shook his head. "Probably not, but no one knows. The latest evaluation was just two months ago. They now have pretty good statistics on children born here; there are about 1,300 of them. Down Syndrome doesn't seem to correlate with radiation, dust, or anything else. There are other things that do, of course!"

"We're fortunate; Rajiv's healthy," said Ramesh. "Have you been to the temple lately?"

"Last week; have they done more?"

"Yes, the stone carver has completed Ganesha and has started on Kartikeya."

"I'm still amazed you were able to arrange for a priest and two stone carvers. We'll have a *real* temple here, not something made of plastic." Lal gestured in the

direction of the Mormon Temple, which was a flimsy assemblage of aesthetically attractive plastic panels over a light metal frame with sound proofing inside the walls. There was no need to build against wind, rain, or cold, so they didn't.

"Yes, we'll have a real stone temple. But it wouldn't have been possible without you spotting the sandstone deposit."

"The stone wasn't hard to find. Thank God you have rich friends in Mumbai willing to pay!"

"Prestige. Mars needs a good Hindu Temple."

The robotic cart returned with their soups, salads, and drinks, so they retrieved their items and began to eat. "Say, Ramesh, I was driving up Uzboi Highway last week and was *very* impressed," exclaimed Lal. "What a beautiful, wide, smooth roadway!"

"Thank you; it is nice, isn't it? Our second automated graveler started to work half a year ago at Uzboi and is working its way southward. A third graveler starts in June in the middle. In eighteen months we'll have the entire roadway finished and we'll send the four gravelers to the Meridiani Highway instead."

"Which is getting longer, as we know," noted Lal.

"Do they have an outpost location yet?" asked Sarah.

Lal nodded. "Near the crater Jumla; 21.3 degrees south and 273.6 degrees west. That's fifty degrees farther east than Dawes and about ten degrees farther south. The gold potential is quite good, but there are very few highly enriched deposits, so we'll have to send a lot of equipment to get production up to reasonable levels."

Ramesh shook his head. “That’s way off the beaten path! Three thousand kilometers from Dawes and probably about fifteen hundred kilometers south of the Circumnavigational Trail, with the rim of the Isidis Basin in between.”

“Very good! You must have Martian features memorized by latitude and longitude! I’m recommending a new road straight from Dawes. The terrain is old cratered highlands with few obstacles. You could clear a crude trail in about three months to open the place for initial construction, then improve the trail to highway status later.”

Ramesh nodded. “Our new bulldozers can open up a route suitable for thirty kilometers per hour pretty fast; that’d put it four sols from Dawes.”

Just then Jon Oakton, proprietor of the restaurant, stepped out of the door and headed for their table. Ramesh smiled. “Good sol, Jon! How’s business?”

“Good sol, Ramesh. We appreciate your patronage! You all are our only customers, right now.”

“Really! No one inside?”

Jon shook his head. “We did real well when the tourists from Earth were staying at the Marriott, and the holiday season was good as well; the hotel had up to fifty guests from the different boroughs. But that was for the two weeks from Christmas through a week after New Years. Since then, this place has been dead.” He sighed. “I wish they hadn’t opened so many domes; they’re all underpopulated! Look at Liberty, half of it’s farmland! None of the new squares can have much business on them.”

“It’s a safety issue, Jon; we need to make a lot of squares and fill them gradually,” replied Ramesh. “But you must have gotten additional population, with the new arrivals.”

“Not much. Aurorae only gained four hundred residents. We were supposed to gain six hundred fifty, but then the decision was made to expand Uzboi and PGM production. I may open a restaurant there as well! The folks down there like steak. If I could get the robotic cooking equipment and the server-carts, I’d need one staffer.”

“How are you making ends meet?” asked Sarah.

“Mary and I both have part-time work, and we have community support; LDS, that is.”

“I’m sure business will improve,” said Ramesh. “We have no more residential domes scheduled for construction for two columbiads, just agricultural domes.”

“I know. Liberty and El Dorado will both get two hundred more residents next columbiad. And things are improving a bit.” He pointed to a new business across the square. “We’re getting a dry cleaners.”

Ramesh squinted. “Cinq-à-Sec?”

Jon nodded. “A Swiss dry cleaning chain with stores all over Europe and in several Asian countries. They’re taking over the main dry cleaner and laundry operation in Cochabamba Dome. There’s no one actually in that store; it’s a customer dropoff and pickup location with a video link and a robotic tender. But it’s better than nothing.” He looked at them. “I’d better get back inside and make sure the food is alright; the robotic cooker sometimes is temperamental. Can I get you anything else?”

“I don’t think so, Jon,” replied Sarah.

“Okay. Let me give Rajiv a kiss.” He leaned over and kissed the boy. “I’ll stop by again after the food arrives, meanwhile you can call me.” Oakton walked back inside.

“Nice guy,” said Lal. “Sounds like he’s struggling, though.”

"All the businesses up here are," replied Ramesh. "Frankly, Aurorae hasn't been designed very well. He's right, we've opened too many domes; we have enough space to house four to five thousand. And we have all these squares, each of which wants business in order to be a proper square. We should have opened half as many and given them incentives. As the population expands, we'll have to dig up and move the agricultural soil to other domes, which will take time and cost money. The extra space makes it harder for private contractors, too, since they've specialized in constructing in the interdomal areas, which I think should be reserved for public transit."

"That report you gave the Aurorae Borough Council last month was an eye-opener," agreed Lal. "It made us realize Aurorae needs to hire a professional town planner who's here, not on Earth somewhere. Alexandra's an excellent architect and construction manager, but she's not a city designer. We have so many big residential domes because she had a crew that could make them in a highly automated and efficient manner. But now we need to build lots of low-pressure agricultural domes; we have the genetically modified crops and the growing techniques for them."

"Otherwise, we won't be able to compete against Aram and several private agricultural outfits," agreed Ramesh. "Low-pressure domes don't save that much, but competition in food production is beginning to ramp up."

"Speaking of food," said Sarah. The robotic cart had appeared with their meals, and Jon Oakton was walking beside it.

"Hot and fresh," he said. "And I put on the finishing touches myself."

“It looks great,” said Ramesh. He took his plate from Jon and passed plates on to Sarah for herself and Rajiv, who was excited to see the potato. John headed back inside, but the robotic cart retreated a few meters only and awaited orders for more drinks.

“It’s very good,” pronounced Lal. “I approve, in spite of the American nature of the place.”

“It’s just about the only American chain we have on Mars.”

“This is a chain?” Lal was surprised.

“Yes, of course; I suspect the advertising fees they get every month are keeping the place afloat. It’s the only American franchise here, except for the Marriott. They’re both owned by Mormons, too.”

“American franchises aren’t what they used to be,” agreed Lal. “Cinq-à-Sec, El Corte Inglès. . . European firms are sweeping the field.”

“The euro’s the world’s leading currency and with the growing links with the Latin American Union, it’s just getting stronger. If I were the United States, I’d begin to feel isolated.”

“I think they are; the voters put in a new Democratic Congress a few months ago,” said Lal. He swallowed another fork full of chicken. “But I gather you didn’t invite me to dinner for the small talk.”

“That’s true.” Ramesh took a breath. “I’m concerned that you’re the only Indian on the Mars Residents Council. We’re nine percent of the Marsian population; we should have at least two members now and at the upcoming elections the Council expands to thirty-four, so we should have three.”

“It’s a coincidence. There are two Chinese, so they’re underrepresented, but three Russians; they’re overrepresented. The two Muslims make them overrepresented.”

“What did you do to get elected?”

Lal was taken back by the question. “I didn’t do anything! No one does anything; we don’t campaign. You know that, you were here last time.”

“Rumor has it that Bruce Cowdrey got himself elected through behind the scenes deals with the Japanese, Africans, and Mormons.”

“That’s the rumor, yes, but it’s never been confirmed.”

“Well, we have nine percent of the votes, and new people are elected with a pretty small number; why don’t we do that.”

“Why do you want to rock the boat?” asked Sarah, her voice rising.

“We need more representation.”

“Possibly by the President of the Hindu Association?”

“This isn’t about me!”

“Looks like it is, to me.”

“Well, it isn’t.”

Sarah stared at him, unconvinced.

“Look, do you want my advice?” said Lal.

“Yes, of course.”

“It’s simple advice. What Mars needs is champions. By a ‘champion’ I mean someone who has the best interests of Mars in mind. A champion identifies something Mars needs, champions that change—not in a narrow way that refuses to let the idea grow and develop as others consider the idea, but lets go of the idea and lets it live on its

own—then when the change is accomplished, he or she finds something new that Mars needs and champions that thing. Someone who champions Mars will quite rightly get elected to councils, because councils need exactly such selfless, dedicated people."

"Is that how you'd characterize the people on the borough and Mars Residents Councils?"

"Some of them. People get elected to the councils for all sorts of reasons, but basically because they've done something to make them prominent."

"And Ramesh, you've done some good, prominent things," added Sarah. "You're already reasonably prominent."

"And you've already been championing causes," noted Lal. "Getting the Hindu community here organized and championing the effort to build a temple are important, and now you're the expert in town planning. Put more energy into that; it's important."

"We have some important decisions to make about this place, in terms of tunnels," said Ramesh. "Expensive decisions. Uzboi, too; with 600 residents, it's getting pretty large."

"Then champion innovative ideas," suggested Lal. "Whether you get elected or not, the results will be good for Mars."

Will read the article in *Mars This Sol* with some sadness, tinged by anger. As he was finishing, he looked up and saw Alexandra Lescov standing in his doorway.

"Are you reading the interview with Cowdrey?"

Will nodded. "Yes. At least he's honest."

“The reporter came right out and asked him point-blank whether he had campaigned for himself. No wiggle-room. I’m much more concerned by what he says about elections.”

“Yeah. But a lot of people agree with him that we have to switch to regular terrestrial-style elections if our democracy is to ‘mature.’”

“I prefer our current system, and not just because I don’t have to run for re-election and thereby avoid the hassle,” said Alexandra. “We have a more honest system right now because people don’t lie in order to get elected.”

“Or to get re-elected.”

“But how do the Bahá'ís avoid having people re-elected forever?” asked Érico, who had now appeared in the doorway, obviously because he had looked at the same story. Ruhullah was with him.

“Well, that’s a problem in any system,” replied Will. “Once someone’s elected, they tend to get reelected. Sometimes we have a spontaneous change in membership, when someone eligible to be reelected isn’t. That’s rare. It’s more common for people to become ineligible for re-election by moving to another place or by ‘promotion’; they’re appointed or elected to a higher position. And sometimes people resign because of age or personal reasons.”

“Any system needs new blood,” said Ruhullah. “But a term limit would automatically prevent the accumulation of experience.”

Will nodded. “Any governing body needs a few members who have been on it for a decade or two and a few members who are completely new. Getting that balance right is hard in any system. The current democratic systems maintain the balance by

occasionally ejecting people after nasty, bruising, expensive, personal attacks on their character and integrity, attacks that are rarely fair."

"Sometimes an entire party is ejected because its ideology proves counterproductive or corrupt," replied Alexandra. "But the attacks taint the entire body with the air of corruption. That's what I hate about politics; it can be so dirty and nasty. Thank God we've avoided that up here! Otherwise I'm not sure the four of us could be friends!" She looked at Érico, the Chief Minister of the Mars Commonwealth Authority, and Ruhullah, Chief Minister of the Borough of Aurorae. She was on both the local and planetary councils.

"I certainly prefer the current system, too," agreed Ruhullah. "I'm not sure Muslims and some other minorities could easily be elected; someone would stir up suspicions against us in an election campaign. At least we don't have to worry about new blood, because every two years our population expands and the Mars residents Council gets new seats."

"Expansion saves us from lots of problems," agreed Will. "New blood is just one of them. Retirement pensions and health insurance are others, since we have a constantly growing population of young adults. It also means there are constant opportunities for promotion. These are some of the main reasons I'm constantly pushing immigration."

"But what should we do about Cowdrey?" asked Erico. "If people break the rules and campaign secretly, the whole system will collapse. It doesn't take much campaigning to get elected to a new position because the votes are scattered among dozens of potentially eligible competitors."

"I know," said Will. "And I agree it taints the entire system with the appearance of corruption."

"It's a slippery slope," exclaimed Alexandra. "Once one person campaigns, others campaign as well, then people spend more time campaigning, and more money. . . the next thing you know, we have long, expensive, bruising election fights every two years."

"I agree," said Will. "And polarization of the population follows, probably on ethnic lines. Considering our immense cultural diversity, we have a lot of potential for a divided and angry population. You can be sure I won't give my own vote to someone who violates the rules. But I don't know what the population overall will do. There are no regulations banning electioneering, so he hasn't violated a law. You all are on the local or planetary councils; you're in the position to establish rules."

Alexandra looked at the others. "I'll submit legislation to the Mars Residents Council."

"I wonder whether severe restrictions on electioneering will be considered legal, though?" said Ruhullah. "It gets into the area of violation of free speech."

"Well, campaigning violates my human right to a free, fair, and open choice for whom I will vote," replied Will. "If we want the electorate to feel truly free to vote for whomever they feel is best, they can't feel that they have a choice between only two or three candidates. They have to feel freedom to vote for anyone their conscience dictates."

"Yes, and few people will vote for anyone when they know that one of two or three people are guaranteed to win," agreed Érico. "Unfortunately, human rights law does not recognize that right, Will."

“Then the problem is with the law! This is a classic example of competing rights, of someone’s right to stand up and say ‘vote for me’ versus my right to decide whom I will vote for without attempts to influence my conscience. We have to balance competing rights all the time; that’s the struggle in any society.”

“That’s true,” agreed Alexandra. “It’s probably too late to do anything this time around, though, with the Future of Mars forums Satursol and the election Sunsol.”

“I agree with you there,” said Will. “It’ll be interesting to see whether the electorate will do anything.”

Érico nodded. “Personally, I’m angry at Bruce. I’m surprised he was so frank.”

“He’s cocky, sometimes,” replied Ruhullah. “That’s his personality. He got away with it before and now he’s been reelected several times, so he figures he can admit it without any backlash. And when you read the article, it’s clear he thinks the no-electioneering custom is antiquated.”

“He certainly laid out the argument,” agreed Will. “It looks like *Mars This Sol* has decided to focus on the issue, too. I hope they ask me for my opinion, because I’ll express it! In fact, a few months ago I wrote something; I think I’ll send it to them.”

“They’ve become quite a capable media outlet,” commented Ruhullah. “And they’re devoting a lot of energy and bandwidth to the elections. If they ask me my opinion, I’ll express it as well.”

“Good,” said Will. “Now I have a meeting to prepare for. Alexandra, stay a minute.”

She nodded and sat at the table. Érico and Ruhullah both headed back to their work down the hall. “Do you need an update?” she asked.

“Yes,” Will replied, walking out from behind his desk to the table where she had sat. “Your operation is by far the largest department of the Commission up here! How’s the planning on the galleon?”

“Pretty well. I spoke to the design team yestersol for an hour. The mass estimates are proving elusive, but I think we can build the basic hull and interior walls for 225 tonnes. Oxygen and methane for midcourse maneuvers will be created from the ship’s waste products.”

“And costs?”

“I think we can make each galleon for about two billion redbacks. If that’s spread over ten flights and 4,000 passengers, that’s five million redbacks per person. Maintenance and propellant will add cost, but methane-oxygen and hydrogen-oxygen is now available for less than a half million redbacks per tonne in earth orbit, and the vehicle will need about a tonne per person on average. We should be able to fly passengers here for six million redbacks. And there are some tricks for reducing that amount; if we add flights via Mercury or Venus we can increase the total number of flights the vehicle can make by about fifty percent.”

“What’s the radiation environment looking like?”

“The computer simulations aren’t done, but it appears that the galleon is so large and massive, most of the interior is a low-radiation environment.”

“Get me a copy of that report as soon as it’s available. Now, what’s the flap I hear about building more domes here?”

“Last week Ramesh Pradhan was asked by the Borough Council to prepare a private report about the expansion of Aurorae over the next decade, assuming an addition

of 500 to 750 residents per columbiad. We gave him three months, but he has rushed a preliminary report to the Council in a week; the guy doesn't sleep! The report calls for no new residential domes for at least three columbiads. His argument is that we've been building westward and now have a settlement axis that's a kilometer long, but only a few hundred meters wide. So from the point of view of both the convenience of walking from one place to another and from the point of view of businesses, we need to widen the outpost rather than lengthen it. The existing squares will have larger populations to support them. We need better east-west transport tunnels and interdomal spaces should be filled up with residential bubbles. He also advocates relatively few new large agricultural domes; he'd replace them with prefabricated agricultural bubbles instead. The new automated manufacturing equipment and waterproofing systems make bubbles cheaper."

"What does Lisa say?"

Alexandra nodded reluctantly. "She likes the idea; she's worried about competition with Aram and with private farmers. The private farmers definitely like the proposal because they can afford to buy forty by twenty-meter bubbles and set them up themselves, and bubbles of that size are large enough to allow robotic farming."

"Overall, it sounds like a plan to produce a higher population density. That will reduce internal transportation and make it more efficient."

"Yes, Ramesh is right. Of course, I don't like his plan for one simple reason; my dome construction team will be idled and our pile drivers and other heavy equipment will mostly have to be mothballed. You can't activate these teams, then deactivate them a while, then reactivate them. It's inefficient."

“Perhaps we can build one large agricultural dome at a time so you can keep one team working. Otherwise, Alexandra, you need the workers elsewhere anyway, to build the facilities to make galleons and then make the galleons themselves.”

“But every time our grand plan gets changed, that’s stressful for me and disruptive for the workers.”

Will shrugged. “That’s life. How many different construction plans have we had for Martian outposts in almost thirty years? There have been habs, biomes, domes with heavy foundations, open-ground domes, ten-by-twenty-meter bubbles, metal construction tubes, twenty-by-forty-meter bubbles. . . as we get gain experience and technology advances, we develop better systems.”

“He’s also advocating thirty-five-by-seventy-five meter bubbles,” she added. “They would provide better economies of scale and would fit the existing dome footprints. And he’s probably right about that, so I guess we’ll make a study. You’re right, Will, I was once the champion of change, but now I’ve gotten used to doing things certain ways, so I have to remind myself it’s time to change! But don’t worry, I will.”

“Good. Now I have to prepare for my meeting with Pierre and a few other staffers on Earth. Have a good sol, Alexandra.”

“Thanks Will, same to you.”

The crowd in Andalus Square began to grow early. Will watched from his seat close to the podium as more and more people streamed in and sat in chairs. “How many chairs did we set up?” he asked Ruhullah.

“A thousand.”

“It won’t be enough. People are bringing their older children.”

“We only have a thousand voters, plus another hundred-fifty at New Tokyo, and the Future of Mars Forum never gets more than a two thirds turnout.”

“Ruhullah, look at the seats!”

He looked over the crowd closely. “You’re right,” he conceded. “I’ll call the work crew. We can move more seats from the Gallerie.”

“People already are,” replied Will, pointing to a few arrivals coming from the Gallerie’s main entrance carrying chairs from the food court.

“I’ll take care of the matter right away,” said Ruhullah, turning to his attaché.

“This is amazing,” said Ethel. “Do you think it’s the issue of independence?”

“I don’t know,” replied Will. “I don’t get the impression that independence is a hot issue. Maybe it’s because this Forum is purely local; no listening to videotaped opinions from landowners on earth or residents in other boroughs.”

“Holding more forums might increase interest,” Ethel agreed.

“Or maybe it’s because of the electioneering issue,” commented Liz, who was sitting with them. The suggestion surprised Will. He digested it while they waited.

After talking to people on his attaché, Ruhullah finally went up to the podium and addressed the crowd quickly, directing new arrivals to the Gallerie to get their own chairs and pointing out areas where seats were still available. That speeded up the process, but Will still had to wait an extra five minutes before going to the podium.

“Good afternoon fellow residents of Aurorae, and welcome to this columbiad’s first Future of Mars Forum,” he began. “I am amazed that so many of you have turned out; it reflects well on our civic pride and sense of duty. We are gathered to participate in

a unique expression of democracy. Every columbiad we elect the Borough Council—nine members this time—and local representatives to the Mars Residents Council, which will have thirteen Aurorae residents on it. Before the election, rather than hearing campaign speeches and listening to all sorts of promises—and sometimes criticisms of others—we gather to discuss this world's future. Everyone can speak. This time around *Mars This Sol* is offering extensive summaries of both oral comments and written ideas that already have appeared on the Future of Mars Forum's website. Indeed, the website's discussion boards have been remarkably active in the last week; all of you must take an hour or two to at least skim the discussions, as I did last night, because they provide an essential supplement to the limited time we have together in Andalus Square this sol. I have asked Father Greg Harris to offer the first comments. My attaché is now set on extension 4558 and if you want to speak, call that number to be added to the list of speakers. When I recognize you, your attaché will become your microphone so the rest of the crowd can hear you. Father Greg."

Greg rose from his seat, attaché in hand, and a camera zoomed in on him so that his face appeared on the screen behind the podium. "Thank you, Commissioner Will. My comments about the quality of life here on Mars will be brief and focused. In the last half decade, the use of the fertility drug Geminale has gone from occasional to routine. Not everyone has twins; some people who were having difficulties getting pregnant at all have found that challenge lessened. In spite of a larger population, our use of surrogate mothers has stayed constant. Our fertility rate has gone from 1.6 to 2.1; we are actually more than replacing ourselves for the first time! This obviously is very important for Mars, a world that desperately needs a high birth rate. Yet our maternity and paternity

leave policies have not changed to reflect this new reality. A couple still gets six months of fully paid leave to split between them as a result of a pregnancy and birth, whether one child results or two. Yet two children take a lot more work; some would say the work increases by the square of the number of children. In my pastoral work around the borough I can testify to a lot of extremely stressed parents of newborn twins. I recommend that the Commission change its policy and the Commonwealth Authority pass a law mandating an extension of parental leave to at least nine months, preferably to twelve months for the couple to split between them. With such policies we conceivably—no pun intended—could see our fertility rate to climb to 2.3 or even 2.5. Thank you." Greg sat.

"Thank you, Father Greg. The Commission needs to look into that suggestion very, very seriously." Will looked at his attaché. "Rahula Peres."

Rahula rose. "Thank you. I wanted to speak to a very similar topic, the situation of new migrants. It has improved in recent years, but it is still very difficult. Most of those who arrive purchase their first condo with an interest-only mortgage, which means they have a piece of paper saying they own something, but they are not scheduled ever to finish paying it off. Admittedly, this is a better situation than when condos were virtually unaffordable, but it is still a crazy arrangement. Couples delay having children under these circumstances; the first child is born an average of four years after the parents arrive on Mars rather than 3.5 years, as it used to be. Last columbiad, Mars actually made a surplus on its exports. Surely a modest increase in starting salaries and a slightly higher minimum wage are affordable changes?" Rahula sat to a chorus of "Here, here!" and similar supportive comments.

“Thank you, Rahula. Madhu Gupta-Anderson.”

Madhu rose. “I always give the arts a plug every columbiad, and this will be no exception. Thank you to the Commission and the Commonwealth for their increased level of support for the arts. We have more full time artists, more grants for specific projects, more commissioned pieces of art inside and outside the outpost, a thriving ballet program, and dynamic sports leagues. This speaks highly of the maturity of our civilization while simultaneously advancing and expressing our unique culture. It is very encouraging and important.

“I say this because I hope the support for the arts will never wane. I am asking the residents not to elect me to the borough or residents councils. I have served on councils practically since we elected our first one twenty-four years ago and feel it is time for new blood. Thank you.”

A murmur went through the crowd and a few comments of “No!” which startled Madhu. Will looked over the crowd and raised a hand to quiet it. “Thank you, Madhu. Lyle Quincy.” He spoke the name with some private trepidation, knowing Lyle’s devotion to independence.

Lyle rose. “Good sol, my fellow citizens of Mars. If there is any issue that presses itself on us today, if there is any issue urgently demanding our attention and deliberation, it is independence for Mars. We are no longer a small, struggling outpost financially dependent on Earth, relying on a thin supply line to keep us alive. We are 4,000 human beings generating thirty six billion redbacks of exports per columbiad—larger than the economies of thirty nations on Earth—and creating an internal economy of 1.5 billion redbacks per columbiad—larger than a dozen nations on Earth. Our thin supply line has

grown to over a hundred solar sailers hauling twenty-five hundred tonnes of cargo between the planets every columbiad. We have been electing a Mars Residents Council for fifteen years; it has had substantial domestic authority for six. It now even possesses its own shuttle. One borough has grown to eight. The cost of flying migrants here has dropped one hundred fold since Columbus 1. We possess a university, a major research hospital, a mall, ten thousand kilometers of highways, thirty restaurants; we even have two MacDonalds!" That generated some laughter. "My friends, our institutions have matured, our culture has flowered, and our economy is sound. We already are a people; we are already a nation! Let us enjoy the full benefits of peoplehood and nationhood and obtain for this land of ours a sovereignty, a control over its own destiny. The Independence Club has a website and it has a petition to the nations of the Mars Commission asking them to grant us immediate independence. So far, almost ten percent of you have signed the petition, a very exciting start to our drive. Please read our petition, discuss it with your friends, debate it, then sign it. Please join us!" Lyle sat to a loud scattering of applause.

Will was impressed by the man's eloquence. "Thank you. Louise Tremblay."

The head of shuttle operations rose. "I wish to raise an issue that has brought me great pain over the last few sols. I refer specifically to the issue of whether our election system, which I regard as unique and exceptionally mature, will survive, or whether it will be corrupted by the practices of terrestrial politics. I have lived on Mars since 2042; in a few months it will be twenty-two years. When I arrived I found our practice of electing borough officers without any discussion of candidates a bit strange, but I figured since we all knew each other, nominations really weren't necessary. I also assumed that

some day we would no longer know each other and we would have to switch to the standard methods democracies use to winnow through a large field of possible candidates and select just a few for elections.

"But I no longer feel that such a change is necessary. This will be Mars's twelfth election. Each time, with dignity, peace, mutual respect, and trust for the opinions of our fellow residents, we have gone and voted, having little idea who would be elected. The results have always been good. We have not elected the loud, the ambitious, or the fast talkers; we have elected fairly wise, reasonably mature, practical, and surprisingly capable leaders. As a result, we have had decision making bodies able to innovate. We have not looked on fellow residents with disdain. We have rarely raised our voices at each other in our borough meetings. We have not seen large sums of money squandered on campaigns. We have not had people try to convince us that minor issues are major or that differing views on issues are black and white, right or wrong, life or death matters.

"I for one will not sit back and watch our collegiality be eroded by personal ambition, for that is what secret campaigning is: it is a bald attempt to acquire personal power. To my mind, it is a breach of public trust of the highest order. It is, in fact, an automatic disqualification for my vote. I hope the vast majority of my fellow voters agree with me and take a similar position. Thank you."

Louise sat to a slightly stunned silence. Will had never heard his rocket engineer speak so eloquently before and was startled. The facial reactions of the crowd told him that not everyone agreed with her. "Eammon O'Hare."

Eammon was another person who rarely spoke up at borough meetings. He sat with his wife and five children, the oldest of whom, Patrick, was nineteen and a voter

himself. “Thank you, Louise. I couldn’t have said it better myself, but I am so stirred up about this I’ll try! In my mind, one thing distinguishes our political system from the democracies on Earth: *we don’t have politicians.* And I’ll be very specific what I mean by ‘politicians’: no one runs for office here. If they are elected, they’re stuck with the duty! As a result Mars is run by nerds, scientists, engineers, technicians; in other words, by ordinary people! Because after all, most of us up here are nerds. Even our kids are mostly nerds. Frankly, I don’t want politicians messing things up. We all follow the news. We know what a mess Earth is always in, and we know why: its governments are stuffed full of self-serving people who try to convert every event into a political advantage, rather than doing the right thing! We have avoided that fate, and I see no reason to assume that has to change! We don’t have to fall into the corrupt habits of Earth. People like my friend Madhu, who has *never* wanted to serve on a council, is exactly the sort of person we need, because such people are not out for themselves. So, you know who I plan to vote for, and most definitely who I will *not* vote for.” And he sat.

Applause erupted again. “Henry Smith,” Will said. He was one of Mars’s most prominent Mormons and a close friend of Bruce Cowdrey. “I have to voice a very different view,” he began. “I have a *right* to stand up and say who I will vote for. I have a *right* to ask people to vote for me. I have a *right* to vote my conscience. I have a *right* to form a political party that coordinates voting positions and votes. I have rights to do these things! It’s called freedom of speech and freedom of assembly! Why are these rights restricted on Mars? It is irrational, illogical, it should be illegal, and it goes against common sense and the tidal wave of history! My friend Bruce Cowdrey is being condemned for exercising his rights and behaving as a good citizen! It is a travesty of

justice and a sign of how impoverished our political system is. You want Mars to be independent? Then Mars has to grow up!" He sat to scattered applause and catcalls.

"Order, please!" called Will. "The next name on the list is Kim Irion."

Kim rose. Her face was flushed with emotion. "Henry my friend, you may have the freedom of speech in some circumstances, but not all. You don't have the right to stand up in the Gallerie and shout 'Fire!' when there is no fire. And you should not have the right to express your rights when you are trampling my rights. Because I have the *human right* to decide who I will vote for *without outside interference.* This is the right to choose my leaders without attempts to bribe me, fool me, or scare me. Those efforts are simply the so-called right to stand up and shout fire when there is no fire. I am an adult, an educated and intelligent human being. I don't need to be told who to vote for. Furthermore, I am not being oppressed by a king or a dictator. The media is not being manipulated or suppressed. I am not in the need of a revolution to free me. I am a free and mature human being. Leave me alone and let me decide whom I will vote for by myself! And you know something, Henry? I will reciprocate and leave you free to do the same." She sat to laughter and applause.

Will looked at his list. "Ramesh Pradhan."

Ramesh rose. "Commissioner Will, I had planned to speak about roads, the need for more and better ones, the need for north-south tunnels here in Aurorae, the need for a new outpost growth plan, a different approach to domes and the use of cylinders, and various other ideas for civic improvements. But I think no one cares about matters such as these right now! I have wondered about our custom of having no campaigns and whether campaigns should be allowed. I have been struck, in my conversations with

people, how strongly many people feel about the advantages of our current system. So I am inclined to say: let's not rock the boat. This new system has not failed us. If it ain't broke, why fix it? We need to try it for some additional elections and see what fruits it bears. I agree with Kim against Henry. This is not the United States with its excessive emphasis on individual rights. This is a culture that strives to balance individual and collective rights. I come from India, where we strive to respect both. Mars is a fantastic example of an effort to find a new balance, and I think our election system is an important innovation." Ramesh sat, surprised by his own comments.

There was applause again. "I can see this is a topic that is generating considerable interest because in the last five minutes the number of people wishing to speak has gone from thirty to two hundred. Obviously, we cannot accommodate that many speakers. But we will continue in this vein for fifteen more minutes, then I will ask the audience whether we should continue the discussion or switch to a new topic. Those unable to speak will be able to post their comments on the Future of Mars Forum's discussion boards."

Will glanced at the chronometer on the living room wall. It was 24:38; just a bit over a minute before the clock would roll over to 0:00, Martian midnight.

"Let's go to the website," suggested Marshall.

Will looked at Ethel and Liz; they both looked tense as well. "Alright," he agreed. He opened his attaché and typed in the web address where the results of the vote would be found. The others gathered around.

"It's not opening," said Marshall.

“Give it a minute. I suspect three quarters of Mars is going to this site at the same time,” replied Will.

“I’ll go to the site of *Mars This Sol*,” said Ethel. “They’ll mirror the election results right away.” She turned to her attaché.

“Oh, there goes the clock; it’s midnight,” exclaimed Liz.

“What do you think will happen?” Liz asked her father.

“I’m too frightened to speculate.”

Then, as if in response to his comment, the website on his screen updated and the results were there. “Wow!” said Will. “The electorate did it! Cowdrey’s out!”

“And poor Madhu’s still in, at least on the Residents Council!” added Ethel. She laughed. “Eammon’s to blame.”

“Ah, look,” said Will, pointing. “They elected Ichiro Otsu to the Borough and Residents Council. The Japanese may have abandoned Cowdrey in favor of the President of the New Tokyo Council. That would explain his defeat.”

“No, every voter had nine votes for the Borough Council and thirteen for the Residents Council,” disagreed Ethel. “They could have voted for both.”

“Louise was elected to the Residents Council as well,” exclaimed Lizzie, pointing. “That’ll be a surprise for her!”

“She was very eloquent,” replied Marshall. “I was impressed.”

“Hey, Ramesh is on the Residents Council also,” noted Ethel. “Congratulations to him.”

“He’s bright,” replied Will. “But more ambitious than he came off at the forum.”

“Father Greg was elected, too,” noted Marshall. “It looks to me that the electorate has spoken pretty decisively; they don’t want nominations and campaigning.”

“I am amazed,” said Will. “I never thought this would happen.”

“No?” replied Ethel. “I thought it was possible, at least.”

“What’s wrong with both of you?” said Marshall. “People were pretty eloquent at the Forum; no politicians!”

“But there were eloquent speakers on both sides,” replied Will. “A few more anti-campaign speakers really doesn’t tell you the mood of the general population.”

“Maybe not, but sitting in the Gallerie does!” exclaimed Liz. “People were talking about little else, and a lot of people wanted to punish Cowdrey.”

“That’s what I heard, too,” agreed Marshall. He looked at his sister. “Come on, Liz. The Square will be hopping right now.”

“You’re right; let’s go!”

“You’re going to the Square?” asked Will.

“Definitely. There will be a celebration, wait and see.”

Ethel turned to Will. “I bet they’re right, let’s go!”

“Okay,” Will agreed.

10

Chief Minister

Feb. 2064

"Ramesh Pradhan, you're acting like a child with a handful of candy!" exclaimed Sarah. "All morning you've been pacing around the house and ignoring Rajiv while I take care of him! I've got things to do, too!"

"I know, I know, but be patient with me; this is my first sol attending a Residents Council meeting!"

"I know, and I don't care; life has to go on. I have a suggestion; you take Rajiv to daycare so I can wash up and get ready to go to work."

"Okay, I can do that."

"And tonight when you come home, bring another package of diapers from Deseret, we're getting low."

"I'm supposed to attend my first sol in the legislature, then buy diapers?"

"Like I said, life has to go on."

"Alright, I'll try to remember."

"You had better."

Ramesh headed for his tiny office next to the nursery and grabbed his attaché. He clipped it to his belt, then scooped up Rajiv, who giggled. Ramesh gave Sarah a quick kiss on the cheek and headed for Andalus Square.

Daycare was in the Borough Building at the east end of the square. He dropped off Rajiv at his class—the toddler cried, as usual—then headed across the square solemnly, walking in a slow, dignified strut to the Mars Commonwealth Authority

Building. It was a grand, pillar-lined structure sixty meters long and thirty-three wide with a forty-meter tall campanile attached to the northeast corner of the building.

He ascended the grand stairs in front and passed between the central pillars to enter the lobby. The entrance to the council chamber was in the middle of the opposite wall; to its right and left, hallways ran to the rear of the building, with committee meeting rooms and offices for representatives along each. Another hallway on the left side of the lobby extended to the southern end of the building and provided access to two court rooms and judicial offices. A grand stair on the right gave access to the second story; the council chamber had a second-story public gallery for observers and was flanked by more offices. The third and fourth floors of the Authority Building had the office of the Chief Minister and his staff; almost the entire staff of the commonwealth worked there. The basement under the council chamber was devoted to storage and future expansion.

The lobby was filled with representatives, Commonwealth staff, and members of the public. Alexandra Lescov spotted Ramesh and came over.

"Congratulations," she said. "Welcome to the Council." She offered her hand.

"Thank you. It's been a surprising two weeks."

"You must have been surprised by the election."

"Shocked! I didn't expect to be elected, and since one can't run for office, one really has no preparation for the election results."

"You never quite get used to it, either. The last two weeks have been quite interesting. The election has made a lot of people. . . patriotic, for lack of a better word."

“Yes, that’s been surprising!” agreed Ramesh. “I guess a lot of the public saw it as a vindication that Mars really is different; that we really have matured as a society. I never would have thought that would result.”

“I didn’t see that coming, either. Independence is suddenly on people’s tongues.”

“Do you think the Council will debate it?”

Alexandra shook her head. “No, I don’t think so. There’s no reason; it still isn’t taken seriously by a large number of people. Just go to the website of the Independence Club. The number of people who have signed their petition has surged, but it’s still only fifteen percent of the population. And I just checked this morning; no one has signed in two sols, now. I think they’ve peaked.”

“That’s a good gage of support.”

“I think so, because when people sign they affix their electronic signature, so the identities can be verified. Oh, here comes Will. We should go inside and get started, it’s time. Do you know where to sit?”

“Yes, I checked the seating map. We’re assigned alphabetically.”

“It’s pretty easy. Help me encourage everyone to go in.” Alexandra began to walk through the crowd and ask people to move inside. Ramesh did the same, then entered the council chamber. It was a fairly large room—twenty meters square—with a circle of thirty-five very comfortable chairs, each with a table in front of it, filling the front third below a large mural of the settlement of Mars. The rest of the room held ninety chairs for guests and authorized observers. When Will Elliott entered, he sat in a small section of chairs on the left side. Brian Stark and General Zhou Qisheng, heads of the American and Chinese nuclear facilities and therefore the official representatives of their governments,

sat with him. Silvio DiPonte, Chief Justice of their three-member Supreme Court, joined them in his robes.

Ramesh found his seat in the semicircle. He looked around, intrigued that a legislative body would function in the round instead of with lines of chairs or even with two halves of the chamber for two sides. It felt more complete and unified. He sat and spread out the electronic paper of his notebook on his table so he could take notes. Lal stopped by to shake his hand, followed by a few others. Then Alexandra Lescov stood and everyone grew quiet.

"As outgoing chair of the Mars Residents Council, I call this first session to order," she said. "Our order of business this sol is quite simple. We will start with a few words of inspiration by Father Greg; every session starts with something and we rotate among the members the responsibility to select someone or something to start us off. We then will have words of welcome from the Commissioner and the American and Chinese governmental representatives. We will select the Council's chair and vice chair and handle other organizational business. Then we will hear the Commissioner's choice for Chief Minister, discuss that choice, and vote on it. That will probably complete the sol. This session of the Council will last two or three weeks, with committees meeting in the morning and the body in the afternoon. There are already three items on the legislative agenda, and we are sure to obtain more." She turned to the priest. "Father Greg."

Gregory Harris stood and offered a generic prayer to the Creator while most bowed and closed their eyes, though a few pointedly did not. Alexandra turned the floor over to Will Elliott, who offered a quick speech about the progress of Marsian governance and the plans for the rest of the columbiad. Brian Stark spoke about

America's pleasure with Mars's development; Zhou Qisheng praised democracy and the recent election, which Ramesh found ironic considering China's own spotty democratic record. Then they turned to the matter of electing a chair and vice chair. "Point of order!" exclaimed Louise Tremblay, raising her hand. Alexandra nodded, so she rose. "I understand we have a 'traditional' system involving nominations and discussion to chose these two officers, but we're a small body and we all basically know each other . . . why shouldn't we just vote?"

"Is that a motion?" replied Alexandra.

"Yes, I move we dispense with nominations and discussion and simply vote for chair and vice chair."

"I second," added Ruhullah.

"Discussion?" asked Alexandra. There was silence as everyone thought about it.

"I wonder whether we can carry this no nominations thing too far?" mused Emily Scoville-Rahmani, but she said it to herself, not to the other council members.

"Shall we vote?" asked Alexandra. "All in favor?" A clear majority of hands rose. "Well, that settles the matter, the ayes have it. Let's use real paper."

There was a momentary pause while the clerk of the Council found a pad of paper and ripped it into small pieces. Finding pens or pencils took a minute as well; most people wrote with electronic styluses. But in a minute that problem was resolved and the room descended into silence while everyone voted. Alexandra suggested tellers—one was Ramesh—and there being no objection, the tellers swiftly counted the votes. "Our chair is Alexandra Lescov," announced Ramesh.

"A boring choice," noted Alexandra, who had been chair for years.

A second round of voting selected Ruhullah Islami as Vice Chair. The matter having been quickly settled, Alexandra turned to the Commissioner, who rose from his chair.

"It is my honor and my legally mandated duty, every columbiad, to recommend someone to serve as Chief Minister," exclaimed Will. "We have all benefited from the steady leadership of Érico Lopes for the last six years, who has led the Commonwealth from strength to strength. There seems to me no reason to change captains at the helm at this point, therefore I am recommending Érico Lopes for a fourth term as Chief Minister."

"Thank you, Mr. Commissioner," replied Alexandra. "Any discussion?"

Érico's hand shot up, so Alexandra nodded. He rose. "I am very honored to be recommended for a fourth term as Chief Minister. I have enjoyed the work and feel a sense of accomplishment when I look back at my six years as Chief Minister, plus additional years as Clerk of the Residents Council before we had a Chief Minister and as Clerk of the Borough of Aurorae before that. I have been involved in our governing system continuously since its founding in 2040.

"But I now wish to retire from any positions of sol-to-sol responsibility. I will continue to serve on this body as long as the voters grant me the privilege of service. I have made this decision for two reasons. First, personal ones: I prefer to return to geophysics. Second, out of a sense of duty to Mars, because I feel it is not wise for someone to occupy a position too long. In a governing system where there are no bruising reelection fights, there is a good chance someone will be re-elected forever. Of course, that is virtually true even in competitive systems; members of most legislative bodies on

Earth have a 95% re-election rate even with competitive elections. But if we seek to create a system that works better, is less corrupt, and adheres both to the principle of no campaigning and to the principle of new blood, then people have to retire voluntarily. For this reason, I retire. I am confident I will have plenty of other tasks to do. Thank you, everyone for many years of pleasant but challenging service."

Érico sat to a few gasps and a lot of talking. Alexandra watched the council for a moment to let some of the chat play out. Then she said, "I move we accept Érico's retirement."

"I second, reluctantly," added Emily Scoville-Rahmani.

"All in favor?" Alexandra did not wait for additional discussion. "The ayes have it. Mr. Commissioner, we need another recommendation from you. Will you give it to us this sol, or tomorrow?"

Will rose. "Thank you, Madame Chair. I am still in a state of shock that Érico has declined and normally would request a recess until tomorrow. He has served all of us well and none of us expected him to make this announcement. But rather than wait, I propose another procedure based on our newly solidified system of avoiding nominations. In the last few weeks, the voters spoke clearly: They do not want campaigns for office. It would seem that the Marsian public has achieved a new level of collective consciousness about its governing system, a collective consciousness that has also produced a stronger sense of Marsian identity. The Marsian public is moving in directions, and at speeds, that none of us could have anticipated just a few weeks ago.

"To respect and honor this shift, I ask that the Council express its will to me about the choice of Chief Minister through a ballot, without nominations. While as

Commissioner I retain the right to choose whomever I wish, I have immense respect for this body and its ability to choose, so I ask it to make a recommendation to me first."

Will sat and everyone turned to speak to a neighbor about his request. "My goodness," said Emily Rahmani-Scoville to Ramesh. "This is practically independence!"

"Will he get in trouble with the Board of Trustees of the Commission?"

"I bet he will!" she agreed.

"Order!" exclaimed Alexandra, reining in the discussion. "We have a request for a straw vote. Unless there is an objection, I am directing the clerk to pass out slips of paper, so that we can vote as the Commissioner requested."

"Who would object?" said Ramesh, with a smile.

"No one here," agreed Emily.

The clerk went around the circle and gave everyone a piece of paper. Silence enveloped the chamber. Emily wrote a name on her piece of paper and folded it, then handed her pen to Ramesh so that he could vote. He rose, as a teller, and walked around the circle to collect the papers. Then he and the other teller, Father Greg, sat in a corner and began to make piles of ballots. One pile was the largest from the very beginning.

"Alexandra Lescov gets 22 votes out of 36," announced Greg. "We have six votes for Ruhullah, four votes for Érico, and two votes each for Lal Shankaraman and Emily Rahmani-Scoville."

Will rose. "Then, Madame Chair, may I make my recommendation for Chief Minister to this Chamber."

"You may, Mr. Commissioner."

"I recommend Dr. Alexandra Lescov to the Mars Residents Council."

She turned to her colleagues with a bit of hesitation. “We have received a new recommendation from the Commissioner of Alexandra Lescov. Discussion on the motion that is constitutionally before us?”

“Let’s just vote!” replied Yuri Severin.

“I want to think about this first, though,” added Father Greg. “Could we have a moment of silence?”

“Yes. Could the clerk could pass out paper while we think about this motion.”

The clerk rose and pulled pages from the notebook and ripped them in half, then walked around the circle and placed a piece of paper on everyone’s desk. Some people began to write. “I take it there is no objection that we proceed to the vote?” said Alexandra.

There was none. Ramesh borrowed Emily’s pen again and wrote down a name—Alexandra’s—then rose to collect the votes. He and Greg soon had a single big pile of ballots. “The Mars Residents Council has made its decision,” said Father Greg. “The vote is 35 for Alexandra Lescov.”

“Very well,” said Alexandra, her voice quavering a bit. “Do I have a motion to accept the vote? . . . Thank you, all in favor?. . . It passes. I direct the clerk to email this decision to the Mars Landowners Assembly, which is currently in session in Houston, Texas, with a request that they also consider the recommendation of the Commissioner.” She glanced at her watch. “We have an hour before we have to adjourn for the sol. I suggest we elect a new chair, then turn to the Council’s six committees and their memberships.”

The Residents Council adjourned an hour later, after having selected the membership of the six committees (arts and culture, development, education, health, regulation, safety, and transportation). The chamber gradually emptied out. Alexandra went to find Will. "This is a huge change."

"How do you feel about it?"

"I don't know, I'm still in shock."

"In some ways, it's a demotion; the Construction Department has more employees. But as Chief Minister, you're the boss."

"To the extent the law allows. The Chief Minister can't do just anything, as we've seen in the last few years."

"I don't know. Érico pushed for the Commonwealth to buy a shuttle, and it did. The Chief Minister can do a lot. And you'll make an excellent Chief Minister, Alexandra."

"Thank you, if I'm ratified."

"You'll be. The Landowners Assembly doesn't know the people up here. They really have little choice. Besides, you're pro-business."

"I suppose. So, Will, are you going to push privatization of the construction department now that I'm out?"

"I want to see how Margen and Marscomm do. Privatizing them is proving complicated. If we spin off anything, it will be domestic construction, then maybe materials fabrication."

"Good. I guess I'll get some supper."

"Be prepared to be mobbed."

She smiled. The thirty-six representatives were all trickling out of the chamber, lingering in the lobby, then stepping out onto Andalus Square. Alexandra did the same. When she entered the Gallerie with some other representatives, someone rose and applauded them. In a matter of seconds the entire food court was on its feet.

"Wow!" she said to Will.

"Smile, wave, and nod," he replied, following his own advice. "What we did this afternoon was historic. We selected leaders in a new way."

Judging from the crowd, I think we gave independence a boost."

"I think so, too."

"Will you get in trouble for asking for the straw vote?"

"I've already received four videomails of protest, one from the White House."

"What will you do?"

"Apologize." Will saw Ramesh stop to kiss Sarah, who was already seated with Rajiv. He stopped by and put his arm on Ramesh's shoulder. "What did you think of this afternoon?"

"It was amazing."

"Sorry they didn't put you on Transportation, but it would have been a conflict of interest."

"I understand. The Safety Committee will be interesting enough."

Will turned to Sarah. "So, did you watch the procedure on television?"

"Oh, yes! The hospital was paralyzed; we were all glued to the screen."

"What was the reaction?"

"Pride! We were inspired. It was a . . .patriotic experience."

“An interesting choice of words.” Will smiled. “How’s the little guy?”

“Oh, he’s fine. Beginning to babble, too.”

“Good.” Will kissed Rajiv on the head. “Well, I’d better find my family.”

He set out across the food court to their usual table. Ethel and Marshall were already there. “Dad, that was quite a move!” exclaimed Marshall.

“What was the reaction at the university?”

“I wasn’t watching tv at the time, but when I came out of class, it was all anyone was talking about; Érico’s resignation, your asking for the straw poll, the Council selecting Alexandra.”

Will pointed to a group of people surrounding the table where she was seated with Yevgeny and Boris. “Judging from the crowd, it’s an exciting development.”

“The applause when you came in, too; that surprised me!” added Ethel.

Suddenly a cheer rose from the crowd closest to the large-screen television. It was always set on *Mars This Sol* during meals. In one corner, *Mars This Sol* ran the BBC news. But a larger window in the center of the screen showed an image of the Landowners Assembly in Houston. They had just voted. A moment later *Mars This Sol* updated its main page and a caption appeared below the live image: “Landowners Ratify Alexandra Lescov as Chief Minister.”

The entire Food Court rose to applaud. “Speech! Speech!” someone shouted, and the crowd quickly joined in. Alexandra made her way to the podium in front of the screen. When she stepped onto the stage applause broke out again.

She took the microphone. “Thank you, everyone. My fellow residents of Mars, I am still overwhelmed by the responsibility I now bear. This has been a historic moment. I

don’t think any of us can yet appreciate the changes we wrought this sol. Coming into the Gallerie, I felt an enormous energy that had been released. We need to turn that formidable energy toward the goals of this columbiad. Mars has boroughs to plant, galleons to design and build, roads to clear, PGMs and gold to extract, scientific discoveries to make, new engineering challenges to overcome. . .all of us have a sacrifice we can make and a significant contribution to this world’s progress to give. I thank you for the encouragement you have given me and I beg that all of you give Mars your maximal effort over the next two years. Thank you.”

11

Equinox

May 2064

Will glanced at his wrist, remembered that he had no watch, and turned to a piece of blank e-paper on his desk. He touched the upper right corner with a magnetic stylus and a menu popped up on the paper. He tapped through to the clock feature and a chronometer appeared on the paper. It was 11:01.

"Ramesh is late," he said to Louise Tremblay.

"He's often been late, these sols," she replied. "What happened to that fancy watch you had?"

"Ahh! I spent ten thousand euros on it last spring when I was in Spain and I was told the battery would last three years, but it died last week! So I went to El Corte Inglès and Silvios; they don't sell watches or batteries. So I went to Radio Shack and they don't have the right kind of batteries, but they ordered some."

"And they'll arrive next year."

"That's the size of it."

"I liked that watch very much, so I told Eliseo to buy me one for my birthday. I don't know whether he has, though."

"When's your birthday?"

"Three weeks. On Earth it was May 31, but since we don't have a May 31 here, we usually celebrate it on the 30th."

"So, you're one of those people whose birthday is on one of the ten missing sols. . . . If he doesn't get it for you, Radio Shack has decided to carry it. They'll have a supply

in a year or so. They don't usually sell watches, but no one else up here does, so they're diversifying."

"I'll remember that. It's nice that it had a chip able to keep Marsian time."

Will glanced at the chronometer; it was now 11:04. "So, what are you all doing for Equinox?"

"Eliseo and I have a reservation at the Dacha. We're leaving Alex here by himself; he's almost fifteen, and the Hollingsworths will be looking in on him, since he's buddy-buddy with Bill."

"Congratulations on getting a reservation up there. Ethel and I tried months ago and it was booked up. We're going to Uzboi."

"Uzboi? I've never heard of anyone going there for fun!"

Will chuckled. "Ethel's spent two thirds of her time there since January; there's been a string of personnel problems. So we bought a little efficiency flat there last month. This is my chance to see it. We're flying up tomorrow morning, in time for the celebration, then I plan to ride back with a cargo caravan Wednesol or Thursol; it'll be a chance to see the new highway."

"That'll be interesting. And I suppose you'll get some work done."

"I've got a few meetings scheduled; morale's not good up there. The outpost has growing pains. But they have pushed up platinum-group metal production sixty percent."

"The reactor has helped."

"Yes, in spite of category-4 dust storm conditions, they had plenty of power." They both heard hurrying footsteps in the hall, and Ramesh appeared at the door.

"I apologize; I got a phone call from Earth as I was stepped out the door."

Will glanced at the chronometer; it said 11:10. “Well, sit and let’s get started.” He pointed to a chair. “How are your plans shaping up for Equinox?”

“We’re staying home. It’s hard to do much with a baby. There will be an event at the temple, and I have lots of work to do.”

“It’s hard to believe Alexandra did everything she did for fabrication and construction,” added Louise. “The two of us can barely keep up.”

“Well, now there’s coordination between divisions, which was much less necessary before. That’s keeping *me* busy.” He looked at Ramesh. “Can you detail the pricing issue, from your point of view?”

“Sure, it’s quite simple. If the fabrication division is to become Mariner Fabrication, Inc., in the next two years, it can’t sell materials to the spacecraft division at cost; it has to make a profit, however modest. The accountants have recommended a fifteen percent price increase. That’s partly to pay for some new equipment if we go into partnership with Dupont.”

“A fifteen percent price increase looks pretty bad if Marcraft is to become a semi-private corporation and establishes a partnership with Boeing’s Spacecraft division,” replied Louise. “Our wages and materials are four times higher on average than on Earth. One thing no one wants is a wage cut; people have enough trouble making ends meet.”

“We need subsidies,” concluded Ramesh, looking at Will.

“Everyone wants subsidies,” replied Will. “Admittedly, PGM profits will be thirty or forty percent higher this columbiad. Louise, what do your accountants say about raising sales prices ten or fifteen percent?”

“They say we have to be very careful. We’re already expensive, but we have natural advantages because the Mars shuttles can launch three times as much into orbit as terrestrial shuttles, and because of the assembly facility on Phobos, and because of cheap propellant from Phobos. Swift’s coming out with a new model-40 shuttle that will put forty tonnes in low Earth orbit starting in 2065; that’ll cut into our advantage at launching large structures. We’re competing with ourselves in terms of fuel prices because of the solar sailers. It’s a matter of time before someone builds a large-structure fabrication facility in LEO or on the moon.”

Will nodded. “We have to stay ahead of the curve. The new Arion shuttle will be able to put ninety tonnes into low Mars orbit and Phobos will soon have a seventy-five meter hanger. Right now it isn’t hard to charge the spacecraft division extra because Mariner Fabrication’s profit goes to the Commission, but that won’t be the case in a few years. You need to absorb it or find greater efficiencies.”

“Look, I have the same problem with the construction division,” said Ramesh. “On January 1, materials will go up in price by thirteen percent. But the construction division, if it’s ever going to become Aurorae Construction, Inc., has to find some efficiencies. We’ve been charging Deseret Construction and Afigbo Construction these higher rates for years and they sell housing and work space of comparable quality for ten percent less. That tells you there are adjustments to make, and some will be painful.”

“Marcraft is a very large customer,” said Will to Ramesh. “Can you give them a deal; say, raise prices only ten percent?”

“Ah. . . I’d have to look into that.”

“What are you doing to increase efficiencies in Mariner Fabrication?”

"We're outlining some reorganization, but it's too soon to say how big the improvements will be. I've been on the job only three months."

Will nodded. "Fair enough. Louise, how are plans for reorganization going?"

"They're at the very beginning only. We have no idea what efficiencies we can gain. That report you got on Earth last year outlined a lot of improvements, but they aren't as easy to implement as the consultants thought. We can't just scrap old equipment and buy new; the old stuff could be purchased by someone and used to compete against us, and the new will take at least two years to arrive. And our labor force is not as mobile or as flexible as terrestrial laborers; they have no place to go and no one else to hire them, so if we want to increase efficiency ten percent, that means employing the same people to do ten percent more."

"I know; I was skeptical for the same reasons. But Louise, you are now in charge of three hundred workers, a 500 million redback per year budget, and production of a billion redbacks of space vehicles. Furthermore, your division is going to double in size in the next three years once the galleon goes into production. That huge increase in size will require a lot of careful management, and if it is done well it can produce a ten percent increase in efficiency; maybe twice that. It's your job to manage everything; the people, the policies, the plans, acquiring the new equipment and physical plant, disposal of the old equipment, reuse of the old space, managing the old caravel production line, starting up the new galleon production line, completing the Phobos hanger. . . everything. And you've got a ten percent increase in the cost of metals, plastics, etc., on the way in January. Are you up to it?"

Louise looked at Will, startled. "Yes, I am."

"I thought so. Look, I'm not saying you have to be hard-nosed all the time, but this is the real world and that means sometimes we make hard decisions. I want our workers to live comfortable lives, but we have to earn our way. Fifteen years ago it cost eight times as much to live here as in the United States, and that involved a much lower standard of living. Now it costs four times as much and the standard of living is better. We won't close that gap for a long time; we're at the end of a very long supply line. So we have to work smart, and sometimes we have to work hard. That isn't easy to manage."

"That's true." Louise nodded. "Okay, we'll work a ten percent price increase into our plans, and we'll look for ways to save some of it through higher productivity."

"Good. The three of us need to get together once a week for the rest of this year so we know what's going on. I want a written report twice a week from both of you, copied to the other. It made sense to have Alexandra in charge of all these different operations; now the three of us have to communicate to keep the information flowing between them." Will looked at Ramesh. "So, what's new with your divisions?"

"We'll have reorganization plans for both Aurorae Construction and Mariner Fabrication done in September, to implement January 1. Fabrication's working on three new super-strong, high-nitrogen plastics; they have better low-temperature properties than many of the materials we're working with now. Construction is on the verge of finalizing a new plan for expanding Aurorae and other outposts that uses fewer large open-ground domes for agriculture and more bubbles. The new 35-meter wide, 20-meter high, 75-meter long bubbles will provide farming enclosure area for a third the cost of open-ground construction and will come in a high-strength, high-pressure version suitable for residential housing. They should feel pretty spacious; they're almost as wide

as Yalta and the other early biomes, they're just as high, and almost twice as long. We're still finalizing the site preparation and floor installation procedures, especially waterproofing and insulation, and the heat storage and removal systems."

"Are a lot of staff meetings planned?" asked Will.

"Yes, in both the brain-storming phase and the implementation phase."

"Good. The Areological Survey held a series of meetings with its field and technical staffs in March. They implemented the ideas on May first with different field survey procedures, lab support processing, and more use of terrestrial support, especially at several universities with strong graduate programs. Roger Anderson told me the other sol that they've increased productivity twenty percent and most people like the new procedures. So a lot can be done. I bet if you get detailed brainstorming from the staff, productivity can increase ten percent. Louise, what's the latest?"

"Martech's new Space Sciences Lab is almost finished; it'll triple our capacity for assembling and repairing automated probes, especially for asteroid belt destinations. We are finalizing a contract for three probes to Neptune in the next decade. The design for the galleon was finalized; the last important detail was deciding how many separate life support zones it would have, to maximize redundancy. But as soon as we settled on eight, both United Spacelines and Lufthansa approached us with modifications. They jointly paid for a study of use of the space on the galleon and came to the conclusion that for flights of less than 150 days, passengers on galleons will need only fifteen square meters or thirty-four cubic meters each."

Will looked alarmed. "How's that possible? The NASA standard was ninety cubic meters per person!"

“But larger vehicles can have fewer, larger public spaces, and one third of the passengers are asleep at any time.”

“Still, the caravels provide fifty cubic meters per person. What does that do to capacity?”

“Raises it to 650 people! They want to install some first class cabins for tourists, so the capacity would be six hundred people. For 180 day flights they’d assign eighteen square meters and forty-five cubic meters, in which case galleons would accommodate five hundred passengers.”

Will whistled. “Wow! I suppose we’ll have to do the same thing in order to compete.”

“By the way, they’re thinking of cranking up the capacity of their caravels to 175 people, and later maybe to 200 people,” added Louise. “I heard it from the engineers I’m negotiating with. They’ll speed up the flight.”

“Can we handle transport of several thousand people to low Earth orbit or to the Martian surface?” asked Ramesh.

Louise nodded. “The tourist volume to low Earth orbit is now five thousand per year; if we use the existing hotels to accommodate our people on their way up, we just displace the tourists to other times of the year and both the shuttle and hotel capacity will increase. Prices appear set to fall again, with orbital manufacturing undergoing expansion. As for deorbiting people at this end, we’ll import more shuttles able to transport either people or freight; we’ll switch them to freight for the two thirds of the time they won’t be transporting people.”

“And we can spread out the arrivals more, and add flights via Mercury,” added Will. “Some of our vehicles can serve as cyclers to carry people to and from Mercury.”

“Cyclers?” asked Ramesh.

“They won’t stop at Mercury; they’ll fly past. Stopping and starting takes too much delta-v. But a shuttle with a LOX-augmented nuclear engine in Mercury orbit can fly out to our caravel to drop off passengers, and a similar vehicle docked to our caravel can deliver passengers to Mercury.”

“And a Mercury passage is actually not a problem in terms of radiation,” added Louise. “Because both caravels and galleons are so big that they provide considerable shielding against solar radiation, and that close to the sun its magnetic field shields against cosmic rays.”

“I see I’ve gotten myself involved in a lot more than construction and fabrication,” noted Ramesh.

Will chuckled. “That’s for sure.”

Érico hunched over his attaché, reading the postings on the Independence Club’s discussion boards. He didn’t even hear his daughter enter the room.

“Do you like my dress?”

He looked up; Corrie was dressed in a traditional Spanish dress for public occasions, brightly colored with flounces. “Oh, you’re lovely! Mom was right, it’s perfect for you.”

“When are you getting dressed?”

“A few minutes. I’m reading.”

She leaned over his shoulder. “The Independence Club! So, you’re finally taking a look!”

“Yes, finally. It’s very interesting. It looks to me that about a quarter of Mars residents have posted something here in the last year, though so many are signing with ‘handles’ instead of names, it’s hard to know who’s who.”

“A lot of people prefer anonymity.”

“But I’m surprised how many people are speaking their mind and signing their names. I’m impressed by that; we’ve made a society that’s open enough so that people feel safe.”

“And they’re all in favor of independence.”

“Yes. Everyone falls into two camps: independence soon and independence eventually. And the latter camp’s bigger.”

“For now.”

“Yes, for now. Eventually has a way of arriving. The export numbers are really good; Mars will have another big surplus. That’s the best argument.”

“I suppose. We’re ready to go; you should see Paolo, he’s really cute.”

“I’ll take a look, then come back to get dressed.” Érico rose and walked out to the living room, where Carmen was dressed like her daughter and Paolo, age 16, was dressed like a traditional Portuguese gentleman, in black, complete with a round hat and brim. He praised everyone’s outfits and headed back into his home office. He pulled out his traditional garb as well, but the attaché’s attraction was too strong. He went back to it.

He switched topics and read about the petition to the governments in the Mars Commission. In a year’s time it had stalled with about three hundred signatories; a mere

ten percent of the Marsian electorate. Everyone was wringing their hands, wondering what to do and how to make the petition move again.

Most of the ideas were silly. A few had merit, but were inadequate for the task. Having reached the end of the topic, Érico couldn't help but contribute his opinion. He clicked on reply and dictated his comment "Your problem isn't how to revive the petition, but the petition itself. You should drop it and start a new petition to the Residents Council, asking them to start negotiations for independence. Everyone knows the Council members; it's more immediate. If you drop the term "immediately," you'll get more support, too." He paused, then added "Érico."

He sent it, knowing half of Mars would recognize his name. It was quite a step and potentially controversial, but he didn't care. He was the former Chief Minister, after all, and had gone back to geophysics.

Then he closed the attaché, put on his costume, and headed for Andalus Square. It was packed with people and so transformed to be utterly unrecognizable. The sixty by eighty meter space was subdivided lengthwise into thirds by two wide avenues and the thirds were in turn divided into ten by ten meter squares, most of which were occupied by pavilions of plastic cloth held up by metal supports. The Japanese, Chinese, Arab, USA, Latino, Brazilian, Iranian, French, German, and Russian Societies had their own pavilions; the Anglicans, Bahá'ís, Catholics, Hindus, Mormons, Muslims, Protestants, and Zen Buddhists had theirs; Uzboi and Cassini both had their own pavilions; the Construction Department had one; the Independence Club and the Hiking Club as well. Most pavilions had food, often ethnic, for sale, a space for sitting, and a dance floor for dancing; music wafted out of many. Thronging the avenues and wandering from pavilion

to pavilion were nearly three thousand people—Aurorae's population plus about five hundred out-of-town visitors—and many of them were dressed in ethnic customs. Some pavilions had crowds so large that they overflowed onto the avenue, but the crowds were shifting around so much that a crowded pavilion could be deserted a half hour later.

Érico wandered the avenues, drinking in the sights. Equinox had become a bigger event every year; the ethnic festival was two years old, and this year was definitely fancier than last year's. He headed straight for the Brazilian Pavilion, where most people were speaking Portuguese, but Carmen and the kids weren't there, so he headed to the Spanish Pavilion after a few minutes of chatting with friends. They had just left it for the Latin American Pavilion, but he stopped to talk there as well. Heading back onto the avenue, he ran into Sammie, Liz, Marshall, and someone he didn't know who was standing close to Marshall.

"Hey, what costumes are you wearing?" he asked.

"Oh, we're dressed as Marsians," replied Sam, joking with Érico but deferential as well. They were wearing ordinary clothes.

"Maybe we need a national dress; perhaps a spacesuit?"

"I'll try that tomorrow!" exclaimed Marshall, joking. "Érico, do you know Amy Sarbanes? Amy, this is Érico Lopes."

"I haven't has the pleasure," replied Érico, shaking her hand.

"Honored to meet you, sir," replied Amy.

"Amy arrived last year; she's a life support engineer," added Marshall.

"And I can't detect a national costume on you, either, but your accent tells me Australia."

“Very good! You’re right!”

“Are you enjoying Equinox?”

“Yes, this is really incredible! It’s a real testament to the community here. My little town outside Sydney has ten times the population of Aurorae and we could never pull off something like this. No one would take the time to plan, construct, and staff all these pavilions.”

“It does take money and time, but in the last decade we’ve developed some rather strong ethnic societies. They’re the backbone of the festival.”

“Still, I live in Cochabamba Dome, and there’s even a Cochabamba Pavilion! I was impressed by that.”

“But there is no Cochabamba ethnic food or costume,” added Sammie.

“I think they’re the only dome with a pavilion,” replied Érico. “It’s too bad, some of the domes represent certain regions of the world. But then, I guess those regions are also represented by ethnic clubs. Well, you all have fun. Have you seen Corrie?”

“They were walking that way,” replied Marshall, pointing down the avenue.

“Thanks. Ciao.” Érico headed down the avenue, weaving around knots of people talking or even dancing to the music flowing from the various pavilions. The USA Pavilion was at the end of the avenue in a larger space because it had a live country and western band, dressed like cowboys and playing a variety of American tunes. The food came from the Texas Steakhouse. He was surprised to see John Hunter there dressed in beaded buckskin from head to toe and wearing a feather head dress.

“John, where did you get that?”

“From my sister on the Reservation. She sent it to me years ago.”

“It’s really impressive!”

“Thank you. It’s very well made, too. Maaka insists that I will it to him.” The older son, thirteen, smiled.

“You’ve got a pretty impressive costume, too!” exclaimed Érico.

“Thanks, but I keep outgrowing them.”

“It’s an interesting contrast in this pavilion; it has cowboys and Indians.”

“Well, the USA has cowboys and Indians. You have a very dignified look, Érico.”

“Thank you, I rather like it. How are you doing?”

“Oh, pretty well. Vanessa and the boys and I are going to Elysium next week for a month; it’s our expedition during summer vacation.”

“Oh? For what?”

“They’re drilling a part of the Elysium Sea that’s deeper than the rest to see what sediment can be recovered. They think it’s the part that froze last, so it can also be useful for geochemical studies of the water.”

“And we may find fossils; the sea had some life in it,” added Vanessa.

“Just four million years ago, too; it’s a shame life made it that long, then died out,” said Érico. “Have a good, safe trip.”

“Thanks. Ciao,” said John.

Érico headed across to the next avenue and down it. He reached the Latin American Pavilion and asked around. His family had just left, but they were heading for the Japanese Pavilion, six pavilions down, because Corrie wanted some sushi. So after a few minutes of visiting he headed out as well, wondering whether he would ever catch

up. He probably should call them, but he was having too much fun chatting spontaneously.

He passed the Independence Club's pavilion. It had a pretty good crowd. Lyle Quincy waved. "Hey, Dr. Érico! I liked your posting! Thanks!"

"You've already read it?"

"Sure; I'm always connected." Lyle pointed to his attaché. "In fact, there are already two responses. I think you're right; we should direct our petition at the Residents Council. I suppose we were trying to be polite."

"It doesn't pay. You can't ask people to write their governments on Earth; that's too abstract, and the governments won't get enough petitions to care anyway. The Council, however, has to do the actual negotiating."

"That makes sense. I agree. Where do you stand, as a member of the Council?"

"I think 'eventually' has just about arrived. Uzboi's doing very well. Of course, the seasonal dust storm season was the lightest in a decade and they had good power supplies. If the surplus is invested carefully, we'll have a nest egg against leaner times."

"There was an article in *Mars This Sol* last week that said the cost of shipping to low Earth orbit's about to drop ten percent," added Lyle. "Solar sailers make shipments between planets cheaper all the time, too. Mercury just ordered a thousand tonnes of water for their Portal Station in Mercury orbit for 2066-69. The Chinese are ordering twenty tonnes of nitrogen for Callisto for 2067; they're settling down and need the nitrogen for life support. Our era's just beginning."

"It's true. Immigration's still building, we're a young and highly trained population, we have a solid system of governance. . . why not?"

“I’ll quote you on that!”

“Yes, you may,” replied Érico. “Most definitely.”

“We have meetings every Thursol night.”

“I’ll come.”

“Great!” Lyle could barely contain his excitement.

Érico nodded and looked around the pavilion again, chatted with a few others, then headed out. This time he called Carmen to make sure he knew where they were and headed straight to them.

“We ran into Marshall and his new girlfriend, and they said you were looking for us,” exclaimed Corrie. “We saw just about everyone except you.”

“I had to walk up one avenue and most of the way back down the other; you kept moving!” replied Érico.

“We saw Ruhullah, Nadia, and Maryam,” added Carmen. “Maryam’s growing so fast; she’s four, now.”

“She’s cute,” added Paolo.

“Well, let’s get back to the Brazilian Pavilion,” replied Érico. “It’s a good location to watch the parade. And it’s got good food, though no sushi.”

“I got some,” replied Corrie.

“Good. We can wander around all we want; this place will be hopping until midnight,” exclaimed Érico.

12

Life

July, 2064

"So, what's the purpose of this meeting? The call from Prof. Armstrong?" Will asked Alexandra. His voice revealed some irritation, as he had almost felt summoned to the Chief Minister's office on the third floor of the Commonwealth Building.

"No," replied Alexandra, irritated. "Political science profs are crawling out of the woodwork to analyze our political system, and I don't give a hoot what they say."

"I've had over a dozen requests for in-depth interviews in the last seven months, since the election," said Will. "They called Érico, too."

"And me. So far they've been pretty fair. No, it's about. . . oh, here's Érico, wait a minute," replied Alexandra.

Érico hurried into Alexandra's office, then paused to say "I hope this can be a fast meeting, Alexandra, because I have to give a geophysics class in forty minutes!"

"Forty minutes; no problem. Érico, have you gone over to the independence cause?"

He was surprised and, in the presence of Will, embarrassed. "Independence? Why do you ask?"

"Érico, we're friends; let's be frank and honest. I'm not saying you're crazy or wrong, though I might say so at another time. And you're on the Council."

"For the last two months I have been posting ideas on the Independence Club's forums, and a lot of people like them. Yes, I am in favor of independence, and I don't think 'eventually' should be a long time from now."

"So, when is right?"

"I don't think anyone knows, but someday the consensus will be 'now.'"

"That's true." Alexandra thought. "And the new petition you're spearheading calls for the Mars Residents Council to start negotiations with the Mars Commission over independence."

"It makes more sense and is a more effective strategy than a petition to national governments to grant independence."

Alexandra pointed at Will. "But it means *I* would have to negotiate with *him.*"

"I'm sure the Council would appoint you to the committee."

"I'm not sure the committee would negotiate with me, though," said Will. "The Board of National Representatives wouldn't trust me with the task."

"So we'd end up declaring independence and waiting for a shipload of Marines to arrive?" asked Alexandra.

"No," replied Will. "If negotiations broke down and we declared independence, the national governments would cut off their subsidies, a blockade would probably be declared, and there would be some interesting blockade breaking and enforcing activities in Earth orbit."

"Accompanied by video of patients in Mariner Hospital dying because of the lack of medicines, not doubt. Do you think that will happen?"

"I don't know. The U.S. is against independence. China probably will be. No one knows where other countries will fall. What do you think Russia's position will be?"

"It's complicated," replied Alexandra. "Six months ago I would have said the Russian government would favor independence. But now this idea of a Grand Union

seems actually to be gaining momentum. That would mean they'd have to consult with the Europeans."

"And about a dozen others," added Will. "As long as the Grand Union was just an excuse to give the republics of the former Soviet Union European laws and policies without letting them fully into the European Union, it had no chance; but when you add Morocco and Israel, and now Lebanon . . . a Grand Union has some logic to it."

"It's still a racist excuse to keep people out of the club," said Alexandra. "But it looks like it will work, and it could expand eastward and southward quite a long ways."

"And westward," added Érico. "Because the Latin American Union could keep most of its laws and even its currency and join."

"Then Canada might join. The U.S. would feel surrounded," speculated Will.

"And did you see the summary of the *Times of India* editorial that *Mars This Sol* carried last week? They were even talking about India joining, and if Pakistan joined that would end their longstanding conflict," noted Érico.

"Don't forget Australia, New Zealand, and then smaller East Asian and Pacific nations," said Alexandra. "The U.S. and China would both be left in the cold, or they'd have to renounce their special hyperpower status and join the club. I think the United Nations would eventually wither away; the Grand Union would replace it. It's an interesting scenario, and possible. But I want to know what it'll do for Mars."

"Who knows," said Will. "But what does this do for Marsian independence? If there's any power or bloc who might support it, it's Europe; they strongly favor grass roots democracy and self determination."

"I think Latin America could support Mars as well," said Érico.

“Work your contacts a bit,” said Alexandra. “I think the Mars Council needs to discuss external relations.”

“So you’re in favor of independence?” asked Érico.

“I didn’t say that! I’m in the ‘eventually’ camp. Will has stated his position on videotape many times and I like it.”

“But when does ‘eventually’ come?” asked Érico.

“You tell me.”

“Why not now?”

Alexandra thought a moment. “But why now?”

“We’re now financially self sufficient.”

She looked at Will. “Was the data published in *Mars This Sol* last week accurate?”

“We have an updated income estimate. This columbiad we’ll produce 600 tonnes of gold, worth sixteen billion redbacks, and seven hundred tonnes of PGMs, worth twenty-two billion redbacks. Prices are down, but overall income is up. Of course, our budget has grown accordingly, for the galleon, to purchase solar sailers, to produce a Mars shuttle 4, to import industrial equipment. . .”

“Give any organization money and it’ll spend it,” said Alexandra. “Does Park give an estimate of the minimum income we need to survive?”

“No one has,” replied Will. “If we were embargoed, we’d import essential medicines—I’m sure that would be allowed—and we’d survive on a billion redbacks per columbiad of expenditure. We have done a study on emergency self sufficiency in case a

war or economic collapse cut us off from Earth. We could survive a long time, depending on how ingenious we were and how much we were willing to sacrifice."

"An embargo would be a very different situation than an emergency on Earth." Alexandra pondered. "This is a ridiculous discussion. I wouldn't call 'economic self sufficiency' much of an argument. We don't know how much self sufficiency really costs, and if we are embargoed we'd be strangled. And for what? We're ninety percent independent now."

"That's the pragmatic approach," replied Érico. "But what you call ten percent of independence is pretty important; it's self-determination, peoplehood, and free choice about your destiny."

"I suppose." Alexandra sat back in her chair. "Why not wait until we have ten thousand people?"

"Why ten thousand?" asked Érico.

Alexandra shrugged. "How about, it's the smallest five-digit number? It's as good an argument as any. If you want to deal with an embargo, you need a lot of people and time to prepare. When will we have ten thousand people?"

Will considered. "If the first galleon flies in 2069, 2070; if not, 2071. Five years."

She nodded. "Okay. That's my 'eventually.' Tentatively."

Érico scowled. "And how do we know your 'eventually' won't get postponed to a population of twenty thousand?"

"Maybe it will."

Érico looked at Will. "How long before we're able to withstand a blockade?"

"It depends on the blockade. At any time we have a year of surplus on Mars and a year's supply on the way. Two years could certainly be stretched to last at least three years. Opposition's coming up in about a year, it's the most favorable opposition in forty-seven years, and we're rolling in dough. Naturally, the Commission's importing a lot of cargo, and it has to consider the safety of the Marsian population."

"Interesting," said Alexandra. "All the more reason for the Council to start informal conversations with governments."

Amy Sarbanes' attaché began to ring with an incoming videocall. She glanced at the caller i.d.; it was Marshall. She smiled and opened the line. His face appeared on the screen. "Hi, how are you?"

"Pretty good; I was productive this sol and want to quit a bit early. How about you?"

"Not bad at all. So, is this a date?"

"Why not? It's a lazy summer afternoon, warm and bright. . ."

She laughed. "We're inside domes on Mars, it's really not that much warmer than any other time of the year!"

"Ah, that depends on the dome! Let's go for a stroll through Colorado and feel the dry heat, or Huron and feel the humidity. . ."

She laughed. "Why don't *you* stroll through Huron and enjoy the humidity! I'll join you in the more pleasant domes. I suggest we stroll to the Gallerie and get supper."

"Good! Let's get it to go. We can sit in the garden at home and enjoy it in peace and quiet."

“Hum.” Amy didn’t like the suggested venue so much. “Okay, let’s do it. Will you come here?”

“Yeah, sure. I’ll be there in seven minutes.”

“Good. I need the time to get some stuff wrapped up. See you soon.” She smiled.

“See you in a few. Ciao.”

They closed the line. Amy walked around her lab, closing a few open plant cabinets, checking a few animals, closing some software she had been using to plot the efficiency of a new carbon dioxide recycling system. About the time she finished, Marshall was at her door.

“Hi.”

“Hi,” he replied. He offered his arm. “Shall we stroll?”

“Alright.” She took his arm and they headed out of the lab. “Shall we go through the bioarchival domes?”

“Definitely,” he replied. They had a three-hundred forty meter walk southward to Andalus Dome through Andalus Northwest. It was divided into three sections; Olympic, Redwood, and San Diego. It was like walking down the Pacific coast of the United States, from the wetter, cooler, and greener, to the drier, hotter, and browner. The three bioarchive ecosystems were maintained to maximize their diversity and productivity; surplus wood was harvested; and they were open to walkers.

“I love Olympic,” said Amy, as they stepped into it. “It’s a green tunnel.”

“The trees are growing really fast! It’s been just four years. But the higher life forms are really limited.”

“We’re talking about three quarters of a hectare of ecosystem. It’s big enough for maybe a hundred species of trees, ferns, and flowers, but only a few species of birds and small mammals. I think they may put deer in here, though. We have enough biomes where deer could live that by moving a few of the animals around occasionally, we could support a small herd.”

“There won’t ever be anything like this on Titan.”

Amy laughed. “No way! The design for a small ecology is coming along, though, using the new thirty-five by seventy-five meter bubbles that are being planned. The trick is lighting them; Titan’s surface gets about a two hundredth as much light as Earth’s surface.”

“And the ‘day’ is 15.9 terrestrial days.”

“Yes, so a pair of domes will have to alternate between artificial sunlight and nighttime; about a thousand kilowatts of it! There won’t be spare energy for a bioarchive. Mars gets the zoos.”

“Are you still planning to apply for the expedition to the south polar base?”

She nodded. “Yes, two ten-by-twenty meter bubbles will give us a nice small-scale experiment. The temperature at our poles is forty centigrade too high for Titan and the heat loss to the thin atmosphere will be way too low, but we can still experiment with the interior conditions.”

“And the base will have fresh food.”

They stopped to pass through a barrier and entered Redwoods. The sequoias had grown only a few meters in four years and were farther from the walkway than in Olympic. “It’s warmer and sunnier in here.”

“Nice.” Amy pointed to the dome on the western side, which was covered by a reflector. “Look, 4:15 and the reflector’s already up! And sunset’s still getting earlier; most unsummerlike.”

“Yeah, but what can you do? The interval from sunrise to sunrise is slightly less at aphelion and slightly more at perihelion. Right now sunrise and sunset are moving a bit earlier every sol because the day-night cycles are about ten seconds shorter than the sols.”

“What can you do? Go on daylight savings time.”

Marshall frowned. “Amy, we’re already on daylight savings time.”

She paused. “Well, I suppose you could say that. On Earth, standard time means sunrise averages at 6 a.m. throughout the year, and sunset at 6 p.m.; here the equivalent, with 24 hours and 39 minutes per sol, would be a sunrise at 6:10 a.m. and sunset at 6:30 p.m. And our sunrise is normalized to 7:10 a.m. instead. But we’re moving toward a time when sunrise moves to 6:30 a.m. instead. When that happens, why not advance the clocks another hour? Then sunrise with be 7:30 and sunset 7:50. Wouldn’t that be better?”

“Sure; everyone likes sun in the evening after work. But changing clocks would be a pain, and software would have to be rewritten.”

“They do it on Earth.”

“You always have a new idea, Amy. That’s one thing about you that impresses me.”

She smiled. “Thanks.”

They passed through another barrier and entered San Diego; it was a bit hot, but the air was dry. Since it was “summer” in San Diego, it wouldn’t rain at all for another three months.

“No snakes, right?” he asked.

“There are snakes and lizards in here, but nothing poisonous. That was the concession bioarchive made to our public.”

“Is anything useful grown in here?”

“Of course!” She stopped to point. “Creosote bush; it makes a useful oil. Prickly pear; it has an edible fruit.”

“Interesting, and we use them.”

“Of course! Bioarchive or not, we have to be able to harvest something in all these domes. The day hasn’t arrived when we can synthesize a compound more easily than harvesting it. All these domes produce fiber for paper, and three quarters of the dead biomass is broken down into methane and compost. There aren’t many advocates for the bacterial and fungal communities!”

“They’re big enough feeding on a quarter of the dead biomass, I’m sure.”

They walked past the “oasis,” a little pool of water with a thick stand of reeds growing in it, populated by desert fish and surrounded by palms. They passed into a tunnel and emerged from it straight into the Gallerie, the Outpost’s shopping center, with eateries fringing the central court, which was full of tables and chairs. It was still early; few were eating yet. They dashed into the Deseret Cafeteria and got trays of food to go, which they carried across Andalus Square to the Elliott household. “So, how’s your research?” asked Amy.

“Slow; I’m beginning to despair that I’ll ever produce dissertation-worthy research about cratering into permafrost.”

“Oh, I don’t know. Your computer model seems pretty sophisticated.”

“The data I gathered in Acadalia two months ago doesn’t always match the model, though.”

“Really? Do you have the water content estimated correctly?”

“Yes, we’re sure of that. The problem seems to be atmospheric pressure; it varies a lot on Mars, and it determines how much of the water entrained in the crater ejecta is liquid and how much of it is vapor. That makes a huge difference in how far the ejecta blanket spreads, how long it remains a slurry, etc.”

“Hum.” She thought about the problem. “That does make things complicated. Any way to use the computer model to calculate the atmospheric pressure? That would make the splosh craters into paleobarometers.”

“Yes, but there would be no corroboration of the result, so we’re looking at radiogenic dating of craters and placing them on the tentative Martian climatic diagram. Then we could roughly correlate the craters with estivals, hibernals, and vernals.”

“Yes, that would help! But how well do we know the pressure at those times?”

“Only roughly. Research on the most recent estival-vernal transition a million years ago would help.”

They entered the tunnel leading to the Elliott household. A few meters down the tunnel they stopped outside the airlock and Marshall asked it to open. They walked into the house’s living room and passed through it to the garden.

“Hey, Liz,” said Amy. Liz was sitting next to the fountain, eating and watching a video message from Mike Tobin on her attaché. As soon as they came in, she stopped.

“Good sol, Amy. What’s new?”

“Not much.”

“She’s solved the problem of short summer sols after the vernal equinox,” quipped Marshall.

“Oh?” asked Liz.

“Daylight savings time.”

“Ignore him,” said Amy. “How’s Mike?”

“Pretty good. He’s with his parents at Bar Harbor, soaking up sun, swimming in the frigid water, and hiking. He and his dad are planning a bear hunt in the fall.”

“A bear hunt?” asked Amy.

“Yeah, Maine has a hunting season for black bear. It’s an attempt by his father to hold onto him, or at least have an adventure with him while he’s still around. They don’t want him coming to Mars!”

“Does he have a berth?” asked Marshall.

“No, not yet, but he’s only number three on the waiting list, and with over a thousand people coming to Mars, they anticipate forty cancellations.”

“He’ll make it,” said Amy. “He’s really smart.”

“When did you meet him?” asked Liz.

“I’ve met Mike twice,” replied Amy. “The first time was seven years ago at the University of Colorado’s two-week Mars Camp. We all wandered around the high peaks of Rocky Mountain National Park in simulated spacesuits together, scaring tourists. Almost all of those high school kids are here now, or are on their way. Then three years ago he came to a conference I helped organize, sponsored by the Stanford University Mars Club. I remember he stood up and asked a speaker several tough questions.”

“But with a smile, no doubt. That’s Mike,” said Marshall.

“His advisor is surprised by his interpretation of the magnetic data from their trip to the south pole,” exclaimed Liz. “But Mike says he’s coming around. He’s pretty sure he has a publishable Master’s thesis topic, and that he can extend it to Mars and Mercury for the doctorate.”

“Great,” said Amy. “Do you want some supper?”

“There’s food in the fridge; I’ll go get something,” she replied, and Liz headed for the kitchen, which bordered the back of the garden.

They sat to eat together. Liz joined them. Ten minutes later Will wandered in as well. “Good sol,” he said to everyone, nodding to Amy. “How’s the closed life support research going?”

“Pretty well. We’re planning to head to the South Pole Research Station next year for nine months to test it out.”

“Yes, Lisa Kok gave me a summary a week or two ago. It sounds like you’ve reduced the species needed, the electrical power requirements, and the staff time.”

“We think so; we’ll be sure after the trip. If we’re right, it has implications for the Ceres and Callisto outposts.”

“And the Saturn mission.”

Amy hadn’t dared mention Saturn, but was happy Will had brought it up. “Does it look likely that we’ll have a role in the Saturn project?”

“Yes, for several reasons; NASA, as usual, wants to spend too much money and Congress is reducing it; we have surplus cash right now and experienced people who know how to spend it wisely; and we have the cheap hydrogen for launch, the plutonium

for the gas core engines, the enriched uranium for the surface reactors, and more experienced astronauts than all of Earth."

"Good reasons," commented Marshall. "We're still looking at 2068?"

"At the earliest. The gaseous core engines aren't ready."

"Is the U.S. mission to Callisto finalized?" asked Amy.

Will nodded. "That was published in *Mars This Sol* last week. The *George Washington* is coming here next year with thirty crew and fifty support personnel. The latter will remain here at Aurorae and will help prepare for trans-Jupiter injection, using a solid-core nuclear engine with LOX augmentation. The gaseous core nuclear engine won't be ready, so they won't use it. The third Chinese expedition will launch for Jupiter from here as well. The Brazilians, of course, sent their expedition to Jupiter from Earth, but I think they may send their second expedition from here. Cross your fingers."

"Thank God the U.S. has joined the Jupiter Commission," she added.

"It's all politics. The Chinese and Europeans threatened not to cooperate in the exploration of the Saturnian system and Titan if they didn't cooperate in the Jovian system. We got involved behind the scenes as well; so did Brian Stark. Can you imagine the foolishness of flying people a billion kilometers and having no mutual rescue agreements in place? It would have been idiocy. But they swallowed their pride."

"Thank God," said Marshall. "More proof we have a superior governing system, if you ask me!"

"That's for sure. Stick to principles and don't elect personalities," added Amy.

"Can I join you all?" asked Will. "I'll heat up some soup."

"Sure," said Marshall quickly.

Will headed to the kitchen and returned a few minutes later with a bowl of soup. The four of them chatted about the football—soccer, to Americans—challenge Uzboi had made to Aurorae and how both outposts were gearing up for the big game. Cassini and Dawes were interested in fielding teams as well; an informal league appeared in the offing.

Amy listened politely but seemed impatient after she finished her supper. She looked at Marshall. “Come on, let’s you and me go to Andalus for ice cream.”

“I think we have some in the fridge.”

“No, I want the mango flavor they have in the Gallerie.”

“Oh.” Marshall looked at his dad and sister. “Okay, fine with me.”

“I need to stretch my legs,” added Amy. She stood up; she wanted to go right away, before the other two finished eating. Marshall stood too, a bit surprised.

“We’ll be back later, then,” he said.

Amy nodded. “Ciao.”

“Ciao,” Will and Liz replied.

Marshall and Amy headed through the airlock and into the tunnel. Marshall clearly was surprised by Amy’s sudden impulse, but when they emerged into Andalus Dome, she turned to him first. “Marshall, why is it that you always want us to go to your house to eat with your family? We get together three times a week, and we always eat in your garden.”

“You’re right.” He stopped walking down the street to think about her question. No one was walking by at the moment; they had privacy.

“Does it have something to do with Marisol?”

“Yes, I guess it does. You know, she and I were doing fine together and were planning a wedding in Cambridge until I told her about the Bahá'í requirement that all living parents have to give permission for the marriage. That really scared her off; she loved me, but she didn’t want to have to get close to my parents. And she never wanted me to get to know her parents; she wasn’t close to them and had trouble with them. She’s a good person, but she had this thing about being independent of parents. I think she saw Mars as a chance to get away from parental authority and be free.”

“Interesting. That fits her personality.” Amy came close to him. “Well, I love you and I have no problem with your family.”

“And they have no problem with you! Mom and dad really like you, in fact.”

“Good. Parental permission strikes me as a bit old fashioned, no one asks permission to get married any more, but my parents wouldn’t object if we wanted to get married, either.”

“Good. It’s an important value to me, Amy. Sure, parents can be arbitrary, but kids get married for foolish reasons sometimes. . . it’s a principle that is supposed to help restore some balance to relationships.”

“That’s fine with me,” replied Amy. “I know your religion is important to you.”

“Yes, it is. Anyone who wants to marry me has to understand that.”

She nodded. “I’m not a very active Catholic, but when I go to church it helps restore and reenergize me. So I can appreciate that.”

“Good. You’ve. . . reassured me, I guess.” Marshall put his arm on her shoulder, then kissed her on the cheek. She smiled and kissed back; it was their first kiss.

“Let’s get that ice cream,” she said, offering him her hand. He took it and they strolled down the street toward the Gallerie.

Vanessa looked at John and her two sons, Maaka and Wicahpi-luta, aged fourteen and ten respectively. “So, you all are going outside with us and the drilling team?”

“I am,” replied Maaka, whose name was the Maori equivalent of “Mark,” Vanessa being a native of New Zealand. He pulled a thin cotton tee shirt over his wiry teenaged frame in their tiny one-room family compartment in the back of the Mobilhab. The shirt was the top half of the light, pajama-like clothes usually worn under a pressure suit. John was already in his longjohns.

“What about you?” John asked Wicahpi-luta, whose name meant “Red Star” in Lakota, his tribal language.

The younger boy shook his head. “I really don’t want to suit up. I’d rather stay here and do some reading.” He was a book-worm.

“I’ve got a lot of work to do,” warned Vanessa.

“That’s fine,” he replied.

“Okay,” she replied.

That seemed to settle everything. John helped Maaka pull on the cotton leggings—they could be quite tight, especially when one was growing—while Vanessa grabbed her attaché and put on her shoes. The rear half of the mobilhab was a space 2.5 meters wide, 4 meters long, and two stories high. At the moment they were in the up stairs room. At night John and Vanessa lowered a double bed from the ceiling, filling the

right half of the room and converting the space into their private bedroom. Expeditions had very limited space and privacy when they were in the field.

John raised the pressure hatch in one corner of the floor to open up a very tight spiral stair and one by one, the four of them descended. The rear half of the mobilhab's lower level was a pressure suit donning area; it opened to a very small airlock. The room was also the sleeping quarters of the two boys, who used twin beds that swung down from the right wall.

Dr. Hu Ziyang and his wife, Dr. Hu Puilan, both geologists from China, were already suiting up. They occupied the front room of the upper level of the mobilhab. Vanessa said good morning to them; she had not seen them at breakfast, which was eaten in the other mobilhab, which was docked to the rear of their's. She opened a pressure door and headed to the front room of the lower level, which was their eobiology lab. Her lab assistant, Rabri Kumar, from India, was already at work. The 2.5 by 4 meter room was her sleeping quarters at night.

Bright, indirect sunlight entered the room from several windows set high in the front wall, above the mobilhab's driver's cab. Some light also entered the right and left portholes, but much less because the mobilhab was parked in a semicircular Quonset-hut shaped garage; long enough for two mobilhabs docked together in the middle, open at each end, the garages provided radiation shielding, electricity, water, and oxygen. The side portholes revealed a view of the garage's drab corrigated metal sides; the front windows opened onto the slight rolling, rock-littered, gray Martian landscape. The so-called "Elysium Sea" offered an unusual terrain to look at. Four million years earlier, as humanity's ancestors had pulled themselves upright on East Africa's savannas, volcanic

activity in the Elysium uplift to the north had released huge volumes of melted ground ice and flooded an area of cratered terrain the size of the North Sea to an average depth of fifty meters. The short-lived sea, formed at a time the Martian equator was a bit warmer and wetter because of the planet's high axial tilt, froze solid in about two centuries, but not before Martian microorganisms had established themselves in it. Then it was buried by volcanic ash and eolian dust.

"Morning, Rabri," she said.

"Morning, Vanessa," she replied. "Is the expedition suiting up?"

"Yes, they'll be going outside in about fifteen minutes. If you need to pass through to the other mobilhab, you've still got a chance."

"No, I grabbed breakfast a few minutes ago." She pointed to a plate of pancakes, a bowl of strawberries, and a big, steaming cup of tea. "Are they moving the drill this sol?"

"Probably tomorrow. The Hus want to penetrate another ten meters into the sediment; we may find evidence of an earlier 'Elysium Sea' under this one. We know the volcanic activity north of here was intermittent, and expeditions have found evidence of at least three releases of water."

"It had to go somewhere," agreed Rabri. "Where are they going, then? That new drilling site looked pretty promising."

"They're checking out a crater about fifteen kilometers west of here that may have penetrated all the way through the ice. It may be a good spot to drill deeper into the sediment."

Rabri nodded, acknowledging the idea. She pointed to Vanessa's work station. "I pulled out that ice core you asked for last night and put it in the glove box. It should have melted by now."

"I'll extract the organic residue, then." Vanessa turned to her work area, sat, and got started. After almost thirty years of fruitless search for Martian life, they still handled all potential biological samples in glove boxes where there was a barrier separating them from the sample. The precaution now made more sense from the point of view of preventing terrestrial biological contamination than from protecting them from Martian biological contamination. Vanessa looked into the box; the ice sample had melted completely, causing the microscopic biological residue to settle to the bottom of the sample container. She stuck her hands into the gloves and reached for a sterile pipette that was already inside the box, which she used to extract a sample of water from the lowermost spot in the container. She began to transfer the sample to a glass slide when the pressure door separating the biology lab from the suit donning area clanged shut. She looked up; it was Wicahpi-luta.

"Can I read in here?" he asked. He pointed to a chair in the corner.

"Okay, but I'm now getting my work done, so I can't be interrupted. I'll be able to talk to you in about thirty minutes."

"Okay," he said. He sat and called up the book he was reading on his e-tablet.

Vanessa turned back to her work. She could see that the pipette had an accumulation of residue in it, so she squeezed the pipette until the glob came out onto the slide. Then she pushed a button and slowly rotated the slide into the microscope.

A magnified image of the slide appeared on the screen in front of her. She spotted the glob and zoomed in on it until the accumulation of dead micro-bodies filled the field of view. She moved a tiny remote manipulator arm into the field and began to push the accumulation around, breaking it apart and spreading out the thanatocoenosis or accumulation of dead creatures. At a glance she could identify the species; it was a typical mixture, found in salty, acidic, carbon-dioxide-rich Martian water bodies during the late Amazonian. The ecology involved about a dozen species arranged in three phyla, seven photosynthetic organisms and five carnivorous creatures or scavengers. The relative portions of the species told you how acidic the water was, as some species preferred certain pHs; the sizes of certain organisms gave you an idea of the salinity. The various ecologies had been exhaustively studied, with five hundred different genera named, described, and arranged into evolutionary trees. The number of species was still unknown; too many resembled each other in death. In spite of the extremely harsh conditions, a certain progression in their evolution had been detected. Some genera were Noachian, some Hesperian, and some Amazonian. There were also significant regional differences in ecologies between the north and south, and a gradually decline in diversity over time as the water bodies became fewer and smaller.

They had sampled the Elysium Sea about six years after humans had arrived on Mars, then about every five years since, as their technology and techniques improved. The sample was very typical of the Elysium Sea except for one thing; coming from the water about ten meters above the very bottom, it had well preserved organisms, because it was neither the immediately frozen and disrupted organisms on top nor the accumulated rotting ones on the bottom. As she toured the residue, she was very pleased by what she

saw. There was a good chance they could identify a new species or two in this sample; proteins and MRNA, or Martian RNA, the blueprint of Martian life, probably could be extracted as well.

She snapped some pictures, then zoomed in on a few specific organisms and photographed them, with a burst of ultraviolet light or x-rays to capture fine detail. She scanned across the slide to a particularly fine example of *spherozoa elysia sp.,* a common heterotroph, which had been frozen in the act of ingesting a *chlorophytes arcadiae,* a photosynthetic autotroph. She zoomed in on it and was surprised to see the zoom missed the organism. So she backed up the focus to spot the organism again. There it was.

It was moving.

She froze, staring at the screen. For several seconds she even held her breath. There was no question about it; it was wiggling very, very slowly. Her training kicked in and she pushed a button to activate the microscope's video capacity.

"Rabri!" she exclaimed.

"What is it?" replied Rabri, who was working just two meters away. She saw the shocked look on her boss's face and hurried over. A moment later she sharply inhaled. "Oh my God."

"What is it?" said Wicahpi-luta, suddenly curious.

Vanessa suddenly realized her son was in the room; a room filled with four living things, not three; a room with life from two distinctly different biologies. "Wicahpi-luta, please leave the lab immediately."

"What? Mom, what did I do—"

"Nothing. Please go work upstairs in our room, okay?"

“He might already be contaminated,” replied Rabri.

“Or not; we might all be contaminated. Wicahpi-luta, please go right now!”

“Okay, okay,” replied the boy. He grabbed his attaché, rose, and went out, banging the hatch as he went.

“It must have survived because it had partially ingested the chlorophyta,” said Rabri.

Vanessa nodded. “And surrounded by ice, it was protected from radiation damage. Let’s turn off the light for a little while and cool off the slide. The water will get hot pretty fast under these conditions.”

“Who are you going to call?”

“I better call Will Elliott right away.”

13.

Implications

late Aug. 2064

Will drained his third cup of coffee and put the cup down. He had better switch to tea to stay awake; he probably should go to bed pretty soon. Aurorae and Elysium were eleven hours different, so it was already afternoon there, more than a sol after Vanessa had found a living Martian organism. The media impact was far harder and more complicated to deal with than issues of contamination; the people sitting at Elysium, so far, were healthy. He missed the steady hand of Louisa Turner.

Fatigue was also a serious limitation when trying to complete a dozen interviews at once. At that time the Earth and Mars were almost as far apart as possible, which meant the time delay was over forty minutes round trip. A four-question interview could take three hours, and one would never remember the first question and the answer one had given when dealing with questions three and four. Fortunately most journalists bunched their questions together and sent them all at once, then did a follow-up bundle of questions, but that method put far more burden on Will, for he had to answer a bunch of questions that the journalist would never use.

So he began to answer bundles of questions by starting with an apology that it was now three a.m. and he had to wrap up the interview. That gave him a bit of time to tackle other things, such as the congratulatory messages from friends and colleagues. He played Rick Pages' first.

"Hi, Will. I have to tell you that at Shackleton Station, we did little more than listen to the news from Mars today. Life on Mars has been found. . . it's really incredible.

It may be the greatest discovery of the century. I'm sure you all are thinking about little else. The implications will take some time to sort out, too. Good luck.

"Our news on the moon is far less dramatic. Parenago keeps expanding; it'll produce seventy tonnes of PGMs this year, which will double in 2065. The carbon and water production from the enstatite-chondrite body is sufficient to meet the station's needs, including for PGM extraction. We're hoping that in the next few months Parenago will start exporting carbon dioxide to Shackleton,. We'll be going into the methane making business up here, which will revolutionize transport on the moon.

"Anyway, keep in touch. Bye."

Rick's face faded from the screen. Will wasn't in the mood to reply to that; it could wait until the next morning. He went on to listen to the message from Commander Dumkowski of Concord Station, Mercury, which was purely congratulatory. But Dr. Enlai Tang's message from Callisto was more touching and informative.

"Will, I've listened to the entire live media coverage of the discovery at Elysium with a mix of fascination and regret. I spent almost twenty years on Mars looking for current life and never found it! Now I come to Callisto, where we're sure there's still an ecosystem, and before we get down to it, you find current life on Mars! It's both frustrating and ironic.

"But besides that, congratulations to everyone. I'll email Vanessa directly. This is an enormous achievement, even if it was accidental. Actually, we should have expected an accidental discovery. We can be sure life still exists on Mars somewhere because the Elysium Sea and similar transitory water bodies have been filled with it throughout Martian history. The ecologies have become simpler, with fewer species, over time, but

they have always established themselves if the water body was large enough and lasted long enough. I just wish the news were coming out faster; it's still a trickle. But I'm sure that's because we have to be careful and thorough.

I wouldn't worry about contamination too much. No one at Elysium should go home for at least three months; such a precaution is essential, even if it is probably unnecessary. These are organisms adapted to a carbon dioxide rich, oxygen poor, acidic environment. The carbon dioxide poor environment of the human body would be a setback, its slightly alkaline pH would be very difficult, but the oxygen rich aspect of that environment would be fatal; as you probably know, Martian organisms store small amounts of oxygen in them for aerobic production of energy, and any 'loose' oxygen damages their cells. I am confident that Martian life cannot live inside a mammalian host. That said, they might manage to live in the organic mud of rice paddies at any of our outposts, and that could be fatal for our ecologies. Or they might become a minor but permanent contaminant of no consequence in such environments; who knows? Clearly, you need to set up an entire Martian ecology and study it, then create mixed ecologies to see which planet's species dominates under what circumstances. I suggest you take one of the wells drilled through the Elysium Sea ice, lower a powerful, waterproof light source, and run it all day. You'll create a big blob of liquid water out of the existing sea ice and you'll provide it with light for photosynthesis. As the blob gets bigger, eventually you'll encounter viable cells capable of photosynthesis and you'll have a second species. Eventually you might find viable cells for all of the dozen species the Sea once had.

"That's my suggestion. We're looking forward to the arrival of the second Chinese caravel next year and the Brazilians shortly thereafter. This place will get bigger

and we'll be able to pass the torch and come home. I wasn't sure whether I wanted to retire to Earth or come back to Mars, but you all have made the latter much more attractive! Callisto is fascinating. Our drill is now down ten kilometers and we hope to penetrate into the liquid water body—the 'hydromagma' body—in a few months. Of course, we don't know whether that particular body has life, but the previous eruptions have brought up dead cells, so it is very likely. We'll have to look at our samples of frozen and dead cells a lot more carefully, now.

"Don't call back if you're too busy. Ciao."

Will had to smile at Enlai's message. He was a good friend and someone he could trust. He hit reply. "Thank you, my friend, for your congratulations. You've also provided me more perspective and better ideas than thirty hours of breathless talking. I'm grateful. I haven't been able to sleep for over a sol, mostly because of the need to manage the publicity and the political implications, which are still unclear. If we need your help for anything, I'll let you know. Ciao."

Then he took a deep breath and called Vanessa, who was hard at work in the midafternoon at Elysium. "Vanessa, I just got a very warm message from Enlai. He passes his congratulations on to you and the team."

"Oh, thank you. He called here to congratulate us directly as well. He was very kind and gracious."

"He was; he's a great man, worthy of the Nobel he won. He made some interesting comments, though. He said that he very much doubted Martian organisms could survive in mammalian hosts; the temperature, pH, CO_2, and oxygen levels would present impossible conditions."

“I’m sure he’s right about that. But we need to be in quarantine anyway.”

“He agreed with that. He said that anerobic environments in our domes—like the mud in rice paddies—were potential homes for Martian microorganisms.”

“Yes, because they’re high in CO_2, low in oxygen, and have low pH. You won’t get Martian photosynthesizers there, only heterotrophs. We don’t know for sure heterotrophs can survive on terrestrial organics. While the proteins and amino acids, for example, overlap a lot, there are some amino acids and proteins missing in terrestrial organics.”

“He suggested we start by creating a sort of Martian bioarchive; take one of our well shafts, lower a water-proof high-powered light, and create an underground sea again.”

“Yes, that’s a good idea. We haven’t had time to think about next steps. We’ve been struggling to make sure the single living cell doesn’t die, which means we can’t shine light on it all the time! But we think it’s getting ready to divide. If so, we’ll soon have two of them.”

“Excellent. Tomorrow I’ll get a team here to start thinking about next steps; right now everyone’s looking over your shoulders. We may have to send down more mobilhabs, or maybe we’ll just fly in supplies and equipment. We’ll see.”

“Okay. Are you finally going to sleep?”

“Yes, but I’ll be available in five or six hours.”

“Okay. I’ll plan to go to sleep after that. Ciao.”

“Ciao.”

Érico surveyed the crowd in the Gallerie, eating supper. “It seems like people haven’t wanted to talk about anything but Martian life for a week, now,” he commented to Lyle Quincy and Sebastian Langlais. It was an odd combination of people to be eating dinner with; he had been sitting with his old friend Sebastian when Lyle, who always wanted to talk about independence, had arrived.

“Yes, and I don’t like it,” said Lyle. “We haven’t had any new signatures on the petition at all.”

“This is not a time to make converts to your cause,” replied Sebastian. “Everyone’s contemplating this discovery and what it means for Mars.”

“More money for us, I hope,” said Lyle.

Érico shook his head. “Ten years ago, discovering life would have brought an extra billion dollars a year in biological research. But with our PGM profits at unprecedented heights, I doubt anyone will be moved to donate to the Commission.”

“A lot of the speculation is about its impact on terraforming,” noted Lyle. “I don’t know that it affects the idea much. Martian life is so rare now, we’ve had to look for it almost thirty years to find it. If we installed a Martian ecosystem in a bubble in the caldera of Olympus Mons on a terraformed Mars, we could convert ninety-nine percent of this world to terrestrial conditions and still expand the current habitat of Martian life.”

“For all we know, Martian life would do better on a partially terraformed Mars anyway, even with terrestrial lifeforms present,” replied Erico.

Sebastian shook his head. “Personally, I think any talk of terraforming is utterly premature and a waste of breath. What we know about the processes—which isn’t as much as people think—is that terraforming will cost trillions of redbacks and take several

centuries before we get a reasonable return on our investment. I think most investors would prefer to spend that kind of money on projects that produce useful results in a shorter timeframe, like doming over parts of Mars. We won't have the population here to need millions of square kilometers for a long time. Meanwhile, we can dome over all the land we need at a reasonable price, and preserve existing Martian wilderness."

"And preserve the natural environment for the Martian organisms," agreed Érico.

"Actually, I wonder whether the Martian wilderness is wild enough for them any more," replied Lyle. "There are terrestrial bacteria everywhere, kept under control by the sterilizing properties of ultraviolet light. The Martian microorganisms will need their own bioarchive."

"And that's already the plan; melt a waterhole in the Elysium Sea, dome over the waterhole, and study the life in it," said Érico. "It'll be interesting to see how many species are found."

"Martian life, I think, can only support our cause," added Lyle. "We now have a 'national animal' you might say! We certainly have *our own* life."

"I can't see a picture of a microorganism on a flag or even in a display of images of official national animals and plants," replied Sebastian, irritated by the speculation. "And it leaves you out in the cold where a 'national bird' or a 'national flower' is concerned!"

Érico smiled. "I don't think that would be a good idea."

Lyle looked at Érico a moment, then to Sebastian. "So what do you think about the idea of independence?"

Sebastian shrugged. “I think people are making too much of the issue. I don’t think it’s a very important matter.”

“Ah; one of them,” said Lyle, with a smile.

“So, are you plotting to start a revolution?” asked Sebastian, smiling back, though there was a half serious tone in his question.

“Of course not! Not in the sense of riots and violence. That’s out of the question.”

“We need a ‘talk revolution,’” replied Érico.

“And what is your role in all this?” asked Sebastian to his old friend.

“Me? I’m the strategist. Lyle’s the evangelist.”

“Division of labor,” added Lyle. “We Marsians know how to work in teams.”

“Thank God for that,” said Sebastian. “Érico, I’m surprised you’re involved.”

“Well, I’m retired as Chief Minister and have more freedom now than I had before. I think we gain nothing by waiting and see no reason why Mars shouldn’t be independent.”

“Why not wait until we’re bigger?”

“How big? I know someone who says ten thousand. But why not five thousand? That’s not that many less. We’ll have that next year.”

“Or the year after.” Sebastian thought about the matter, then shrugged. “I suppose now or later is about the same. We certain *can* run our affairs already. We largely do. Economic strength and diversity is a bigger issue.”

“By the end of 2065 we’ll be making fuel cells, about eighty percent of the parts for rangers and mobilhabs, and half the parts for pressure suits,” replied Lyle. “We already make ninety percent of the parts of our life support systems.”

"I agree that we have a pretty impressive economic infrastructure already," said Sebastian. "And there's no such thing as self sufficiency. We'll always be importing."

"And we already have a trade surplus with Earth," added Lyle.

"I know, I know," said Sebastian, raising his hand.

Just then, Kristoff walked up. "Dad, are you going to Helmut's for supper tonight?"

"Yes, and I haven't forgotten; Érico and I were having coffee."

"Okay." Kristoff turned to the other men. "Good sol. Just thought I'd check."

"How are you doing, Kristoff?" asked Érico. "You've got a new bubble, right?"

"Two; they're both ten by twenties. I've ordered a thirty-five by seventy-five, also."

"You're a farmer?" asked Lyle.

"Yes; I mostly raise vegetables and grains. This expansion is killing me because I'm sifting the regolith for the new bubbles and adding it myself, and shifting organics from my existing bubbles to the new ones as well. A lot of work!"

"Sounds like it," said Lyle.

"Let's go over to Helmut's right now," said Sebastian, seeing a chance to escape Lyle's enthusiasms. He rose. "Gentlemen, thank you for the enjoyable discussion."

Amy and Marshall had to hurry from the Catholic Cathedral in El Dorado Dome to the Bahá'í House of Worship in a little dome of its own next to Andalus. They entered the Temple just as the service was beginning, and Marshall was immediately struck by the contrasts between the spaces: the walls of the Bahá'í Temple were fairly unadorned,

except for a few quotations, while the cathedral walls and ceiling were covered by high quality reproductions of some of Catholicism's greatest sacred art. While the temple had many windows and was filled with light, the Cathedral had a few large stained glass windows and a darker interior.

They arrived just in time for the devotional program. It was a contrast as well; it consisted mostly of passages from the Bahá'í and other sacred writings and singing—slightly out of tune—by the choir. There was no ritual, no eucharist, no sermon, and no passing of the contribution plate. Marshall wondered whether Amy found it boring. Afterwards, they all went to the refreshment table set up on the edge of the garden.

"How was mass?" asked Will, walking up to Marshall.

"Interesting. The theme was new life."

"That was the theme of the interfaith service at 10, too. Everyone's doing it this Sunsol."

"I was fascinated by the Bahá'í passages, though, especially this one," said Amy. She opened up a copy of the program. "'The learned men, that have fixed at several thousand years the life of this earth, have failed, throughout the long period of their observation, to consider either the number or the age of the other planets. Consider, moreover, the manifold divergencies that have resulted from the theories propounded by these men. Know thou that every fixed star hath its own planets, and every planet its own creatures, whose number no man can compute.'"

"Isn't that fascinating?" said Will. "Bahá'u'lláh, the prophet-Founder of the Bahá'í Faith, said that in the nineteenth century."

“I suppose His reference to ‘every planet’ having creatures is hyperbolic,” added Marshall.

“Still, it’s amazing,” said Amy. “Such foresight. How was the interfaith service?”

“It was good,” replied Will. “Though they did this little ritual with water as symbolic of life that didn’t do much for me.”

“The mass didn’t turn me on much, though Father Greg had some interesting things to say about the ubiquity and diversity of life,” she said.

“The big problem going to mass and then the Bahá'í service is that we had to skip lunch,” quipped Marshall, taking a third cookie.

“Everyone’s digesting this question of Martian life,” continued Amy. “It’s a fascinating thing to watch, really; every faith tradition is chewing on the problem.”

“Just like everyone individually,” said Will. “Who can talk about anything else?”

“What do you think it means, in terms of, say, independence or terraforming?” asked Amy.

Will shrugged. “In terms of independence, it depends on the symbolic significance our Marsian culture gives it. It could prove irrelevant, or it could come to symbolize our Marsian identity. It’s too soon to say. In terms of terraforming, it means we have a role as trustees of an entire biosphere that we didn’t anticipate. We haven’t decided whether to terraform and take over the planet for terrestrial life, and I suppose we won’t decide that for a few decades or centuries. Whatever we decide, we’ll have to leave some of the planet for the natives. Considering that most of the planet is a sterile, frozen desert, even for Martian life forms, I’d be in favor of giving them larger areas to thrive in than they have now. That would still leave us plenty of Mars.”

“Father Greg talked in terms of trusteeship as well,” said Marshall.

“Though he managed to work references to abortion and birth control into his sermon on life,” complained Amy.

“He talked about trusteeship at the interfaith service at 10, too, but not about the other things,” noted Will.

“I wonder whether the decision about terraforming is centuries away,” said Amy. “Decades may be closer to the truth. In 2040, would you have thought that the issue of independence was just two and a half decades away?”

“No, I would have said centuries,” replied Will, appreciating Amy’s astute observation. “So, do you think the issue of independence has arrived? I’m curious.”

“Yes, the issue has arrived,” Amy replied hesitantly, since she was speaking to the Commissioner. “But that doesn’t necessarily mean independence has arrived.”

“A good distinction,” Will agreed. “I agree with you.”

“Everyone’s talking about it,” exclaimed Marshall. “And wondering why we shouldn’t assume complete responsibility for our own destiny.”

“Perhaps we will now earn that responsibility,” replied Will. “Because we now have responsibility to manage life. Down in Elysium, that single cell has now multiplied into several hundred cells. We have a heterotrophic colony, though one lacking autotrophs to keep it going. Fortunately, the Elysium Sea has a lot of organic muck on its bottom.”

“I was talking to some folks in exobiology yestersol,” said Amy. “They said that they think some of the late Amazonian lakes they have studied had the problem of

imbalanced ecologies, either only autotrophs or only heterotrophs. So the ecology collapsed."

Will nodded. "The diversity of Martian ecologies has been steadily decreasing; Noachian lakes and seas had up to several hundred species, but Elysium only had fourteen. We're going to have to sink a lot of money into recovering those fourteen, and any others lurking elsewhere. Elysium is going to become a permanent station, maybe even an outpost; there's too much work to do there. This is a big, permanent commitment."

"I wonder whether there's life on Titan," commented Marshall, looking at Amy.

"We're pretty sure there's some inside Titan, in the subsurface hydromagma bodies, but it's impossible on the surface," replied Amy. "On the other hand, it took almost thirty years to find Martian life, so who knows?"

"Exactly." Marshall reached for a fourth cookie. Amy touched his hand.

"No, let's go to the Gallerie and get some real lunch."

"You're right, that would be better."

"See you later," replied Will.

Amy and Marshall nodded and walked to the dome's main exit. They passed through the airlock and entered the tunnel to Andalus, which also passed the entrance to the Elliott residence.

"Do you want to bring the lunch to your house?" asked Amy.

"No, that's okay," replied Marshall. He put an arm around Amy. "I don't need any more reassurances. You get along great with my entire family. I could see how much dad liked talking to you, a minute ago."

“He’s a good conversationalist,” she replied, with a smile. “I like both your parents. They’re great. And the Bahá'í Faith isn’t bad, either. I’ve never been a very active Catholic.”

“I get the impression I enjoyed mass more than you did.”

She nodded. “It’s possible. I don’t find ritual very satisfying, and I’m intrigued that your scripture actually refers to life on other worlds.”

“Of course, the real trick is figuring out how to live by the scripture,” replied Marshall.

14

2065

January 1, 2065

Andalus Square seemed almost alien and unworldly to Vanessa Smith after five and a half months of living in a cluster of mobilhabs in Elysium. Her body ached from the eleven-time-zone jet lag she felt. It was time for brunch, but her stomach wanted some supper. Maaka and Wicahpi-luta were at home and sound asleep, hunger being less important than the exhaustion they felt.

She passed under the "Happy New Year 2065" banner stretched across the entrance to the Gallerie and entered the food court. It was December 30, the last sol of 2064, for Mars lacked a December 31. She was looking for her friend Anna Racan, who usually took a coffee break at that time. Sure enough, she spotted Anna at a table talking to Sarah Pannakar. When Anna spotted her, she jumped up and waved.

"Vanessa, you're back!" she shouted.

"Yes, I am! Good to see you." She hurried over and they embraced. Then she turned to Sarah. "Good sol; it's good to see you again. I don't mean to interrupt."

"Oh, it's fine. We're just talking about my sometimes stubborn and childish husband," replied Sarah.

"Isn't that true of all men?" asked Vanessa with a laugh as she sat, though she didn't feel that way about John, who was sweet and supportive, and she doubted Anna felt that way about Greg.

"Not of your man," replied Sarah. "But never mind, I love him anyway. We're going to have twins, in fact!"

“Congratulations!” said Vanessa. “When?”

“Mid July.”

“And how’s your kid, your. . .son?”

“Rajiv. He’s doing great. He’s almost two and talking up a storm; it’s too bad he can make so few sounds, though. He’s really hard to understand and sometimes it’s quite amusing!”

“Wicahpi-luta was that way, and he caught up eventually,” replied Vanessa. She tapped her friend Anna. “How are you?”

“I’m fine and the kids are fine. Johnnie’s green with envy that Maaka got to stay in the field for five months, and was part of a big discovery! He can’t wait to see him.”

“Give him a sol or two to sleep off the jet lag. Maaka dealt with being stuck in Elysium pretty well at first, but he got really bored and restless at the end. He missed his friends and hated going to class by videophone from 7:30 p.m. to midnight. Wicahpi-luta was adaptable, as usual; it was no problem for him.”

“So, how are *you*? I suppose you won’t get a Nobel Prize for this right away.”

“No, let the excitement die down! I don’t even want to think about that. I have to run the Elysium effort long distance for the next six months, while trying to get the university back on track; an absent Chancellor for almost six months is not a good thing. I could have done more telecommuting, but when you’re managing a lab with newly discovered Martian life, who has the *time* to run a university?”

“I’m sure they managed,” replied Anna.

“How are the little beasties doing?” asked Sarah, curious.

“Not bad. We’ve still got only one species, but we can feed them the dead organic muck of other microorganisms and we’ve found out how to regulate the temperature of their environment and thereby control their dividing rate.”

“How big is the water body?”

“It’s still pretty small. We have a seventy by seventy meter dome set up on top of the Elysium Sea ice, anchored in place through burial of the plastic skirt under three meters of regolith. The dome shields out the ultraviolet light and traps the heat, so the entire interior, which was cleared of the regolith layer covering the ice, now has liquid water. But it’s still only half a meter or so deep. We have a remote-controlled boat with cameras, sensors, and a sampling device that can travel around the interior, and it brings samples back to an airlock where we can retrieve them robotically. We can also use it to introduce dead organics to feed the microorganisms. In a year we’ll have two or three meters of liquid water and the ‘sea’ will start to get reasonably large. God willing, by then we’ll find some hibernating photosynthesizers as well.”

“Are you just introducing stuff to the ‘sea’ then?”

Vanessa nodded. “We’re screening ice cores for living microorganisms and we have several airtight containers with ecologies in them. But we’re unlikely to find another living species by examining little samples under microscopes. Only one cell in a billion is still alive after four million years of entombment in ice. Our best bet to reestablish a species is to excavate as many cores from the ice as possible, melt them in an isolation container in an ideal Martian environment, examine the contents, and transfer some of the content into the new sea. Any cells that can revive, will.”

“Do you have a big enough facility to do that?” asked Sarah.

"No. Sometimes we're tossing ice cores into the 'sea' and monitoring it! We need to create a large, complex, diverse ecosystem. In a few years we'll set up an even bigger dome around the seventy-meter dome and let the Martian colony get even bigger. We want to contain the colony and take samples out robotically only. After four months of research, we're now pretty sure the microorganisms can't survive on or inside of humans. The oxygen-rich environment kills them. But we can't take the chance."

"Especially to protect the ecologies inside the outposts," said Sarah.

"So, will Elysium become a borough?" asked Anna.

Vanessa nodded. "Eventually. Maintaining and gradually expanding the colony will take a half dozen folks. Studying it will take a dozen more initially. Add to that some life support maintenance specialists and a child care person, and you're up to about two dozen. That's enough for an outpost, since the location will be permanently settled. The Commission's scrambling to import an extra fifty to one hundred people this coming year to expand the research, so Elysium could have fifty folks a year from now. Construction's already planning the outpost."

"Ramesh's working around the clock on it," noted Sarah. "The new thirty-five by seventy-meter bubbles will be the key element."

"Yeah, and I want something bigger," complained Vanessa. "But I suppose they'll work pretty well. We'll want to do agriculture there, because contamination of our ecologies by Martian microorganisms is inevitable and we'll want to study it."

"Even protecting Earth may become an issue," agreed Anna. "It's an exciting opportunity, Vanessa."

"We live in exciting times," she replied.

The Texas Steakhouse was crowded with diners seeking the special New Years eve dinner. Marshall looked around the restaurant nervously; he was unhappy with the crowding. But the murmur of conversation wasn't too loud and their own voices didn't carry very far.

He looked over the candle and the rose in the middle of the table, between himself and Amy. "I'm ready to order; what about you?"

"Yes, I think so."

"Okay." Marshall pulled out his attaché and called up the restaurant's website in a few clicks, then pushed the icon for their ordering feature.

"What'll you have, Marshall?" asked the computer-generated image of Mary Oakton, wearing the very cowboy hat and western outfit he had seen her wearing as she bustled around hosting her guests.

He pushed the attaché across the table to Amy. "Mary, I'll have the western chicken with steak fries and vegetables, with a salad—with the house ranch dressing—and sparkling water, please," she said.

"And I'll have your sixteen-ounce steak, medium, and the rest the same as Amy," exclaimed Marshall, speaking loudly enough for his voice to reach the attaché.

"Got it, honey," she replied, and the order appeared on the screen.

"Looks right to me," said Amy. "We'll need some more bread in about five minutes; Marshall's wolfing it down."

"That boy has an appetite, doesn't he," replied the computer Mary. "I'll send some over, don't worry."

“Thanks,” said Marshall, and he closed the circuit.

“You’re eating like crazy tonight,” observed Amy, with a smile. “You’re hyper one minute, and nervous the next.”

“I guess I am,” replied Marshall, smiling back, because he could see she was anticipating a certain conversation. He reached into his pocket and pulled out a small box, which he handed to her.

“Oooh. . !” she said, excited. She took the box and opened it, revealing a diamond engagement ring.

“Try it on,” he suggested. “We’ve got to make sure it fits; that is, if you’ll marry me.”

She smiled and with joy beaming from her face she slipped it on her finger. “It fits; how did you know?”

“Mom helped. Remember the other sol when you admired her old wedding ring and she insisted you slip it on? That’s how I knew your finger was a bit bigger than hers.”

“You’re such a clever man!” she replied. “Oh, Marshall, it’s *beautiful*.”

“Well, so are you. Will you marry me, Amy?”

She beamed. “Yes, I will.”

He leaned over the table, barely remembering to move the candle out of his way, and they kissed, a simple, warm kiss. As they separated they heard a sigh of happiness for the table next to them. They looked and saw Dharmapala and Maya Peres looking at them and smiling.

“Congratulations,” said Maya. “We couldn’t help but overhear; sorry about that.”

“The ring and the kiss were dead giveaways anyway,” added Dharmapala. “If you don’t mind, we’ll order you something; a surprise.”

“Oh, that’s very kind of you!” replied Amy. She looked at Marshall. “I must be red with embarrassment!”

“So am I. I thought this place would be quiet and romantic.”

“Romantic, yes; quiet, no. That’s alright, my dear.” She smiled. “We’ve got people to tell.”

“Yes. We can stop by the house and tell my parents later, after the New Year’s celebration. They’ll be up.”

“Okay. We can call my parents after that; it’ll be New Year’s morning in Sydney. When shall we get married?”

Marshall shrugged. “Not too soon, not too long from now. How about April or May? Plenty of time to plan the wedding.”

She nodded. “Of course, I’m on the way to the South Polar Station July 20th for six months. What’ll we do about that?”

“”I thought about that, so I went to Husni and asked him whether I could still apply, because there were splosh craters not far from the station that would be relevant for my dissertation. He said his team had not filled the station, so there was still room if I could arrange funding. That should be easy; it’s dissertation related.”

“So you’d come along.” She smiled. “That’d be good.”

“I’m glad you think so!”

“Of course.” She thought further. “Now, what about Saturn?”

“We could apply together.”

“You’ve never said you were interested in going.”

“That doesn’t mean I’m not.. My research is relevant to the study of Titanian cratering, where you have a thick atmosphere and both water and methane that could serve as liquids in ejecta dispersal.”

“It’d be a long trip.”

“I know; two years each way, so there’s really no reason to stay less than four or five years. That makes the trip eight or nine years. If we want to have kids, we would either have to postpone them a very long time or stay in the Saturn system even longer and have them there.”

“That’s a sobering thought.”

“Probably not as frightening as the thought of having the first child on Mars was to mom and dad.”

“You have a point,” conceded Amy. “A third of the folks who went to Callisto on the *Tienan* plan to stay and have families. Planting mini-colonies makes sense.”

“And you end up laying your bones there a half century later,” said Marshall. “That’s what mom and dad will do.”

“Right again.” She reached her hand across the table and he took it. They stared into each other’s eyes a moment, then kissed again and giggled. “This life together we’re considering could be quite an adventure.”

“Let’s hope so, because life isn’t always predictable.”

“That’s for sure, but I’d rather face it with you.”

“And I want to face it with you.”

Just then Mary Oakton—in the flesh—approached the table. “Here’s the extra bread you ordered. But I gather from Dharmapala that this might be more appropriate.” She held up a bottle of non-alcoholic champagne.

“We’re getting married!” said Amy, holding up her ring.

“Oh, how lovely. Congratulations!” said Mary. “Then this bottle is perfect. I’m delighted. Jon and I have been happily married for twenty-two years; well, it’s been happily most of the time, of course.”

Marshall smiled at her frankness. “That’s what we’ll aim for too, then, Mary.” He took the bottle and poured out two glasses. “A toast: to love all the time, happiness most of the time, and togetherness in spite of what comes our way.”

“Here, here,” replied Amy, and they drank.

Will looked at Ethel, seated next to him on the couch. “It’s strange to watch the New Year’s ball drop on television, when we’re literally only a hundred meters from it.”

“I’m glad they’re broadcasting it,” she replied, watching the crowd in the square try to sing Auld Langsyne while a live band played it in the background. “I suppose half the outpost is watching it this way.”

“The half with sleeping children.”

“It’s hard to imagine it’s now 2065. Almost two thirds of the twenty-first century is over.”

“And some difficult years ahead of Mars, I dare say.”

“Is that why we’re not going to the Square?” asked Ethel.

“Last year they asked me to make a speech. I don’t want to do that this year.”

“The year 2065 could be more than just the end of the columbiad.”

“Trans-Mars injection for the *Aldebaran* and *Rigel* are less than twenty-four hours away. Now I’m not so sure I should have urged the Board of Trustees to send a committee of representatives to come out and try to understand our culture and the drive for independence.”

“It seemed like a good idea at the time.”

“Things are moving faster than I could have imagined. It seemed like a chance to foster dialogue and understanding, a chance to prepare everyone for the inevitable negotiations in, say, about 2070. But I can’t help but feel this will trigger the negotiations instead.”

“You haven’t made efforts to slow things down, either,” said Ethel. “One of the best oppositions in fifteen years; imports are cheap and fast; let’s try out this new direct descent system and see if it cuts costs as much as they say; import as much as you can, it’s a great opportunity. . .”

Will smiled. “Two more shuttles went into operation on earth early and two were not retired on schedule because of the extra thousand tonnes of stuff we ordered. I never thought we’d get it all launched, but it looks like it’ll all leave Earth this opposition.”

“And what will it do for us if there’s an embargo?”

“Well, no one is looking into that question, of course.” Will hesitated. “But I’ve checked the master inventory manifests and compared them against the emergency preparedness document. We’ll have 3.9 years of everything at normal rates of consumption, rather than 2.7 years of everything. If you assume reasonable rationing and repair of essential equipment, we could go seven years.”

“A long time, if a Krakatoa erupts and wipes out half the Earth’s agriculture for a year and its economy collapses for half a decade.”

“Exactly. And long enough to defeat an embargo, if anyone were to try it.”

“I doubt it’s a serious option; loss of our gold and PGMs would be a pretty serious problem for the terrestrial economy.” She added “And by the way, Mars Metals, Inc., will have spare parts to keep production going at normal levels for 3.1 years.”

“Sibireco can go three years; so can Consolidated Mining. Muller Mining can go 3.5 years. Everyone has decided to prepare for possible supply interruptions.”

“And without prompting. It must look like a conspiracy theory.”

“The importing of an extra 125 migrants could, too; but then, the Americans are sending 75 of them to support the Callisto expedition, and we’re adding 50 because of the discovery of life at Elysium.”

“And they’re going to transport some of our fifty, right?”

Will nodded. “Twenty, I think. With the larger zero-gee gymns, we can squeeze the rest on the existing caravels. I don’t think anyone will accuse us of packing the planet with independence fanatics.”

“Do you think there’s the possibility of violence?”

“On the face of it, it seems very unlikely, but who knows what could happen. Nationalism and national identity create strong emotions. For the last month I’ve been lurking on the Independence Club’s web forums, never posting anything, but I’ve been reading and listening. There’s a strange mix of comments and emotions. It’s hard to tell who’s who because everyone uses handles. The most extreme voice, ‘Mars Revolutionary,’ lives on Earth, not Mars. I didn’t realize that until I looked him up and

found that he had set his time zone as seven hours behind Greenwich Mean Time, rather than a Mars time zone, meaning he lives in the mountain states of the United States or Canada. I suppose that could be a ploy. There are a few immoderate voices; I don't know where they live. Most people seem reasonable, but feel the time has come for Mars to be sovereign."

"I can understand that."

"So can I. We're running our own affairs already, if you include the fact I live and work here and run the things the Commonwealth Authority doesn't. Our financial surplus is beginning to drop as the price of gold and PGMs drops, but we're still covering our expenses. Because of the high level of automation in our economy, a few thousand people can produce incredible wealth, which is unprecedented in history. So there are no historical analogies to our situation."

"Well, I hope that's true of the level of violence in any revolution we might have. We can't afford chaos; the air will leak away."

"It makes me lose sleep at night. I don't know what to do other than pray, and prayer isn't sufficient."

"No. If anyone has to do more, it's you."

"Exactly. It's the most stressful test in my life."

Ethel nodded. She leaned over and kissed him and put her arm around him. They sat there on the couch in silence, she comforting him, for a minute. Then they heard sounds from the airlock; someone was coming in. They looked up. "It's early for the kids to be coming home," noted Ethel.

The front door opened and in came Marshall and Amy, looking energetic and excited. “Happy New Year!” said Will.

“Thank you!” replied Marshall. “I hope we aren’t interrupting anything.”

“Just watching t.v. and talking.”

“Amy and I have some news.” Marshall smiled. “We’re engaged.”

“Really!” said Ethel, sitting up. “Fantastic!” She stood and walking to them.

Amy held up her hand with the ring. “He got me a diamond, too.”

“Congratulations,” added Will, and he rose to follow.

Ethel embraced Amy. “I couldn’t be happier! You’re a great addition to the family, dear, and very welcome.”

“I agree.” Will embraced his son and couldn’t help but think back to his own engagement twenty-eight years earlier. Then he embraced Amy and Ethel embraced Marshall.

“When will the wedding be?” asked Ethel.

“We figure May,” replied Amy. “We have two friends coming to Mars—one’s Mike Tobin—and they arrive in late April, so we’ll wait for them to get here.”

“And it’s plenty of time to plan the wedding,” added Amy.

“It’s almost as complicated as a wedding on Earth, we now have so many options and possibilities,” agreed Ethel.

Will was surprised. “May. That should make life interesting.”

“Oh, you’ll have the dignitaries from the Commission here, won’t you! Maybe we should postpone a bit,” said Marshall.

“No, a wedding won’t take that much of my time, so don’t delay it for that reason,” replied Will. “The year 2065 will be quite interesting. All year.”

EM 3 June 2048/14 May 2063
EM 14 Aug. 2050
Vernal Equinox, Sept 2, 2047/June 25 2062
Autumnal Equinox, Sept. 18, 2048/July 13, 2063
Vernal Equinox, July 21, 2049/12 May 2064
Autumnal Equinox: Aug. 3, 2050/May 29, 2065

C14E departs Earth, 23 November 2047
C14M departs Mars, 8 December 2047
C14M reaches Earth, 18 March 2048
C14E reaches Mars, 8 March 2048
C14E departs Mars, 15 April 2048
C14M1 departs Earth, 15 April 2048
C14M2 departs Earth, 28 April 2048
Opposition, 3 June 2048
C14E returns to Earth, 1 August 2048
C14M2 returns to Mars, 10 September 2048 (4.3 month flight)
C14M1 returns to Mars, 30 October 2048 (6.5 month flight)

[Note: C14E can be changed to this: Earth to Venus, 20 June 2047 to 5 Sept. 2047; reach Mars 5 March 2048; leave Mars 15 April 2048; reach Earth 1 Sept. 2048]

With Alexandra out of Construction, Will moves to privatize housing construction, plastics and chemical manufacture, and metallurgy as three separate, semipublic joint stock corporations, 2049-50. Power (Margen) and communications (Marscomm) are scheduled for 2049. Corporations are in favor and pressure their governments to support privatization, which would leave the Commission an empty shell.

Will pushes for a Saturn expedition as joint US/Mars project in the 2055 timeframe.

Life is found on Mars after all, late 2049. Latin American Union, European Union, and the "European Rim Union" (Russia, former Soviet republics, Israel) agree to form a "Grand Union" and Canada, Central America want in. The common currency would embrace one third of world economy.

DATE: Dec. 2063

9. Election 146
Ramesh, Sarah, and Lal discuss the Hindu temple, roads, outpost planning, and upcoming elections; Will and Alexandra discuss the article where Cowdrey admits to secret campaigning and discuss plans for domes and galleons; Future of Mars Forum and arguments about campaigning; Cowdrey is not reelected.
DATE: Jan. 2064

10. Chief Minister 174
Signers of independence petition jump in numbers; Érico declines another term as Chief Minister; Will asks for Residents Council straw vote and nominates Alexandra; later that evening she is ratified and assumes office.
DATE: Feb. 2064

11. Equinox 187
Will meets Ramesh and Louise to settle a dispute between them and find out how they're doing with privatization of the former Construction Department. Érico reads the Independence Club's discussion boards and becomes a bit of a Mars patriot; they walk around the Equinox Ethnic Festival
DATE: May 2064

12. Life 203
Alexandra called Érico and Will to her office to discuss Érico's independence efforts. They discuss when independence is right, the plan to form a "Grand Union" of the European Union, and European Rim countries" (Russia, former Soviet republics, Israel, Morocco, Lebanon, Iraq). Marshall and Amy talk about the future. Vanessa Smith finds living Martian life in Elysium.
DATE: July 2049

13. Implications 226
Will talks to Enlai about the discovery of Martian life, then with Vanessa to make plans; Sebastian, Lyle, and Erico talk about the implications of life for independence and terraforming; Marshall and Amy attend Catholic mass, then Bahá'í worship and both services focus on the uniqueness of life.
DATE: late Aug. 2064

14. 2065 240
Vanessa returns to Aurorae and sees Anna Racan and Sarah Pannakar, and they talk about Martian life, a new borough, and other changes; Marshall asks Amy to marry him; Will and Ethel watch the New Year's celebrations and reflect on what might be coming up that year.
Date: January 1, 2065

Started February 10, 2005 (outlining); Feb. 15 (text); finished April 10, 2005. Rewrite begun Feb. 12, 2009 and finished Feb. 16, 2009.