

## Ecopoiesis

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"I wonder why they call this the red planet?" I asked. The rebreather made my voice sound funny in my ears. "Looks like the brown planet to me."

"You got a problem with brown, boy?" Tally said. Her voice was muffled by the rebreather she wore as well.

I turned, but Tally wasn't looking at me; she was watching the opposite direction, standing in a half crouch. That position surely couldn't be comfortable, but for her it looked completely easy and natural. Her head turned with a quick birdlike grace to glance now one way, now the other. Guarding our backs, I realized. Against what?

"Nothing wrong with brown, my opinion," she said.

The more my eyes got used to the terrain, the more colors came out. Brown, yes, barren rocky brown plains and brown buttes and a brown stream frothing over a tiny waterfall. The hills were sharp-edged, looking as if they had been blasted

out of bedrock the day before, barely touched by erosion. But in the brown was hints of other colors; a sheen of dark, almost purple, echoing the purple-grey of the cloudy sky, and even patches on the rocks where the amber shaded off to almost army green.

"It's beautiful, isn't it," said Leah Hamakawa. She was, as always, two steps ahead of us. She was down on one knee in the dirt, her nose right up against a rock. She'd taken both her gloves off and was scraping the surface of the rock inquisitively with her thumbnail.

I knelt down and scooped up a handful of rocks and dirt in my gloved hand. Close up, I could see that the brown was an illusion. The rocks themselves were the color of brick, but clinging to them were blotches of purple algae and tiny, dark amber specks of lichen. I pulled off one glove so I could feel the texture. Cold, with a rough grittiness. When I rubbed it between my fingers, the blotches of purple had a slimy feel. I was tempted to try pulling off the rebreather for a moment so I could put it right up to my nose and smell it, but decided that, considering the absence of oxygen in the atmosphere, that would not be wise.

"Beautiful, yeah, right," Tally said. "You got rocks in your head, girl. Stinks. I seen prettier stinking strip mines."

"It used to be red," Leah said. "Long ago. Before the Age of Confusion; before the ecopoiesis." She paused, then added "I bet it was beautiful then, too."

I looked at the handful of dirt in my palm. Mars. Yes, perhaps it was beautiful. In its way.

My ears and the flesh of my face in the places not covered by the rebreather were getting cold. The temperature was above freezing, but it was still quite chilly. The air in the rebreather was stale, smelling slightly rotten and distinctly sulfurous. That indicated a problem with the rebreather; the

micropore filters in the system should have removed any trace of odor from the recycled air. I thought again about taking the rebreather off and seeing what the air smelled like.

"Shit," said Tally. "Anyway, you and Tinkerman about done gawking the scenery?"

We got a murder to solve. Two murders."

"They've been dead for well over a year," Leah said. "They can wait another day.

God, isn't this place magnificent?"

"Stinks," said Tally.

#

The lander was bulbous and squat, painted a pale green, with the name Albert Alligator in cursive script next to the airlock door. Leah and I cycled through the airlock together. Langevin, the pilot who had shuttled us down, was waiting for us in the suiting atrium when the inner lock opened. He opened his mouth to say something, and then abruptly shut it, gagged, and turned away, his hand going up to cover his mouth and nose. He scrambled out of the atrium abruptly. I looked at Leah. She shrugged, and reached up to unfasten the strap of the rebreather from behind her head.

"Let me get that," I said, and she turned around and bent her neck. Any excuse to touch her. Behind me, I could hear Tally cycling through the lock. The strap unfastened, and I gently took a finger and ran it along Leah's cheek, breaking the seal of the rebreather to the skin.

Suddenly she broke away from me. "Oh, god!"

"What?"

"Take off your rebreather."

Puzzled, I reached up, snapped the strap free, and pulled it forward over my

head. The silicone made a soft "poik!" as the seal popped loose. I took a breath, and gagged on the sudden odor.

The smell was as if I'd been wading through a cesspool in the middle of a very rotten garbage dump. I looked down. My shoes were covered in brown. My hands were brown. One leg, where I'd knelt on the ground, had a brown spot on the knee. Leah was even dirtier.

Shit.

Tally popped through the lock, accompanied by a fresh burst of fecal odor. I held my nose and suppressed my instinct to gag.

"Of course," said Leah. "Anaerobic bacteria." She thought for a second. "We're going to have to find some boots, and maybe overalls. Leave them outside when we come in."

I started to giggle.

"What's so goddam funny?" Tally said.

"I've decided you're right," I told her. "Mars stinks. Take off your rebreather.

You'll see."

#

The utility landing platform was a hexagonal truss plate with small rocket engines mounted on three of the six corners. The hab-and-lab module that Spacewatch was delivering for our stay was strapped on the top. It hovered in the cloudy sky like a flying waffle-iron. Langevin guided it in by remote control, setting it down in the sandy valley a hundred meters from the ruins of the earlier habitat. His landing was as neat and as unconcerned as a man passing a plate of potatoes. Still operating by remote control, he unstowed the power crane, lifted the habitat off of the landing platform and lowered it gently to the ground. The habitat itself was an unpainted aluminum cylinder, fixed with

brackets onto a platform with an electromechanical jack at each corner to level it on uneven ground. It was a small dwelling for three people, but would be adequate for our stay.

"Man, I don't envy y'all," he said. He delicately pinched two fingers over his nose. "No surprise nobody comes here." He shook his head. "Anything else y'all need?"

"How about the rover?" Leah asked.

"It's still in transit from the Moon; won't arrive for a few more days. When it gets here, I'll send it right down."

#

Tally was first one inside the habitat, of course. Even though it had just come down from space, like a cat, she had to sniff it out herself. After five minutes she waved us in.

The interior of the habitat was brand new, the fixtures molded to the interior. Across from the airlock atrium was the air regeneration equipment, with three spherical pressure tanks painted blue to indicate oxygen, and three green-painted tanks of nitrogen to provide make-up gas. To the left was a combined conference room and kitchen area, and behind that the sleeping cubbies.

"Only two cubbies," Tally said, "and a mite cozy ones at that. Guess we girls bunk down in one; give you the other all to yourself, Tinkerman."

I couldn't breathe for a moment. Somehow I managed to sneak a quick glance up.

Tally wasn't looking at me. She hadn't yet realized that the silence was extending a bit too long. Leah glanced across at me. Her expression was neutral, curious, perhaps, as to what I would do. I couldn't read her intention. I never

could.

In a very small voice, I said, "I volunteer to share a bunk with Leah."

Tally looked up sharply. Leah gazed back at her, her expression unreadable. But she didn't voice an objection.

"Huh," said Tally. I don't think I'd ever seen Tally at a loss for words. "Well.

Guess I get a cubby to myself." She paused, and then added, almost to herself,

"lucky me."

#

Terraformed Mars had an atmosphere half as thick as Earth's. That was enough pressure for a human to survive, but with no oxygen to breathe. With rebreathers to recirculate exhaust carbon dioxide back into breathable oxygen, we could survive outside comfortably without a vacuum suit. For that matter, you could survive outside stark naked, as long as you had your rebreather, and didn't mind the cold.

Outside again, this time with boots and coveralls to keep the worst of the stinking dirt out of our habitat, we walked in silence across the rock-littered landscape the hundred meters to the place that the earlier habitat had been.

Ragged edges of aluminum stuck out from the platform like ribs. Pieces of the habitat had been scattered across the plain by the wind, a fan-tail of shining metal and shards of composite sheeting visible against the brown all the way to the horizon.

There were two bodies, one within the remains of the exploded habitat, one out on the plain. Not much was left of them. The bodies were barely more than piles of dirt with a rib-cage and part of a pelvis protruding, even the bones covered with the purple-brown of the Martian microbiota. I was glad for the filtering effect of the rebreather. I made videos of the bodies in position while Leah

knelt down to examine them and take samples: clothing, hair, skin, tissue. After she examined the one in the habitat, she rose without speaking and went to the one outside. Unlike the other one, the clothing on this one was partly eaten away by bacteria.

Leah's long black hair blew around her face as she worked, but the carbon-dioxide breeze wasn't strong enough to move the pieces of aluminum framework. The wind must have been much stronger to have spread the wreckage so far.

Tally stood, as always, a dozen paces away, eyes restlessly scanning the horizon for enemies.

"We really should have had a doctor to do this analysis," Leah said, standing up. "But a few things are obvious. For example, the man in the habitat had a fractured skull."

"What?"

"But this one," she nodded down at the body she was standing over, "shows no apparent sign of trauma. No rebreather, either, so I'll hazard a guess that carbon dioxide poisoning was what did for him." Leah put the tissue samples into her sample-pack and took a step toward the habitat. "I'll have to let the computer analyze the samples to verify that, of course." She looked around. "Who could have killed them? Why?" She looked up the plain, following the trail of debris. "I think we've seen enough. Tinkerman, you have enough pictures? Does your checklist have anything else?"

I looked down at the list. "No, as far as forensics is concerned, we're done."

"Then, unless you have any further suggestions, do you think maybe we could get them decently buried?"

When there's a fatal incident in space, of whatever kind, there needs to be an investigation. If it was an accident, the cause has to be found so that Spacewatch Authority can take appropriate measures to prevent its recurrence, and deliver warning to anybody else with similar equipment.

We were that incident investigation team, Leah and I. Tally, a freelance survival specialist, was our protection. If somebody had killed the two researchers, deliberately blown up their habitat for some as-yet undetermined motive, whoever it was that had killed them might come back.

But nobody cared about Mars. The exciting horizons were light-years away, where relativistic probes lasercast back terabits of images, giving the excitement of vistas that anybody could access on optical disk without the danger and discomfort of leaving Earth, and with far stranger life-forms than any mere microbes. Mars was such an uninteresting location that it took over a year before Spacewatch Authority noticed that a scientific team that had gone there to study microbes hadn't returned. They were the first researchers to bother with an on-site investigation of Mars in over a century.

"It doesn't make sense," I told Leah, back in the habitat. "Why would anybody want to murder two researchers on a stinky planet too close to Earth to even be interesting?"

She shrugged. "Kooks. Bacteria-worshippers. Or, maybe one of 'em had an angry ex."

"It's not as if the planet were exciting," I said. "They tried to terraform it. They failed. End of story, go home."

"Failed? Tinkerman, you have it all wrong. You should go learn a little history before going on a trip." I could hear her switching into lecture mode. "They didn't try to terraform Mars. They never tried to terraform Mars. What they did



was ecopoiesis, and they succeeded spectacularly, more than anybody had a right to expect."

"Ecopoiesis," I said, "terraforming, same thing."

"Not at all."

#

The way Leah told it, it was part epic, part farce.

It's hard for us, now, to imagine what it was like in the age of confusion, before the fusion renaissance and the second reformation, but the people of the twenty-first century had a technology of chemical rockets and nuclear reactors that, although primitive, had its own crude power. By the middle of the twenty-first century, Mars had been explored, cataloged, and abandoned. It was too cold to harbor life, even of the most primitive sort; the atmosphere was closer to vacuum than to air, and there were far more accessible resources in the asteroids. Mars was uninteresting.

It didn't even make good video. The largest canyon in the solar system-- so big that if you stand in the middle, the walls on both sides were out of sight over the horizon. The biggest mountain in the solar system--but the slope so gentle that it meant nothing on any human scale. Ancient fossil bacteria-- but not even a hint of anything that hadn't been dead and turned to rock a billion years before trilobites crawled the oceans. A hundred spots on Earth and across the solar system were more spectacular. Once somebody had climbed Olympus (and in the low gravity of Mars it wasn't a hard climb), and had placed flags at both poles of Mars, why go back?

The ecopoiesis of Mars was done by a band of malcontents from one of the very first space settlements, Freehold Toynbee. Habitats--they called them "space

colonies" back then--were crowded, dangerous, undersupplied, constantly in need of repair, and smelly. They were haven to malcontents, ideologues, fanatics, and visionaries: the vanguard of humanity, the divine agents of the manifest destiny of mankind into the universe. More succinctly, the habitats were home to people who couldn't get along with their fellow humans on Earth. Arguments were their way of life.

It was an engineer named Joseph Smith Kirkpatrick who proposed that Toynbee could transform Mars. The people of Toynbee debated the question for a year, arguing every conceivable point of view with a riotous enthusiasm. At the beginning, the consensus of the colony seemed to be that since human destiny was in space, even to consider living on planetary surfaces could only be idiocy, or some deviant plot to subvert that destiny. But Kirkpatrick was more than just a maverick engineer with wild dreams, he was a man with a divine mission. A year later, the quibble about living on a planetary surface wasn't even part of the argument. Toynbee decided that the right of Mars to remain unchanged was preempted by the imperative of life to spread into new niches. They had convinced themselves that they had not merely a right, but a divine duty to seed life on Mars.

Mars, back then, was completely inhospitable to life. The atmosphere was less than one percent of the Earth's, and the average temperature was far below freezing, even at the equator. But their analysis showed that the climate of Mars just might be unstable. The surface of Mars showed networks of canyons and run-off channels, dry lakes and the seashores of ancient oceans. There had been water on Mars, once, a billion years or more ago, and plenty of it. All that water was still there, hidden away. The old scientific expeditions had proven that--frozen in the polar ice-caps, locked into kilometer-thick hills of

permafrost in the highlands. They convinced themselves that there was, in fact, far more water on Mars than previously suspected, frozen into enormous buried glaciers under featureless fields of sand. Enough to form whole oceans-- if it could be melted. All that was needed was a trigger.

It's not easy to heat up a planet, even temporarily. They did it by setting off a volcano. There were a number of ancient volcanoes on Mars to choose from; after many geological soundings to determine magma depth, they picked a small one. Or rather, a volcano small by Mars standards, still a monster by the standards of any Earthly mountains. Hecates Tholus; the Witch's Teat. To set it off, they determined, required that they drill five kilometers deep into the crust of Mars.

Just because it was clearly impossible was no reason they wouldn't do it. Mars has no magnetic field, and so the solar wind impacts directly on the planetary exosphere. A thousand miles above Mars, currents of a billion amperes course around the planet, driven by the solar wind-derived ionization. Joseph Smith Kirkpatrick and his team of planetary engineers short-circuited this current with a laser beam, ionizing a discharge channel through the atmosphere, creating the solar system's largest lightning bolt. They discharged the ionosphere of Mars into the side of Hecate, instantly creating a meter-deep pool of molten rock. And then they did it again. And again, as soon as the ionospheric charge had a chance to renew. And again, a new lightning bolt every five minutes, day and night, for ten years.

One million lightning discharges, all on exactly on the same spot. They melted a channel through to the magma chamber below, and a volcano that had been sleeping for almost half a billion years awakened in a cataclysmic explosion. The

eruption put carbon dioxide and sulfur dioxide into the atmosphere; more importantly, it shot a hundred billion tons of ash directly into the stratosphere. Over the course of several months, the ash settled down, blackening the surface.

The new, darker surface absorbed sunlight, warming the planet and releasing adsorbed carbon dioxide from the soil. The released carbon dioxide thickened the atmosphere, and the greenhouse effect of the thicker atmosphere warmed the planet yet more. The resulting heat evaporated water from the polar ice caps into the atmosphere. Water in the atmosphere is an effective greenhouse gas, even more effective than carbon dioxide, and so the temperature rose a little more. Finally ice trapped underground for eons melted. A whole hemisphere of Mars was flooded, eventually to form the vast Boreal Ocean, as well as innumerable crater seas and ponds. But that was much later. In the beginning, in Joseph Smith Kirkpatrick's lifetime, only on a band around the equator was water actually liquid all year round. But that was enough for what they wanted to do.

Slowly, the eons-frozen permafrost of Mars was melting.

The atmosphere was still thin, and still almost entirely carbon dioxide, But Mars is a sulfur-rich planet. Sulfur dioxide frozen into the soil was also released, and rose into the atmosphere. Ultraviolet light from the sun photolyzed the sulfur dioxide into free radicals, which recombined to form sulfuric acid, which instantly dissolved into the new equatorial oceans. The new acid oceans attacked the ancient rocks of Mars, etching away calcium carbonate and magnesium carbonate, releasing carbon dioxide. In a few years, the acid oceans had been once more neutralized-- and the atmosphere was thick, fully half a bar of carbon dioxide, enough for a greenhouse effect warm enough to keep the new oceans liquid year round.

Mars had been triggered.

But how to keep this new atmosphere, to keep the planet warm? Not even Joseph Smith Kirkpatrick could keep a volcano erupting forever, and already the Witch's Tit was settling down from an untamed explosion of ash to a sedate mound of slowly-oozing lava.

Joseph Smith Kirkpatrick's answer was bacteria. Anaerobic bacteria, to live in the oxygen-free atmosphere of Mars.

"Sewer bacteria," I said.

"You got it, Tinkerman. Anaerobic bacteria-- modified sewer organisms. Yeasts, slime-molds, cyanobacteria, methanogens and halophiles as well; but all in all, bacteria closer to gangrene than to higher life."

"No wonder it stinks." I shuddered. "They were crazy."

"Not so. They were, in fact, very clever. They engineered a whole anaerobic ecology. The bacterial ecology darkened the surface, taking over the job of the volcanic ash. It burrowed into the rocks and broke them apart into soil, releasing adsorbed carbon dioxide in the process. The methanogens added methane, a vitally important greenhouse gas, to that atmosphere, and raised the temperature another few degrees. They didn't dare establish too many photosynthetic forms, of course, because if the carbon dioxide in the atmosphere were to be converted into oxygen, the greenhouse effect that kept the planet warm would vanish, and the planet would return to its lifeless, frozen state.

"But terraforming Mars hadn't been their goal in the first place; in fact, terraforming was the very antithesis of what they intended. Their goal was ecopoiesis, the establishment of an ecology. They were Darwinists, and diversity was their creed. They looked down in contempt on unimaginative humans who

believed that humans were the pinnacle of creation; they saw humanity as only agents of life, spore-pods by which life could jump from one world to another. They believed that once life, however primitive, could establish a toe-hold on Mars, it would adapt to its environment, and flourish, and someday evolve. Not to make a copy of Earth, but into something new, something indigenously Martian."

"So they wanted to be gods."

Leah shook her head. "They wanted to be men."

"So they're responsible for this place. Great."

"The ecopoiesis was a wonder in its day, Tinkerman. It spawned debate across the Earth and cis-lunar space: was this the greatest feat of engineering in history, or was it a crime against nature? The year of arguing at Freehold Toynbee was nothing compared to the cyclonic fervor that was released when Joseph Smith Kirkpatrick proudly announced to the Earth what they had done.

"Kirkpatrick was kidnapped from Toynbee and put on trial in Geneva as an eco-criminal. The question the High Court argued was, Do Rocks Have Rights? Can it be a crime to destroy an ecosystem that contains no life? The trial took three years, and ended in a hung jury. Kirkpatrick was eventually acquitted of all charges, but he was never allowed to leave the Earth again, and died an angry, bitter man.

"Freehold Toynbee claimed ownership of Mars, and passed a law making it illegal for any human to land on it for the next billion years--but nobody paid any attention to their claim. For decades, Mars was the subject of intense scientific scrutiny. In a few more years Toynbee went bankrupt, for ecopoiesis paid no bills. Technologically obsolete, the colony itself was ripped apart for scrap; the colonists scattering to a hundred colonies and asteroid settlements.

And then, after a few decades of fame, Mars was ignored. Bacteria or no bacteria, there were far more abundant resources elsewhere in the solar system."

"And if two researchers hadn't decided to die here, it would still be uninteresting today."

"Not uninteresting, no. Ignored, maybe. But not uninteresting."

"To you."

Leah smiled. "To me."

#

Langevin took the lander back upstairs, flying the utility platform in formation with him, leaving us alone on the planet. We were in the tiny kitchen area of the habitat, sitting around the only table large enough to serve as a conference area. Leah spoke first. "Tally, did you learn anything?"

"After almost two years," Tally said, "did you really seriously believe any footprints of the perpers would be left preserved? Well, surprise." She grinned.

"Yeah, I found some boot prints. Took me some looking, let me tell you, but I found 'em."

"So tell," Leah said. "What did you get?"

"A few places in the lee of the rocks didn't get washed away by rain or blurred by wind." Tally shook her head. "But I checked them all; every damn print matches the size and patterns of one of the boots in the hab. Either whoever did it used the same boots as our late friends, or, more likely, whoever did it didn't leave any boot prints. That's all I've got. You?"

Leah spoke slowly. "The one in the hab died from being hit in the head. The other one died outside. No rebreather in evidence, and he wasn't dressed for

outside. Just a thin robe. Carbon dioxide poisoning, as I expected."

"Hmm," said Tally. "Two guys sleeping in the same cubby. Ask me, I'd call it as a lover's quarrel gone violent. The one guy bashes the other in a fit of rage, probably didn't mean to hit quite so hard. Then, realizing what he did, he blows up the habitat and walks outside to die."

"Could be," Leah said. "It's a hypothesis, anyway. Can't prove it one way or another with the evidence we have so far. One odd thing, the man who died outside had charred clothing."

That explained the ragged appearance of the clothing of the man who had been outside. His clothes hadn't been eaten by bacteria; they had been charred.

"Maybe caught alight when he blew the habitat?" Tally suggested.

Leah shook her head. "Carbon dioxide and methane atmosphere. Nothing burns, outside."

"Um," Tally said. "Guess I don't have an explanation for that one."

"Tinkerman?" Leah said. "You get anything?"

I shook my head. "I collected as much of their records as I could find, but so far I can't read them. A lot of their opticals were damaged by fire, and on the ones that weren't, the surfaces are pretty corroded by exposure. I've started cleaning them off, and I may be able to get at some of their records, but, even if I can do it, reading it will be pretty much a bit by bit process. They weren't very conscientious at making backups and putting them in a secure location, I'm afraid."

"Pity. If we could read their diaries, it would help, let us see if anything was going wrong before the blow-up. Oh, well. Do what you can, and we'll get together again tomorrow and check progress."

As we talked, Leah's face had slowly been reddening. Her eyes were pale circles;



her nose and lips and chin, where the rebreather had covered them, a pale diamond. The rest of her face slowly turned a brilliant scarlet, deepening even as I watched. She raised a hand and brushed her hair away from her face. "Ouch." She looked puzzled.

Reflexively, I raised a hand to my temple. My own touch was like a whip, a brilliant stab of heat.

Tally looked at the two of us, grinning. "Well, well, aren't you two the sight. Look like you're wearing warpaint. Painted up like two owls, you are."

Tally's dark skin showed nothing, but Leah reached over and gently touched her face.

"Yow! Hey, that hurts! Shit!"

"Ultraviolet," Leah said. "It's the hard ultraviolet. CO-two is too difficult for UV to split; it doesn't form an ozone layer. The climate is cloudy and cold, but the hard UVs still get right down to the surface. I'd say, we've been a bit stupid, going out unprotected. Good thing we weren't out much longer."

"Shit," said Tally. "Why didn't you say something sooner?"

"The hab has to have some kind of a med kit," Leah said. "Maybe we'd better see if it has any sunburn ointment."

#

At night, in the cubby. I didn't know what to expect.

She wasn't in the bunk. She was sitting in the cubby's one small chair, staring into space. I got into the bunk, on one side, making a space for her.

She didn't move. Fifteen minutes. Half an hour.

I'd done something wrong. But she hadn't objected! I thought--

Damn.

The silence in the cubby was oppressive.

At last I said, "Leah?"

She said nothing.

"Leah, I'm sorry. I didn't mean to try to--"

In the dark it was hard to tell where her eyes focused, but I could see the slight movement of her head and knew that she was looking at me.

"David." She paused for a moment, and just before I was about to speak again, to apologize to her, she continued, "I've seen bodies before."

It was not what I'd expected her to say. "Bodies?"

"I thought I was used to it." Her voice was tiny in the darkness. "I thought I could handle it. I can handle it."

It was odd. The bodies hadn't bothered me. They had been so far decomposed that they were barely recognizable as having been human at all. And they hadn't seemed to bother her, not in the daytime.

"I've seen too many bodies." And then she came into bed, turning to face away from me. I held her. Her body was rigid, but she turned her face and pressed her head into my side. "Too many, too many." Her breath was warm against my shoulder. "It wasn't even anybody I knew. I'm sorry. I'm sorry. I'm going to stop crying now."

I touched her face. Her eyes were dry, but somewhere inside she seemed to be crying.

"I don't even know why I'm still alive," she said. "Everybody else died."

I didn't know what to say to her, so I stroked her hair and said, "I know, I know."

"Careful how you touch me, you idiot," she said, and her tone was back to normal. "My whole face feels like it's on fire."

I knew so little about her. She never talked about herself; she so deftly managed to always avoid the subject. She had always seemed so much in control. But suddenly she was asleep, and the time for asking questions had passed.

#

I've heard that some people fall in love at first sight. It took me about three classes.

The first one, I don't think I even noticed her in particular, just another face among the many. I was teaching a class on troubleshooting. There are two techniques to troubleshooting equipment. The first is, you know the equipment so thoroughly that you have a sense of it, you know it as a friend, and when it's down, you can feel what's wrong by pure instinct. That method is rather hard to teach.

The other way is to be simple, thorough and logical; to home in on the problem by pure mechanical elimination, a matter of dogged and willfully unimaginative technique. That was the technique I was teaching. It means teaching how to be methodical, how to structure a grid to let no combination of symptoms escape detection.

The Institute has simple rules: everybody teaches, everybody learns. Every year, during the Earth's northern-hemisphere summer, the Institute holds a month-long convocation, and this year I was teaching. My class lasted only a week, and it was almost half over before I really noticed Leah.

But, once I'd noticed her, I couldn't get her out of my mind. The breeze rustled across pine needles, and I heard the sound of her voice, asking a question, precise, cogent, perfectly phrased. I'd see the way she cocked her head, listening. I became suddenly self-conscious, worried about how I presented the

material, whether it was clear and precise.

So, when I finished, I sat in on her course, although it was somewhat out of my usual feeding range. Soliton-wave solutions of the Einstein field equations. I'm slow; my lips move when I solve field equations in four dimensions. She was a lot faster than the class, so smooth that it was obvious that she knew the material so well she didn't even bother to review it before she started talking.

I knew that once the convocation had ended, I would never see her again. The thought made me desperate, although I'd not spoken more than a half dozen words to her beyond what was required of a student. I knew absolutely nothing of her other than her name, Leah Hamakawa, and the obvious fact that she knew more about general relativity than I would be able to learn in a lifetime. I had to do something that would get her attention.

I invited her to come with me to visit old Los Angeles.

The month after the convocation is traditionally a time for vacation and independent study, before we went back to our individual lives, hiring out as Institute-bonded technicians or consultants or troubleshooters. I had no idea whether she'd be interested in a trip to OLA; it was a wild shot to try to impress her.

But her eyes had suddenly flared with interest, and, for the first time, she looked at me and actually saw me. "Old LA? Interesting. Have you been there?"

I didn't want to admit that I hadn't, so I temporized. "I know a good guide."

OLA was one of the most dangerous, and certainly the oddest, of the ecosystems on the Earth. Back at the end of the second Elizabethan age, the doomed city had been the home of a dozen or more gene-splicing laboratories, corporations that had made synthetic retroviruses to replace flawed DNA with custom-designed

synthetic, right inside the chromosome of the target organism. Other cities had such labs, too, of course, and Los Angeles hadn't even been the most prominent of them. Just the unluckiest.

The virus that had gotten free was a generic gene-splicer. It would copy snippets of genes at random out of any host organism it happened to infect. As soon as it vectored to another host, it would make a billion copies of itself, and of its copied DNA, copy the genes back into a likely spot in the genome of the new host, and then start over again from the beginning by grabbing a snippet of DNA from the new host. As a parting gift to the new organism, it would then trigger the cell's own enzyme promoters to express the DNA.

The fact that retroviruses copy DNA from one organism to another is a natural process, of course; just a part of the mechanics of evolution. The rogue virus had the effect of a million years of evolution, set loose in a single day: chaos.

Most of the additions to the genome were meaningless changes, genes which coded neither useful nor harmful proteins. Most of the changes that had effect were dysfunctional, and killed the hosts over the course of a few days or weeks, if they were lucky, or produced an explosion of cancers that killed the host over the course of months, if not so lucky. Over the course of the first year a great die-off occurred.

The things that survived were-- strange. The rogue virus had indiscriminately cut and pasted genes with no notion of species; what came out of the mingling were neither humans nor animals nor plants, but weird mixtures: predatory plants, octopuses with hands, tiger-sized raccoons that knew how to use guns, social bacteria that drew recondite, hypnotic patterns across deserted beaches.

The thrown-together quarantine barriers held, barely, and the hastily-mobilized scientific effort to combat the virus devised a specific antiviral protein that knocked out the rogue virus's ability to reproduce. The plague was stopped before it spread outside the boundaries of what had been Los Angeles.

Inside the hundred-mile ring, surrounded by scorched sand and silent, instant death, what had once been Los Angeles was still evolving toward a new ecosystem.

There was no place more deadly, or more strange. The retrovirus itself was gone, but the creatures it had spawned remained. You could go there, if you signed a waiver indicating that you knew the danger and were aware that there was no guarantee that you would come back.

The guide I had been told about was a mysterious survival specialist and weapons expert named Tally Okumba. Nobody, I was told, knew more about OLA, or about any of the odd, dangerous corners of the Earth, than Tally did; and nobody knew more about staying alive, on Earth or elsewhere.

"Old LA," Leah said. Her eyes were veiled, dreaming. "When do we leave?"

#

In the light of the dawn, Tally was dancing, high kicks, spins and backflips in the low gravity. Over her rebreather, her face was covered with a bone-white warpaint that, after a moment, I realized was an improvised sun-block. I watched her through the habitat's window, and wondered how long she had been at it. Her flexibility was astonishing.

Leah did not mention what she'd said the night before, and I didn't bring it up.

The task for the day was to gather up shards of the shattered habitat and as much of the wind-scattered contents as we could find. Leah and I worked mostly in silence, occasionally pointing out to each other pieces in the distance.

Aerial photos taken as we had landed helped locate the more distant fragments, but didn't substitute for plain, dogged walking.

The job took a lot of walking. The camp was located on the Syrtisian isthmus. This was a broad saddle that separated the Hellenian Sea from Gulf of Isidis, a bay of the Boreal Ocean which covered nearly the entire northern hemisphere of Mars. To the northwest the land sloped gently upward toward the Syrtis caldera, an ancient shield volcano, dead now for well over a billion years. An endless series of lava-etched rilles corrugated the landscape from northwest to southeast, each with a tiny brown stream at the bottom. The wind that scattered the pieces of the habitat had, in accord with Murphy's law, been crosswise to the rilles, meaning that we had to trek up and down innumerable gullies to collect the fragments.

"It must have been some wind," Leah said. "Blowing pretty constantly from the Hellenian Sea toward the Gulf, apparently."

The carbon dioxide atmosphere was still now, with barely a trace of breeze. By local noon we had made a large collection of pieces. I took a break and sat on a rock by one of the streams. The brook foamed as it rippled over submerged rocks. Amber bubbles clumped together, then detached and floated downstream. The stream looked like an alcoholic's vision of paradise: a river of ice-cold beer, flowing down into a lake of beer, emptying somewhere into a frigid ocean of beer--

"Well, yes--what did you think that the rivers are?" Leah said, when I mentioned the thought to her. She was wearing a makeshift sun-bonnet constructed from piloting charts; even with her face hidden by a rebreather and caked with burn ointment, she was stunningly beautiful. I wondered what it would be like to peel

off her winter garments, to make love to her right there by the stream. "By any practical definition, it is a river of beer. Yeast is an anaerobic microorganism-- the stuff that the ecopoiesis team seeded this planet with will ferment just about everything. Naturally carbonated, too: five hundred millibars of carbon-dioxide atmosphere is going to dissolve a hell of a lot of carbonation into the water at this temperature. I'd bet that if you brought a glass of that stuff inside it would develop a pretty good head."

"You mean I could drink this stuff?"

Leah looked at it critically. "Hmmm. You know, you just might be able to. Full of bacteria, I expect, but if our anti-biologicals aren't working, we're already dead anyway, so I doubt it's a problem. Tell you what." She looked up at me.

"You try it, and let me know."

I didn't.

By mid-afternoon, we had gathered as much of the debris as we could find. Everything that looked like it might have originally been part of the habitat pressure vessel, Leah set out in an array next to the site of the explosion. Each piece was numbered, and then Leah began fitting them together like a jigsaw puzzle.

"There are some minor pieces missing, but I think we've pretty much got everything important," she said at last.

I walked up behind her and looked at the neatly-indexed array of scrap. "What have you learned?"

She shook her head. "It doesn't tell me a story, yet." She picked up a piece and handed it to me. "Tell me what you think about this one."

It was a curved piece of aluminum, forty-centimeters long, somewhat bent.

"Exterior habitat pressure-vessel wall," I said.



"Right so far. What else?"

The piece had broken at a seam at one edge. Shoddy workmanship? Probably not; the other end had ripped jagged right across; the weld had probably never been designed for the stress it must have taken. It was bent in the middle. The jagged end had a scrape of paint on the raw metal. "Blue paint chips on the end here," I said.

"Right," she said. "And the bend?"

It took me a moment, but suddenly I saw it. "Bent the wrong way," I said. "It bowed in. The explosion should have blown it out." I thought for a moment.

"Could have been bent by the wind, later."

She nodded, thoughtful. "Possibility. There are other pieces bent the same way, though."

"How much overpressure would it take to bend it that way?"

"Good question," she said. "If we could figure the overpressure as a function of position, we can guess the locus of the blast. Turns out, though, that it doesn't take much blast pressure to make the habitat structure fail this way.

The pressure vessel was designed to hold an interior pressure; it's not well designed against an external overpressure."

"So, what do you think?"

"It might have failed in the rarefaction rebound following the overpressure of an explosion," she said. "Microstructural examination might tell. Might not."

"Or the explosion was outside the habitat." That would make sense. If somebody had wanted to kill the team, the easiest way to do it would have been to put a bomb next to the shelter.

Leah shook her head and chose another piece to hand to me another. "Carbon

deposits," she said.

I looked at it and nodded. The burn marks were on the concave side, the interior. "Fire after the blast?" I suggested.

She nodded, but slowly. "Could be, I suppose. But after the habitat breach, everything vents to the reducing atmosphere. Fire goes out pretty quick."

#

"If it was murder," Leah said, "Who might have done it?"

We were sitting back in the little conference room. My whole face itched now, despite the ointments that Tally had devised for sunburn. My face felt like I was still wearing the rebreather.

"Hard to say," Tally said. "I suppose either one of 'em might have had enemies.

If it wasn't personal, I've got a few possibilities. First, before they went, turns out they got a couple of anonymous messages saying not to go. The point was, Mars was property of Freehold Toynbee, and it was reserved for the Martians, however long it took them to appear. Humans were expressly forbidden to land."

"Toynbee!" Leah said. "They were dissolved more than a century ago. Bankrupt and sold for scrap. Besides, lots of researchers have visited Mars."

Tally nodded, slowly. "A century ago, yes. I doubt anybody been here in the last hundred years, though, except our poor friends. Seems hard to believe anyone would still care. A nut, I'd say. Still, a nut might be what we're looking for."

"And the other possibilities?"

"Turns out that there are still some people," Tally said, "as think that ecopoiesis is usurping the role of God. And some as think that ecopoiesis is, or was, a crime against the ecosystem. And there's been talk that if Mars could be

triggered, then other planets, in other solar systems, could be. Some of these have life of their own, incompatible with terrestrial life. So, some radicals, they don't want Mars studied. They're scared that any studying of Mars is a step to triggering planets in other solar systems. There are those as would like to stop that. Stop it early, and stop it at any cost.

"And, finally, there are those as worry about Mars, worry that this ecopoiesis might just be another LA waiting to happen." She shrugged. "Me, I rather like old LA. Got that kind of raw charm you don't see much in other cities nowadays. But I know that not everybody thinks like me."

"I see," said Leah. "And which of these would have set a bomb?"

Tally shrugged. "Any of them. Or all of them, working together."

"Working together? Logically, the Toynbees and the eco-radicals are enemies."

Tally smiled. "Logically, we're not precisely talking rational people here."

"So what do we have?"

"See, are we even sure it was a bomb?" Tally said. "Tinkerman, you find any suspicious pieces of pyrotechnic?"

I shook my head. "Nothing yet. But I don't know much about bombs. I might have missed something."

"Me neither," Tally said. "And I do know about bombs, I do. A bit."

#

Leah Hamakawa was completely opaque to me. I never had a clue what she was thinking, what she felt or thought about me. Sometimes her gaze would wander over me and stop, and she would look at me, not with a question, not with an invitation, just a look, calm and direct. I wished I knew what she was contemplating.

I wished I knew why I was so attracted to her.

The trip to Old LA had been a cusp in our relationship. On the trip we had just been fellows, co-adventurers and nothing more. Afterwards, Leah accepted the fact that I tagged along after her as just a facet of the environment, hardly worth commenting on. We're not, actually, a team, although it must seem like it to others. Leah was the hotshot scientist, and, well, every team needs a tech and a pilot.

Eventually she had noticed.

"Look," Leah had said. "You're as skittery as a colt, you're stammering, I can't get one full grammatical sentence out of you in a cartload, and you're so nervous I'm sure you're going to break something. Do you want to sleep with me? Is that it?"

Her gaze was direct. It was always direct.

I couldn't say anything. I had trouble closing my mouth,

"If you do," she said, "fine, do it, or don't do it, I don't care, just will you quit stumbling around."

And, later, after she'd taken off her clothes, she said, "Just don't think it means something, okay? I couldn't stand that."

But it did. Maybe not to her, but to me.

And so we came to Mars. When the authorities had finally noticed that the missing science team had stopped filing status reports to Spacewatch, and the orbital eye they sent to report got a break in the heavy Martian cloud cover and saw pieces of the habitat spread across ten kilometers of landscape-- a "presumed fatal malfunction," as it was reported, Spacewatch had asked for Leah; she had a rep for unraveling tough balls of fur, and I scrambled to rate the slot to go along. Not that this was so hard; I had my skills, piloting and

mechanicing and, yes, troubleshooting, and most crews were glad to have me aboard. In this investigation, the third slot on the team was special, in case the accident we were investigating was no accident at all, and the perpetrators might not be finished. The third slot needed a professional paranoid.

We both knew exactly the survival expert who was right for that place

"Still hanging 'round with that long-legged white girl, I see," Tally had greeted me, when I came to ask if she wanted to join the team. "Give it up, boy, she's too good for you."

"Don't I know it," I'd said.

But that was the past, and brooding over the past wasn't going to get me to bed, or explain Leah Hamakawa to me. She had undressed without the least trace of self consciousness and gotten into the cubby's tiny bed. I undressed, with a lot more trepidation, and lay down beside her. She turned and watched me with a pellucid gaze, free of any emotion I could interpret. She wouldn't let me understand her, but for whatever reason of her own, she would let me love her. For the moment, that would have to be enough.

#

The next day I worked on decoding the data from the damaged opticals, while Leah put together the jigsaw puzzle of the exploded habitat pieces, and Tally ranged in ever wider loops from the habitat, exploring. I succeeded in getting large blocks of data, but nothing was of any evident value: lengthy descriptions of bacteria, lists of bacteria count per square millimeter in a hundred different habitats.

"Here's something," Leah said. "Take a look at my collection of pieces. What's missing?"

I looked over the junk pile. Skin, electronics, window fragments, plastic shards. "What?"

"Don't you see it? Aluminum, titanium, carbon-composite, plastic-- anything missing here?"

Now that she had given the hint, I could see it, too. "Steel. Nothing out of steel, or iron. Is that surprising? Steel's heavy." Hardly anything in a space-going technology is made out of steel. In space, every extra gram is paid for over and over again in fuel.

"There's not a lot of steel on a hab module," Leah said, "but there is some.

Look around our hab, not everything is made of the light metals. But, no steel in the pieces here. And, take a look here." She chose a piece out of the pile and handed it to me. It was a damaged recording unit. The capstan flopped loose in the absence of the steel axle it should have rotated on. She handed me another, a piece with a neat hole where a steel grommet should have fit.

"Does that mean anything?"

She shrugged. "Who can tell? Probably not."

"Any steel fixtures hold pressure?"

Leah shook her head. "I checked the plans. No, all the iron and steel parts are incidentals. No steel penetration of the pressure hull."

Tally came back from her scouting, and looked at us both. "You are working too hard," she said. "It's time for a break. Way past time, you ask me. And I know just the thing."

"What do you have in mind?" I asked.

"Here." She handed me a sheet of aluminum. It was about a meter long, slightly curved, one side coated with a carbon composite facing. In a corner "117 Outer" was written in Leah's neat printing. A panel from the outer skin of the exploded

habitat. A mounting flange with a hole for bolting interior fixtures was at one end. She handed another one to Leah. "Sure you don't need these panels, now?" she asked Leah.

"Already looked at them." Leah shook her head. "That was the side opposite the explosion. Nothing but junk, now."

After we had suited up for outside and smeared one another's faces white with sunblock, we each took a panel, and Tally led us up to the top of the ridge that rose above the habitat. The hill surface was comprised of sand held in place with a thin veneer of purple-brown algae, slick as powdered Teflon. We had to choose our footing carefully to avoid skidding back down.

It was a gorgeous day. From the ridge, the marscape appeared striped, brown and purple strips in alternation all the way to the horizon. The purple was the algae, covering the sunnier face of each ridge; the brown anaerobic scum colonizing the shadier back face. The characteristic north-south wind pattern was clearly manifest in the form of long streaks trailing behind each of the larger boulders. Today, though, the wind was once again slight, erratic light gusts of no fixed direction.

We reached the top, and Tally smiled. She threaded a lanyard through the bolthole on her aluminum sheet, dropped it on the ground, and put one foot on it. "You might try this sitting down first," she said. Holding the lanyard in one hand like a set of reins, she pushed off down the hill.

At first she didn't move very fast. As the sled gathered speed, each bump sent it increasingly higher. Her balance seemed precarious, but in the one-third normal gravity of Mars, she had plenty of time. As she leaned to control the sled, her movements were a slow-motion ballet. We could hear her shout, muffled

by her rebreather, trailing behind her.

"Yahoo!"

I looked at Leah. She looked back at me, then shrugged. She dropped her sled on the ground and pushed it with her toe, testing how well it slid over the scum.

Then she sat down on it, grasped the lanyard with both hands and pulled it taut, and looked back over her shoulder. "Give me a push," she said.

It took a little more skill than Tally had let on, but after a few spills, we got the hang of it, and organized scumsledding races. Tally on one sled and Leah and me together on another, then Leah and Tally together, then finally all three of us on one sled, Leah and I sitting docked together and Tally standing with her knees gripping my chest from behind.

At a rest break, sitting exhausted from climbing, I said to Tally, "So this means that you think there's no danger? I mean, nobody trying to kill us?"

"Never said that." Tally shook her head. "No, I'm not about to be calling all-clear, not quite yet. But I'm pretty sure that there's no danger right exactly this instant. Not unless these killers are invisible and don't leave footprints." She paused. "And, 'sides," she continued, "this is pretty much the tallest ridge in the area. If they were coming for us, we'd see 'em miles away."

"But what if we did? What could we do? We'd be sitting ducks."

Tally grinned a broad grin. "Sitting ducks, you say? Take a peep that ridge over there." She pointed.

I looked. Nothing special, no different than any other ridge. "So?"

I had glanced away for only an instant, but suddenly Tally had an omniblaster in her right hand, a knife in her left, and a projectile rifle with an infrared targeting scope resting at her feet. I had no idea how she could have concealed



such armament on her.

"How bout you?" she said. "Don't tell me you're naked?"

I was far from naked--the temperature couldn't have been more than a few degrees above freezing-- but I wasn't carrying a weapon.

"Didn't I tell you to always wear a gun?" she said. "Dangerous out here. Who knows who might want to shoot you?"

"Carry an omniblaster? No, I don't think you ever told us that."

"Yes I did. Told you both. Back in OLA." She paused for a second. "Shit. I bet Leah's walking around naked, too." She shook her head. "You two just a bunch of children. I'm surprised you've lived this long, I really am."

"Say, look," said Leah, coming up behind us. "The sun's out."

We both looked up. The sky had been steadily overcast ever since we had landed, but the clouds were breaking up, and between them we had a glimpse of the sun.

"Take a look at that sky!" Tally said. "Isn't that gaudy!" Behind the clouds, the Martian sky was a startling blue, a bright, nearly turquoise shade that I'd never seen on Earth. I couldn't think of a reason offhand why the sky should be a different color, but, naturally, Leah could.

"Methane," she said, after a second of thought. "After carbon dioxide, methane is the main atmospheric component here. Strongly absorbs red light, so the sky color is a deeper blue than just the Rayleigh scattering would predict."

"Oh," I said.

"Explains why the colors here are so muted," Leah said.

With the sunlight, the wind had picked up as well, a steadily rising wind out of the north. Suddenly the coveralls we had on weren't enough to keep us warm. We ran for the habitat.

#

The overcast had cleared completely the next day. The sky was preternaturally blue, and the wind had become a steady near-gale from the north. Leah and I worked inside. Tally still did her reconnaissance patrol outside, but I think that even she must have spent much of her time huddled in the wind screen of one or another of the boulders. Now we knew what had scattered the pieces of the habitat.

The missing iron, as it turned out, wasn't a mystery at all. Once Leah realized what to look for, she found it easily enough, in the form of grit scattered in with the rest of the habitat pieces.

"It's a sulfur rich planet," she said. "I should have thought of it. In the year and a half of exposure, everything iron or steel got converted to iron sulfide.

It looked just like part of the regolith, so I overlooked it the first time."

"In just a year?" I asked. "Isn't that kinda fast?"

Leah shrugged. "Seems fast to me, too, but don't forget the UV. The surface here is more reactive than we're used to."

I worked on deciphering their electronic records. They hadn't kept personal logs, or perhaps if they had, they were on some optical I hadn't found yet. The opticals I had were mostly data, with occasional notes about where or how the samples were collected. By afternoon I had enough to determine when the last data had been recorded, and could at least put a date to the disaster.

"Sometime on August tenth," I told Leah. "Two years ago."

"Really," Leah said. "That's interesting."

"Interesting?" I said. "Not really. But you asked me for a date."

"No, but it is interesting," Leah said. "Today is June 23rd."

"So?"

"That's Earth reckoning, of course. The Mars year is 687 Earth days long-- one year, ten months and a few weeks. So, in Mars reckoning, it's nearly the first anniversary of the disaster. Five days from now, in fact."

"Spooky," I said.

"No, I wouldn't call it spooky," she said. "But it is an odd coincidence."

I marked it on the calender.

I liked working alone with Leah, with Tally outside on patrol. I didn't exactly resent Tally, but I did sometimes envy her effortless camaraderie with Leah. I welcomed the chance to be alone with her, even though, for the most part, we worked in silence.

"Tinkerman," Leah said.

"Yes?"

"Once you start getting the data you've recovered indexed, do a search on weather for me."

I shrugged. "No problem." I looked at her. "You think it's relevant to the investigation?"

She shook her head. "Just curious."

They had, I discovered, not taken detailed observations of the Martian weather. But occasionally there was a mention of conditions outside. Their own experience mirrored ours. About the same time in the Martian year, the overcast had cleared, and a steady wind had arisen out of the north. The day before the disaster, data had been marked with a note that samples from two sites had been missed; the wind had blown away the stakes marking the site locations. On another optical I found satellite photos of Mars. I looked at these with interest. The weather clearing we'd seen wasn't local to the Syrtisian saddle;

the photos showed the northern hemisphere completely obscured by cloud cover, and then a sudden clearing across the entire hemisphere. The view must have been an infrared falsecolor, since the ocean was white and the land areas, in contrast, looked nearly black. I checked the dates on the photos, and converted them in my head into Martian season. The clearing started at just about the end of northern hemisphere spring.

Leah nodded when I showed her what I'd recovered. She'd already radioed up to ask Langevin for orbital photographs, and he'd confirmed that the clearing of the clouds we'd seen was ubiquitous, starting with breaks in the cloud cover at northern mid-latitudes, then slowly spreading south. "Apparently it's a seasonal thing."

Langevin had also mentioned that the rover had arrived, after a long slow transit from the Moon. Did we still want it? Where should he set it down? Oh, yes, we still wanted it.

#

"Time for a vacation!" Tally said, when the unpiloted utility lander had dropped the rover off and I had checked out the systems and declared it fully functional. The rover was the same awful shade of yellow-green as the lander had been, a color chosen for maximum contrast against the browns and purples of Mars. It had six webbed wheels mounted on a rocker-bogey suspension that would give it incredible hill-climbing ability; I had little doubt that it would have been able to crawl right over the hab-lab, if an incautious pilot had tested poorly on navigation. I said as much to the team after the brief test drive.

"Are you seriously suggesting that the habitat was crushed by a rover?" Leah said. "No tread marks were found on any of the pieces we found."

"A rover would have left tracks," Tally said. "Even after two years, we'd have

see them."

I shook my head. "No," I said. "I was just giving an example of how robust the suspension is."

"I see."

"So," Tally said. "Time for a trip."

"A trip" Leah said. "Why not? Where did you want to go?"

"Why not go the beach?" Tally said. "Head north. See what a Mars ocean is like."

"Mmm," Leah said. "Not today. I'll still be busy tomorrow, too, I think. Maybe the next day."

"Copacetic," said Tally. "I wouldn't mind a day to do some long-range recon with the rover, anyway. That is, if Tink says it's checked out okay?"

"All systems in perfect shape," I said. "No reason for you not to drive around a bit."

A lot of the work Leah asked me to do seemed to have nothing to do with the investigation of the accident. She was conducting her own investigation, I decided, a scientific investigation of the progress of terraforming-- no, ecopoiesis-- on Mars. She had me decipher all the data I could out of the opticals; data on bacteria counts and atmosphere, and checked it against the measurements she could make herself. "Cripes, I wish I were a biologist," had become her favorite phrase, muttered as she stared into the screen of a microscope, counting bacteria, but she was clearly happy doing the work, and I was happy to assist, to do anything that made Leah happy.

More methane in the atmosphere, she said, at a break. Some ethane, ethylene, even acetylene. And quite a bit more oxygen than expected.

"Oxygen and methane? Isn't that explosive?"

"No, oxy is still way under one percent; all in all, it's still mostly a reducing atmosphere. The hydrocarbons are all greenhouse gases."

"Gaia," I said, suddenly realizing what she was getting at.

"Gaia," she agreed, a soft smile creeping slowly across her face. The bacteria were producing greenhouse gases, warming the planet up. Making it a better abode for life.

#

I was getting bored with the claustrophobic spaces of the habitat, and the sameness of the landscape, and I was sure that Leah and Tally were as well. We were all looking forward to the jaunt north to the shores of the Boreal ocean.

So I was rather surprised when, at breakfast on the morning designated, Tally shook her head, and said, "It'll be just you two loverbirds. I'm not coming."

I pretended interest in my food. I never could guess how Leah would react. For me, the idea of a trip in the pressurized rover, a thousand-kilometers alone with Leah, was as close to heaven as I was likely to ever find.

"Why?" Leah said.

Tally smiled. "A trap."

Despite assiduous searching, Tally had found no evidence whatsoever of sabotage. Anybody else would have said, that means it was an accident. Tally said: that means that they were clever.

We made a great show of our departure, deliberately packing the rover slowly and openly with all the supplies for three people to take an extended trip. Then all three of us got in. From outside, through the bubble canopy, it would be clear that three people were in the piloting compartment, eagerly watching the terrain.

It would be impossible to tell that one of the three was no more than a dummy constructed of spare clothing.

Once aboard, I powered up the rover, and it rose up from its squatting position to its full height above the Martian terrain. I checked all the systems one more time, testing each wheel in turn for forward and reverse power, making skid-marks through the brown grit and tossing muck across the landscape. The bacteria would not care; they would thrive in one spot quite as well as another.

If somebody had bombed the first habitat, and was clever enough and subtle enough to betray no sign of themselves, they must be flushed out of hiding. They might be complacent enough to try the same trick again, if they were thoroughly convinced that nobody was watching. Tally wanted to give them that chance. Tally wanted to watch them set the bomb.

Systems all functional. I had a wild urge to wave goodbye to Tally, but that would never do. We set off with no ceremony.

#

For hundreds of kilometers we looked at brown rocks, covered with a thin veneer of slime.

The wind got stronger as we drove north toward the ocean. The landscape was monotonous; rocks and rilles and tiny rivers, broken by lakes, each lake in the form of a perfect circle, reflecting the too-blue sky. To our left, the ground sloped gently up toward the ancient volcano whose flanks we were skirting. The actual summit of the volcano was invisible over the horizon. When we crossed the peak of the Syrtis saddle the wind was coming straight at us at well over a hundred kilometers an hour. It was enough to slow the rover's progress

considerably, and at places I almost worried that the wind would pick us up and blow us backwards, but the rover's six huge wheels held traction superbly, and kept us moving.

Once across the pass, the wind dropped a bit, but never let up entirely. It was constant, unwavering from the north.

The rover drove itself, if we let it, with infrared laser-stripers searching out obstacles in front of it and a mapping program in its computer brain that continually compared the view against the inertial navigation and the stored satellite maps, to compute an optimal traverse across the rippled terrain. For most of the first day, Leah and I took turns driving, following the computer's suggested path sometimes, diverting to a different route that looked smoother or more interesting when the whim struck. By the afternoon, the novelty of the drive had slackened, and we let the rover pick its own path.

Langevin had left Mars orbit days earlier, but he had left behind him a little areosynchronous communications relay, so we could have stayed in touch with Tally at the habitat if we had desired to. We kept radio silence, though, by agreement: Tally had said that we should assume that any radio communications we made would be heard by the enemy. The relay had enough power to let us send reports directly to Spacewatch. We transmitted our daily report back, essentially just a "yes, we're alive" verification, and in the report we included a recorded snippet of Tally's voice, to maintain Tally's deception to her hypothesized snooping ears.

In the middle of the afternoon, the rover crested a rise and angled off to the west, finding a smoother traverse down the slope to avoid a field of boulders the size of skyscrapers. Leah was in the aft cabin, analyzing data she had brought with her, and I was alone in the cockpit. At first I didn't know what I



was seeing, looking north. The horizon was white.

This was the highest ridge between us and the ocean, so, looking north, I ought to be able to see the ocean. Was the ocean covered with ice? I overrode the autopilot and parked the rover for a moment, rummaging for binoculars to get a better view. Leah came up from the cabin.

"The ocean's white," I said.

"Odd." Leah looked at it, pondering. "Not ice; it's nearly northern summer, and the ice melted months ago. Whitecaps, from the wind, maybe. We'll see soon enough, if we keep driving."

I took that as advice, and brought the autopilot back on line. The rover started to roll. Leah reached out an arm to steady herself against a handbar, and kept on standing, looking out the bubble at the horizon.

We didn't reach the Boreal Ocean that evening. The autonavigation on the rover was perfectly capable of continuing its traverse after dark, but we were no more than thirty kilometers from the ocean, and we elected to shut down for the night, so that our arrival at the ocean would be in daylight.

After nine hours of motion, the cabin still seemed to rock with the motion of an imaginary traverse, although I had squatted the rover in the lee of a hundred-meter escarpment.

The workstations of the aft cabin folded away into panels on the walls, and two narrow cots folded out from the bulkhead, transforming the cabin into a small but cozy bedroom. I looked at the cots, and at Leah. The cots were narrow, but looked like they might be wide enough for two, if the two slept close. Leah gave me no hints. I folded the second cot back into its niche, and convinced myself that I saw just the faintest trace of a smile on Leah's face. In any case, she

slid over silently, and I nestled myself in next to her.

We reached the ocean a bit before noon of the next day. The final few kilometers was a steep traverse down the bluffs, not quite steep enough to be called cliffs, but steep enough that the rover picked its way slowly, sidling nearly crabwise down the last few hundred meters. There wasn't much of a beach; just rocks. From above, the ocean was white. It moved with something more than just the rhythmic swell of waves. It writhed, and humped, looking almost alive. As we got closer, a fine spray peppered the bubble in erratic spurts. The spray dried to milky white flakes, smearing but not totally obscuring the view.

"Salt?" I said.

Leah shook her head. "Magnesium sulfate, mostly," she said. She spoke louder than normal to be heard over the whistling of the wind and a sudden patter of spray. "The ocean's got tons of it. It's another reason the ocean doesn't freeze solid in the winter; lowers the freezing point a few degrees."

I squatted the rover down behind a boulder, where it would be out of the worst of the spray, and we suited up with rebreathers and sunblock to go outside.

Outside, the constant wind was warm and damp. Between the wind and the spray, I think that it was the most miserable place on Mars. Leah, though, laughed and ran like a little girl, arching her back and spreading her arms, daring Mars to do its worst.

I took off one glove, raised my hand and caught a bit of spray on my fingers, then pulled up my rebreather mask slightly to put it to my tongue. It was slightly bitter. Leah looked back at me over her shoulder, and laughed. "Don't eat too much of it," she shouted.

"Why?" I shouted back. "It's not poisonous."

"You might regret it," she shouted back. "You know what they used magnesium

sulfate for in the old days?"

"What?"

"Laxative for infants! You're standing right next to the universe's largest dose of baby laxative!"

With that she turned back, and started to pick her way past the rocks toward the ocean. I scrambled to catch up with her. I could hear the ocean now, but it wasn't the rolling of waves that I heard. It was a stranger sound, hissing and popping and splatting.

In a few moments we reached a final set of rocks, right at the edge of the ocean, and at last we could observe what we had been unable to see from further away.

The ocean was boiling.

From the pools at our feet to the farthest horizon, the entire ocean was aboil, bubbles rising up and breaking, spattering spray everywhere. Enormous bubbles rose burping out of the depths with a thunderous roar followed by a tremendous splatter; smaller bubbles rose with blurps and pops from everywhere; infinitesimally tiny bubbles fizzed and hissed in rocky pools.

An huge bubble burst in front of us, not five meters distant, and I instinctively flinched, anticipating being hit with scalding spray. Leah laughed with delight. She pulled her glove off and, when the slosh came toward her, bent over and dipped her bare hand into the boiling water. Before I could scream at her, she cupped a handful of water and, with a grin so large I could see it even behind her rebreather, she dashed it in my face and giggled.

The water was lukewarm.

#

When we got back in the rover, our coveralls were so stiff with dried spray that it was difficult to peel them off. Our faces and hands were red from the wind, and itchy with dried ocean. Leah was still in her puckish good mood, and as we peeled down to undergarments, she was laughing.

"You know what?" she said, pulling off her rebreather, and she didn't bother to wait for an answer. "You know the great thing about it? Makes it worth the whole trip?"

"What's that?"

"You don't stink!"

I opened my mouth to say something, and suddenly realized she was right. The stench of Mars that we had gotten so used to every time we came in from the outside, was missing.

"What a great planet," she said.

We both stripped, and gave one another sponge baths. The water recycler would have the devil of a time pulling sulfate out of the water, but that was what machinery was for. I took a lot longer cleaning her off than I had any right to, and with one thing leading to another, it was nearly dark before either of us dressed.

I knew she was waiting for me to ask. At last I did. "Leah? The water was warm, but it wasn't hot. Why was it boiling?"

"That's an easy one. It wasn't."

"But--"

"Carbon dioxide," she said. "I should have known, but it wasn't obvious until I saw it. Mars has mostly carbon dioxide in the atmosphere, so it should have been obvious that the oceans would be saturated with dissolved CO-two. It wasn't boiling-- it was fizzing."

That made sense, all but one thing. "But, wouldn't it be in equilibrium? Why should it be fizzing?"

"Summer. The ocean is warming up in the summer sun. Carbon dioxide has a solubility in water that strongly decreases when it gets warmer. So, as summer comes to the northern hemisphere, the Boreal ocean releases carbon dioxide."

"Oh."

And it wasn't until the middle of the night that she suddenly stiffened and sat bolt upright. "Oh," she said, in a tiny voice. I opened my eyes and watched her sleepily. "The wind," she said. "The wind."

She got up, and in a moment there was a glow as her computer came alight. She was beautiful, limned in pale fire by the glow cast by the screen backlighting.

"What is it?" I said.

"Nothing. Go back to sleep."

"It must be something."

"Just-- I had a thought, that's all."

"What?"

"I wonder." She bit her lip. "Just how much carbon dioxide, exactly, do you think is dissolved in the Boreal Ocean?"

By the time the sky started to brighten with dawn, Leah was distinctly bedraggled, but she had it mostly worked out. The answer was, a lot. A hell of a lot.

Over the long Martian winter, the temperature of the northern ocean dropped to near freezing, and the ocean had served as a sponge for carbon dioxide. A peculiar convection served to stir the ocean as it cooled: as the surface layers cooled and became saturated with carbon dioxide, they got denser, and sank,

turning over the ocean until the entire ocean was uniformly cold and saturated with carbon dioxide.

When the spring began, the surface layers of the ocean warmed up, and the dissolved carbon dioxide began to come out of solution. But the warmer water, free of its heavy carbon dioxide, stayed on the surface; the cold, saturated water stayed below. With only two tiny moons, there was little in the way of tides to stir the deeps. The water got warmer, but in the deep water, the dissolved carbon dioxide was under pressure. The water warmed a little, but the supersaturated carbon dioxide stayed in solution.

But it was an unstable situation, and ever more precarious as the season moved toward summer. Eventually, something must trigger the inevitable. Somewhere, a little of the carbon dioxide came out of solution, at pressure, and formed bubbles. The bubbles stirred the water, expanding as they rose, and the stirring let more carbon dioxide out of solution. The warm surface waters turned over, and supersaturated cold waters from the depths warmed up. Like a chain reaction, the release of supersaturated carbon dioxide was almost explosive, and it took only days for the reaction to spread across the entire width of the Boreal ocean. A whole winter's worth of atmosphere was coming out of the ocean, and coming out with vigor.

The wind. We had felt the wind from the ocean, a clue blowing right in our faces, and we'd ignored it.

"They weren't murdered, Tinkerman," Leah said. "They were-- my god, Tally's still back there, in the habitat. She doesn't know-- The radio. We can get her on the radio, warn her."

"Doesn't know what?"

"I'll explain everything when I talk to her. Quick, what day is it?" She grabbed

my calender and looked at it. In neat letters, on the bottom corner of the square marked June 28, I had completely forgotten that I'd written a note: One Martian year. RIP.

But Tally didn't answer the radio, not the regular channels, not the emergency channel.

"Damn," I said. "It's Tally and her blasted radio silence. She won't answer."

Leah shook her head violently. "I know Tally better than that. She would listen to the emergency channel no matter what, and she'd answer when she heard us break silence. Tinkerman, I think the wind must have torn away the radio aerial. The hab was designed for space, not for Mars, and the antenna wasn't that strongly mounted. Probably blew over the high-gain antenna as well. "

"So?"

"So how fast do you think this thing can go?"

It took longer to get moving than I had expected. The autonavigator wouldn't come on line. Over the night the spray had fogged over the lenses of the laser stripers, and the autopilot wouldn't budge without its obstacle-recognition system working. As I took the rover up the bluff on manual control, climbing only centimeters at a time over the rough spots, Leah fidgeted with clear agitation, but she stayed silent, knowing that distracting me from piloting would only slow us down. As soon as we had climbed a few hundred meters above the ocean, I put on a rebreather and, using half our supply of clean water, I carefully washed the laser striper and the bubble.

The steel parts of the rover looked matte, almost corroded. When we got back, I would have to take the rover down for inspection and overhaul. In fact, I would have preferred to do a thorough inspection right then, but I knew Leah wouldn't

let me stop for that. The rover's autodiagnostic checked out green, so I put the autopilot back on line and punched for speed.

There was nothing more we could do. There was no way that I could out-pilot the autonavigation system over a course it had run before; it had all the bad terrain memorized in detail and had learned exactly which parts to detour around and which were smooth running. The ride was bumpy, but that was only to be expected. I turned to Leah, and waved a hand.

"I'm ready to listen," I said.

#

"It was all there in front of us," Leah said. "All the clues, if only we'd really seen them. The pieces of the habitat, that should have tipped us off right there. The habitat modules, they weren't originally designed for Mars. We knew that. Nobody ever goes to Mars, so how could there be hab modules designed for it? It's a lunar habitat design.

"The air pressure on Mars is five hundred millibars, just about half that of Earth. So we set the pressure in the hab to five hundred millibars, and forgot about it. With a nearly fifty-fifty mixture of oxygen and nitrogen in the air mixture, the oxygen in the habitat was just what it is at standard conditions, and after a week I bet you didn't even remember that it wasn't Earth standard.

"But there's one critical difference. Lunar habitat modules are designed to withstand pressure from the inside. They're plenty strong, against internal pressure. But what about external pressure?"

"It imploded."

"Right. The air pressure on Mars is not a constant! All that gas dissolved in the northern sea-- when it comes out of solution, the air pressure rises. It rises a lot. The wind, that constant wind from the north-- that was our second



clue. The habitat was set to maintain a constant pressure of five hundred millibars inside. Nobody ever designed it with the idea that the outside pressure might increase. Somewhere there was a weak joint, maybe a seam that wasn't reinforced against an unexpected pressure from outside. It blew."

"But there was an explosion. We saw the marks."

Leah shook her head. "You saw the piece, the one with the tiny scrape of blue paint on it. What does blue paint mean to you?"

I only had to think for an instant. "Blue. Oxygen."

"Right. The implosion must have punctured an oxygen tank in the habitat. Pure oxygen, under pressure, spurting out into the Mars atmosphere.... the Martian atmosphere is mostly carbon dioxide, but a good component is methane, and it's got noticeable amounts of other hydrocarbons as well. In a pure oxygen leak, of course it will burn."

"It must have happened at night," I said. "They never knew what hit them. The one man was killed instantly. The other was tossed out of the hole in the side of the habitat, without a rebreather, to die of suffocation."

Leah nodded. "And now the same thing is happening. The atmospheric pressure is rising. Tally's there in the habitat, alone... and she's waiting for the wrong enemy."

#

We were over the peak of the Syrtis saddle and a good way into the long, slow downhill toward the Hellas basin, only a hundred kilometers from the hab, when the wheel fell off. Leah was on the radio, in the unlikely hope that perhaps the synchronous relay was the problem, and now that we were approaching line of sight conditions, direct communication might raise Tally. The wheel came off

with a resounding snap, and the rover lurched.

The autopilot diagnosed the problem, instantly rebalanced the suspension to keep the weight away from of the missing wheel, and smoothly braked us to a stop, blaring alarms.

The alarms were a little late.

We both went outside to look. It was the right rear wheel that had failed; we found it a few dozen meters further on, where it had rolled up against a rock.

The wheel itself was a titanium-alloy mesh, light enough to carry in one hand, for all that it was nearly two meters in diameter. The wheel bearing was steel.

Or, it had originally been steel, when it had been there at all. There was little left of it.

"Well," Leah said.

"Well," I said. There was no way to replace a wheel; they weren't supposed to come off. "I think maybe we can rebalance the rover. Shift the loading to the front left side. Five wheels ought to be enough. We might have to go a bit slower."

Leah nodded. "It's a plan."

We piled rocks onto the rover, and strapped them down with bungees, to move the center of gravity forward off of the missing wheel. Then we piled more rocks inside the rover, in the front left pilot's seat. I didn't mention that we would never get the Mars stink out of the rover; it was too late to worry about that, and we barely noticed it by then anyway. The autopilot refused to budge so much as a meter without an overhaul, so I piloted it on manual. This was good for less than a third the speed of the autopilot, but still, even that pace covered ground. Leah went back into the aft cabin to examine the samples she had scraped off of the wheel.

It was only a hundred kilometers. We finished more than fifty of them before the second wheel fell off.

We were going more slowly this time. There was no lurch, and no noise. The rover just slowly careened to the right, and kept on rolling until it slid to a stop on its side.

Leah came out of the hatch after I did. She didn't bother looking at the axle, or at the rover. No need; it was obviously not going anywhere, even if we had a crane to put it back right-side up. The rocks we had piled onto the rover had cracked the bubble when it rolled. "Sulfur-reducing bacteria," she said.

"Say again?"

"Sulfur-reducing bacteria," she said. "Convert iron to iron sulfide. There's energy in free iron; in the presence of free sulfur, enough energy for a bacterium to exploit. The lack of iron at the site; I should have figured that ordinary weathering wasn't enough to account for it."

"Oh," I said.

"Not that it matters now," Leah said. "We don't have time to waste. We've got to get to Tally and warn her." With a matter of fact attitude, she hopped up onto a rock and stared across the horizon. "So how far do we have to walk?"

I tried the radio one more time. Come on, Tally. What was she doing, I wondered.

Did she even know that the antenna was down, or did she just think we were scrupulous in keeping radio silence? Was she standing at the door of the habitat with a gun? Hiding behind the rocks, waiting for enemies that would never come?

If only she would answer, it would only take an instant to tell her about the dangerously low habitat pressure.

Fix the antenna, Tally, I thought, just fix it, and listen to the radio. But she

wouldn't. Fixing the antenna would be too obviously a sign that the habitat was still occupied. I threw down the radio.

The inside of the rover was a mess, but we managed to scrounge two spare sets of replacement packs for the rebreathers. I downloaded the bearing to the hab out of the rover's computer, and set the inertial compass. Once we got close, we would be able to use the habitat's come-hither beacon to home in. I grabbed a set of portable radio transceivers and checked that they were working. I couldn't think of anything more to carry. Before we left, Leah snipped two pieces of titanium sheeting away from internal partitions of the rover, and snapped them free.

"Ready," she said.

We ran.

The Mars gravity makes it easy to run, and the unwavering wind was, for a change, on our side. Still, after an hour of running I was winded, and the second hour was more trudging than running. Our cold-suits trapped sweat all too well, and it ran down my back and down my legs, like ants with clammy feet.

Mars narrowed in on us. Ridges, followed by valleys; valleys followed by ridges.

Another hour.

"Bear further to the right here," Leah said.

"That's not the most direct route."

"I know."

We were walking pretty slowly by now. Her route followed the contour, instead of cutting downhill, and was a bit easier, even if it was less direct. I was beginning to worry that we wouldn't make it to the habitat by nightfall. It would be impossible to continue after darkness fell--Mars's moons shed almost no useful light--and by the morning, we couldn't even be certain that the habitat

would still be there.

In another hour we had reached the edge of a long downhill. There, tiny in the distance was a glint of metal: our goal, the habitat.

It was impossible to tell from the gleam whether it was still in one piece.

Without a word, Leah handed me one of the two sheets of titanium. I looked at the downhill. It was a long, smooth grade, with the usual cover of Martian slime. I grinned, and Leah grinned back at me, her face in the rebreather mask like some painted mechanical demon, and then we both stood on our sleds, grasped the lanyards, and, at the same moment, pushed off.

We would arrive in style.

#

My sled skidded to a stop in a spray of slime a hundred meters or so from the habitat, and Leah stopped close behind me.

The habitat was apparently empty. But at least it was still apparently in a single piece. I ran toward it, shouting for Tally. I reached the airlock, and was just reaching out for the handle when I felt the gun pushed gently between my shoulder blades.

"Moving real slowly, friend, keep your hands in sight, and turn around. Slowly."

Tally was painted the same color as the Martian slime, bits of sand and rock sticking to her randomly. The projectile rifle was in her left hand, aimed steadily at my middle. I could see the crinkling at the edges of her eyes as she smiled behind the rebreather. "Tinkerman. Welcome home."

She lowered the gun, and turned to greet Leah. "Didn't expect you to come back on foot. What brings y'all back so sudden?"

"The air pressure," Leah said. "It's going to--"

"Yeah," Tally said. "I noticed something going on with the air. Could feel it in my bones, like a thunderstorm. Fact, I had to dial up the pressure in the hab three times in four days."

Leah stopped, thunderstruck. "You increased the hab pressure?"

"Why, sure," Tally said.

We just looked at each other.

"What?" Tally asked. "Something wrong with that? I figured that if the hab pressure wasn't increased, there could be trouble."

Leah shook her head. "No, nothing wrong. Nothing at all."

#

It was our last night on Mars. We had filed a preliminary report with Spacewatch, and in the morning, Langevin would bring the lander down to take us home.

I was looking out the tiny window of the hab at the Martian landscape. In the evening twilight the browns had turned to purple. Tiny puddles of water caught the skylight and reflected it back at us. Even the slime looked fragile and ethereal "It is beautiful," I said "in its way."

"Ask me, it still stinks," Tally said.

"It's dying," Leah said.

"Dying?" I turned away from the window.

Leah nodded slowly. "I've been finishing up the work from the data they had stored to optical before the accident. They got enough data to fully model the ecology. It's dying."

"How?" I asked. "Why?"

"Oxygen," she said. "The oxygen level in the atmosphere is rising, slowly but

inexorably. The photosynthetic forms simply out-compete the anaerobes, and the result is that oxygen is gradually accumulating in the atmosphere."

"But that's good," I said. "That's what happened on Earth. The biosphere is evolving."

Leah shook her head. "But Mars isn't Earth. The oxygen is starting to scavenge hydrocarbons out of the atmosphere, and after that it will begin to displace carbon dioxide. Just like on Earth, but for Mars, that will be catastrophic. A few tens of millibars less carbon dioxide, and--" she clapped her hands. "Frozen solid. End of story."

"But the Gaia hypothesis-- doesn't the presence of life regulate the temperature?"

She shook her head. "Bacteria are dumb. Gaia is a hypothesis; it's never been a proven theory. In this case, it happens to be a wrong theory."

"You're sure?"

Leah nodded. We were silent for a moment, and then I asked, "How long?"

"Hmmm? Well, couldn't say precisely. Not enough data."

"Give or take."

"I'd give it few thousand years at the outside. Probably less than a thousand."

She saw me smiling, and added, shaking her head, "The time may be uncertain, but the fact still is, it will happen."

That put a little different spin on it. We would all be dead before the planet returned to bare rock. No need to mourn for Mars, not for quite a while yet.

#

Later, alone with just Leah in the tiny sleeping cubbyhole, I made love to her slowly and deliberately. She closed her eyes and arched her back as I stroked

her, in her own way sensuous as a cat, but still I couldn't tell what sort of feeling she had for me.

When it was over, and we were lying in the dark, I had to ask. "Do you feel anything for me? Anything at all?"

Leah turned over. "Quit asking meaningless questions. I unask your question. Mu."

Much later, after I thought she had fallen asleep, she said softly, "It looks like I'm stuck with you. I suppose there are worse people I could get stuck with. Don't get in the way."

It was all I could ask for. I will follow her as long as she will allow it, love her, ask nothing in return. Maybe someday I will mean something to her, maybe some day as much as a comfortable pair of slippers or a favorite chair.

In the mean time, though-- It was a large universe. There would be places to go, no end of places to follow her to. That was enough.

In the morning, the lander would come, and I would follow her home.

END

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