

Homunculus

by Stephen Lawson, ...

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The yellow-orange tholin haze above Titan's surface whirled around the chassis of a lighter-than-air research drone. A tiny carbon-fiber humanoid robot sat perched on its support structure, dangling his feet next to the drone's camera as it took pictures of the rocky surface below. The dirigible, designed to carry sampling probes and communication equipment, barely registered the stowaway's mass. Folded aramid-fiber wings fluttered on aluminum ribs on the bot's back as the breeze swept over the drone's chassis.

"Man, this place really does have atmosphere," Gavin whispered.

He snorted at his own bad joke.

It keeps out the cosmic radiation though. They have to live underground on Mars, like moles.

Gavin watched the haze roil beneath his tiny carbon-fiber feet. It wasn't really *him* of course. Gavin and his wife Lori were hurtling through the space between Earth and Saturn in a Goshawk Heavy Transport. The winged avatars through which they interacted with Titan's small colony would've only come up to his knee

if they stood side-by-side. Nonetheless, six hour virtual reality workdays in the bubble box made the homunculus's carbon-fiber shell feel very much like skin.

Steady development in smartphone battery capacity and size had paved the way for the tiny twelve to fourteen hour lithium-ion battery nested in his back. The same was true of the dual micro-cameras that gave the homunculus crisp depth perception and picture, even in Titan's shrouded twilight.

Quantum entanglement communication—built on John Bell's experiments and tested from a satellite to Earth by the Chinese in 2017—had brought the *ansible* into the real world. It made instantaneous control of the homunculus possible, though the true breakthrough in quantum manipulation hadn't come until 2021 at CERN. That had earned two post-PhD researchers the title "Spin Doctors" in every major publication when they'd changed the spin of a pair of entangled electrons.

Gavin didn't wait twelve minutes, as the MarsX contractors had, to get an image from his avatar, or to send it a command. He was present—*now*—through the virtual reality goggles, surround-sound speakers, and the nest of tiny inflatable bubbles that rapidly expanded and contracted to provide haptic feedback in zero gravity.

The green qMail icon blinked twice in his visor.

He held his right thumb and index finger together to activate voice commands.

"Open qMail," he said quietly, and a stream of text overlaid the bottom of his view of the Kraken Mare's liquid methane.

Gavin, the message said, please come to Greenhouse 3 as soon as possible. We can't find Jonah. We think he might be in a ventilation duct. Please hurry —Hope

That didn't sound good.

Gavin's hand moved up through the plastic bubbles to his left, and he felt the homunculus's hand grasp one of the airship's support cables as he pulled his tiny avatar to its feet.

"Add overlay," Gavin whispered, "—colony hub. Add building numbers. Add thermal signatures for humans."

Translucent blue lines shimmered around the plastic igloos two thousand feet below him. White numbers identified the nuclear plant, electrolysis facility, greenhouses, and homes. To the north, on Mayda Insula, a pair of blue outlines showed him the tidal generators that supplemented the colony's fast-breeder nuclear reactors.

Gavin turned his gaze back to the greenhouses. If he planned his glide right, he'd only have to put power to his wings for a few seconds before he touched down.

The tiny aluminum and carbon-fiber man leapt from the chassis that supported the lighter-than-air drone's camera and over-the-horizon communication hardware. Gavin tapped his left thumb and forefinger together, and the homunculus's wings opened.

He soared like a flying squirrel through the nitrogen-methane haze, S-turning left and right to match the shimmering blue optimal glide path in his visor. If he overshot too much, he'd have to swim out of the Kraken.

The flesh-and-blood colonists had tried flying when they'd first arrived. It was one of the great appeals of Titan—with a running start and some good hard

flapping, a human could fly like an Earth-bird through the soupy atmosphere and low gravity.

The novelty wore off when they realized how many calories they had to eat after such workouts, and how few calories the greenhouses produced to supplement the monthly supply rockets.

There was, also, a limited amount of scenery to awe flying humans. Once they'd seen methane waves swelling under Saturn's tidal pull and a few cryovolcanoes spewing blocks of ice, they uploaded some videos to the interplanetary net's social media sites to impress people they'd never see at another high school reunion, and settled down to the hard work of colony growth.

It *had* grown—rapidly in fact—during Gavin's first three years in transit. Hydrocarbons like ethane (C₂H₆) and methane (CH₄)—so plentiful in Titan's surface and atmosphere—were easily transformed into hollow-core, vacuum-insulated polyethylene (C₂H₄) plastic building blocks which could be joined with resin to form domes. These plastic In-Situ Resource Utilization (ISRU) igloos rapidly replaced Titan2070's inflatable, less-insulated habitats.

The colonists had added two more greenhouses and had begun experimenting with gene-edited vegetables that wouldn't have survived Earth's cumbersome gravity. They'd bored a network of underground ventilation shafts as a contingency to the aboveground inflatable conduits, just in case the remnants of a micrometeor shower made it through the atmosphere.

Now, rather than flying humans, the fleet of semi-autonomous airships they'd built to map and study Titan circled the moon like zeppelin-Roombas, sometimes obscured in yellow-orange clouds, sometimes visible dropping tiny geo-samplers to the surface when the colonists found something that piqued their curiosity.

Gavin tapped his thumbs against his middle fingers to send battery power to his wings, which flapped on command. He decelerated rapidly before stepping onto the rocky surface outside the greenhouse.

In the ship's bubble box, plastic balls flexed rapidly against his feet, providing the sensation that he'd landed.

Good thing aluminum doesn't get brittle like steel or titanium in extreme cold, he thought. It's lighter too—better for flying.

He tapped his fingers for voice-command again while simultaneously folding his wings.

"Voice channel," he said. "Open comms—Greenhouse 3."

A chirp in his ear told him he'd been connected to the building's intercom.

"Hope," he said, "I'm outside."

The igloo's outer airlock door—also made of plastic—whirred open on servo motors. A safety circuit between the two doors kept one door locked if the other was open. Only intentional tampering would violate the igloo's climate control.

Air jets hissed in Gavin's ear as the pressure, temperature, and gas mixture equalized around his carbon-fiber skin. He turned to see if the meth picture was still up, which it was. Someone had taken an anti-drug poster from 2016, and written "ane" in black Sharpie to add a bit of humor to the airlock. "Meth(ane): Not even once," it said, above an addict's before and after pictures.

The inner door whirred open, and Gavin stepped into the greenhouse.

"Thanks for coming," Hope said. "I know you're busy building your—"

"No worries," Gavin said, with a dismissive wave. "Lori and I have two more years to make our home inhabitable. Once you figure out the brick-oven, assembly's pretty easy."

The homunculus leapt into the air and Gavin activated his wings to alight on a plastic workbench. Height disparities always made conversations awkward.

"Well, thanks just the same," Hope said. "The Earth-bound homunculus crew is on the far side of Titan still, researching a site for Hub 2. You're the only wee man within a week's travel."

"I don't understand why they wouldn't just build closer to Hub 1," Gavin said. "Resource pooling and all. You know how I feel about it. It makes rescue operations a bit easier too..."

"Yeah," Hope said. "Jonah's taken to crawling in the ventilation ducts the last week or so. I've tried to get him to stop, but it's hard to build decent child-proof gates out of polyethylene. Usually he comes out for meals, but I haven't seen him since yesterday."

"He's, what, six now?" Gavin asked.

Jonah had been the first "replacement colonist" allowed to be conceived onsite, after the death of the medical officer. Hope and her husband Scott had been overjoyed to be selected, even in the somber wake of Titan's first funeral.

When the Hub had achieved sustainability with backup power and surplus food, Gavin and Lori had purchased tickets on the next Reusable Launch Vehicle (RLV) to orbit from corporate headquarters. They left Earth's orbit in a robotically-assembled-in-orbit Goshawk Heavy Transport, with its counter-rotating toroid habitat sections and non-rotating, zero-G section.

Smaller, more frequent launches meant a steady operations schedule and supply chain for corporate, less risk in a single launch, and less resource strain per landing on Titan's colony. A crew of two was, in fact, nearly perfect from Titan2070's perspective.

"That's right," Hope said. "He's taller than any six-year-old on Earth, but way more curious. He gets into everything, and I can barely stop him reading to go to sleep at night. He's got a notebook full of fairytale sketches too—he's actually pretty good at drawing."

"Do you think he's embarrassed by something?" Gavin asked. "Maybe he's hiding. Has Scott—"

"We've looked everywhere for him, Gavin," she said. "Everywhere we can fit without tearing the ventilation apart. There are pry-marks on the floor hatch that goes underground, but I can't tell how old they are. He's either in the shafts, or he's—"

She didn't finish the sentence. Titan was more forgiving than Mars—its 1.5 bar surface pressure meant they didn't need the Martians' bulky pressurized suits—but a child without electrically-heated coveralls and closed-circuit air would certainly be dead by now.

"Okay," Gavin said. "I'll stay on this channel. Let me know if you find him while I'm inside, and I'll do the same if I find him holed up down there."

Gavin dropped from the table, fanning his wings halfway to the floor. He stepped to the vent, which Hope had opened. He wondered how long she'd yelled

into the vent, praying for a response—how many times she'd tried to squeeze herself through the ninety-degree joints before calling for help.

He fluttered his wings again as he dropped into the darkness of the shaft, and landed on its floor, six feet below the surface.

"LED," Gavin commanded, and four tiny lights above and below his camera-eyes illuminated the horizontal shaft.

"Add overlay: underground ventilation."

Error M512 blinked in his visor. Overlay not found.

Dammit. I'm going to have to take notes so I don't get lost down here. Why wouldn't they put a virtual grid on the server when they dug the tunnels?

"Can you see where I am, Hope?" he asked through the radio.

"Let me check," she said. "No, sorry. The only locators anyone has are GPS-based, and our satellite constellation here is Gen 3. The ones around Earth are actually newer. There's no underground repeater system either."

Guess I'm on my own.

Gavin walked straight ahead in the dimly-lit tunnel, with its roof scant inches above his head. He found it hard to believe a kid would escape by crawling down here.

"Jonah?" he called, but there was a limit to how loud the homunculus would make his voice. The bots hadn't been designed for speeches or rock concerts, after all.

"Jonah?"

"Gavin?"

It was a woman's voice though, and not Hope's.

It took Gavin a second to realize it was Lori, and that he was hearing her voice through his own ears and not his synthetic ones.

Given how little she'd spoken to him in the last month, he excused himself for not recognizing her voice immediately.

Most long-duration spaceflight test groups experienced it—the emotional shutdown after months of confinement and sameness—so Gavin had poured himself into exploring while he waited for her to snap out of it. He was sure he'd get into a funk too at some point.

The homunculus stopped moving in the ventilation shaft.

"Hey, Lori," he said. "I'm—"

"You're not building," she said. "I know you love burning up battery power flying around or methane-surfing before shift, but we really, literally, won't have anywhere to *live* if we don't get this shelter built. I can't even get a ping-back for your location on the map."

In the ventilation shaft, the homunculus reached up to pull a non-existent helmet from its head. The shaft disappeared from Gavin's vision, replaced by the cramped interior of the *Goshawk 7's* command module. Communication and systems computer screens lined the four walls.

"Lori—"

"Gavin."

She stared at him, waiting for an answer.

"Jonah's missing," he said. "Hope thinks he might be in the ventilation."

"If he is," Lori said, "he'll come out when he gets hungry."

"What if he's stuck or something?"

"Not really our problem," Lori said. "Just like building our house isn't theirs. You know how this works—how it's *supposed* to work."

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It had been Hope's idea, when Hub 1 was still in the draft stage. The problem of the sheer boredom and cabin fever of multi-year spaceflight had plagued scientists and science fiction writers for decades.

"So," Hope had said, "the current timeline goes: send robotic probes and workers, pilot them from Earth, then spend five years in boring transit, and start the rest of the work when we land. Right?"

Everyone else had nodded, not sure what she was getting at.

"What if we do the work *while* we're flying? Quantum communication makes instantaneous control a possibility. Take the burden of robotic work off of mission control, and give it to the colonists during the long transit. It'll save time and resources on arrival too, since we can tend a greenhouse before we even get there if we send bots with seeds. Once the main infrastructure is set up, every new crew will be responsible for building their own home before they arrive. We don't know how much iron we'll have—and we won't have trees until we terraform—but the plastic bricks Ben designed are pretty easy to work with."

A few eyebrows had risen. Ben, the chief engineer, had been sitting across from her. His eyes had retained their hard skepticism.

"What kind of robotic vehicles?" he'd asked. "If you're suggesting virtual reality, you're also basically suggesting sending the same payload twice. Launching that much mass is a high-dollar proposition."

Hope had smiled.

"For one," she'd said, "robots in stasis don't need to eat or breathe, so that's half your payload gone. Since they're inorganic, you don't have to worry about lift-off force crushing them. You can launch the bots with a rail gun or whatever. They'd get there fast, and with renewable energy."

Ben's head had wagged to the side, as he half-heartedly acknowledged her point.

"For two," she'd said, "we don't have to make them full-size. Send homunculi, one for each—"

"Homunculi?"

"Tiny, little men," Hope had said. "I'm borrowing the term from psychology, and the shrinks borrowed it from alchemy. The sensory homunculus rides around in your brain experiencing the world. Maybe it's just time to turn that inside out and let the homunculi do the walking."

"The thing that's going to fry your motherboards—" another voice had said. All eyes had turned to Milton, the resident theoretical physicist. Milton had retired and come back from retirement so many times that at this point no one was certain whether he was getting paid to come to meetings, or just researching space for his own amusement. "Well, not *your* motherboards, perhaps, but your grandchildren's—is when we build something a bit bigger than a Goshawk Heavy and push out for an interstellar transit at something approaching, say, fifty percent the speed of light.

"Perhaps we'll have sent Hope's homunculi ahead, as I hope we'll agree to in this case, and they reach Betelgeuse before we do. With instantaneous communication *and* time dilation—since you'll essentially be in two places at the same time—will you watch your tiny avatar move much faster than you, as you slog your way through the expanded time of a slower point of reference? Will it react to commands before you realize you've given them? What if we had an artificial neural processor in one plane, and humans in another? Could they *think* for a thousand years while their bodies only aged ten?"

Ben had laughed.

"Maybe we should worry about getting to Titan f—"

"Milton," Hope had said, "do you realize the next implication of what you're suggesting?"

The old man had fixed her with an expression of patient curiosity, knowing she was prone to leaps of reason that took others hours to catch up to.

"Not yet," he'd said, "but I'm all ears."

"We can get information from the inside of a black hole," she'd said.

Milton had blinked several times behind his glasses before pulling them from his eyes. He'd polished the lenses with a microfiber cloth, stared at the floor, and after some moments, laughed softly.

"It looks like I'll have my work cut out for me while you're launching your homunculi, my dear," he'd said finally. "This is—well—it's not a done deal, but the theory's sound. Our probe would still be crushed as it neared the center of the gravity well, but we'd certainly get more data than we could with existing methods."

"I'll admit that I don't get it," Gavin had said. "Why can't we study the inside of a black hole now?"

"Light can't escape the gravity well," Hope had said. "So neither can radio, or post cards, or anything else we use to communicate. Quantum entanglement is instantaneous though, so the—"

"Ooooooooooh," Gavin had said slowly. "Never mind. I get it. Spooky action at a distance, and across relative planes."

"Yep."

Lori had elbowed Gavin at that point.

"I know it's easy to get excited," Lori had said, "and I really like the idea of being able to work while in flight versus, say, going into suspended animation or something, but—"

No one had asked, "*but, what?*"

Lori had a reputation for pragmatism and harsh reality, and Gavin guessed the others were half-scared to hear what she had to say.

"If we're building our homes while we're in transit," she'd said, "that means we're literally on our own on a new world until we start selling services back to corporate or the other colonists or whatever. It's like a straight-up frontier town, right? Rugged individualism and all that?"

"Well," Hope had said, "I mean in an emergency people are going to help each other. But yes, your log cabin is yours to build. Or plastic Lego-cabin. Whatever. The vent shafts, power connections, all that. You can rent greenhouse space in the mains or build your own."

"Okay," Lori had said. "I'm fine with that. It just seems like Ben and I are the only ones who realize this stuff costs *our* money and *our* sweat—that it's not just cool televised rocket blast-offs on a taxpayer subsidy."

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"I do know how it's supposed to work," Gavin said. "Give me thirty minutes and I'll be at our build site, okay? We're ahead of schedule as it is."

"We're ahead on the *habitat*, Gavin," she said. "What if we have hang-ups with the greenhouse? I don't want to rent space to grow food. That wasn't in our budget."

"Thirty minutes."

"Fine," Lori said. "I'm going to make tea before I start then."

She pushed off from the bulkhead, pulled herself through the hatch, and disappeared into the food prep area.

Gavin replaced the headset, and the dimly-lit ventilation shaft became his world once again.

"—still there?" Hope's voice came through the speakers. "Gavin, can you hear—"

"Yeah," he said. "Sorry. I had to detach to talk to Lori."

"Oh," Hope said, her voice thick with maternal anxiety. "Okay."

Gavin moved his legs through the plastic bubbles that floated in the box, their limp, unflexed forms offering almost no force feedback. Beneath his feet, bubbles flexed each time the homunculus's feet touched the floor.

The tiny bot speed-walked through the narrow ventilation shaft until he came to a crossroad. Gavin looked left, then right, but saw nothing.

He thought, for a moment, he heard shuffling, but it could've simply been a shift in the air pressure.

Or it could've been a child.

Gavin turned left, which he knew would take him toward the long shaft that led to the tidal power station.

"Jonah?"

Nothing.

He heard another shuffle, and this time he was certain that it was the sound of cloth on plastic. He sped up, and the shuffling abruptly stopped.

Gavin rounded the corner, and found himself looking into the wide blue eyes of a young boy. The boy seemed startled for only a moment before his face broke into a broad grin.

"I found you!" Jonah said. "Or you found me. I thought you'd left me alone."

"Hello Jonah," Gavin said. "My name is Gavin. Your mother is—"

"Mama told me not to come down here," Jonah said, "but I knew you lived in the labyrinth. I knew I'd find you if I searched all the tunnels."

"Jonah," Gavin asked, "who do you think I am?"

The boy cocked his head to the side.

"Fair folk never tell their *real* names," Jonah said. "Names have power—even I know that. I just thought I'd gotten too old to play with you, or—"

"*Fair folk*," Gavin said. "You think I'm a fairy?"

"Where are Mr. Pickles and Lady Twilight though? Are they further down?"

The techs on Earth have been entertaining this boy, without realizing the consequences of their departure to research Hub 2.

"Jonah, your mom is really worried about you," Gavin said. "We need to go back the way you came. You're probably not going to see Mr. Pickles and Lady Twilight for a while because they're working on a project. And truthfully—because I feel like their make-believe is getting dangerous for you—I'm just a guy in a box with a remote control. I'm not a fairy."

Jonah frowned and sat back.

"This is a trick," he said. "You don't want me to find your secret underground kingdom. Wait—are you one of the bad fairies?"

"I'm not a—"

"You stay away from me," Jonah said. "I'm not big, but I'm bigger than you. I can smash you if I want to."

It was true, too. Durable as the carbon-fiber was on its aluminum frame, a few kicks would break Gavin's circuitry, leaving him incapacitated in the tunnel.

"Okay, Jonah," he said. "I won't try to come near you."

The plastic bubbles pulsed around Gavin, then pulsed again.

What was that? A malfunction in the bubble box?

Jonah's eyes grew wide again, so Gavin assumed he'd felt something too.

Gavin tapped his fingers together.

"Hope," he said through the radio, "there's something going on down here. The shaft just shook."

"I felt it too," she said. "Let me look at some things. I'll call Scott."

Gavin's homunculus took a step toward Jonah, but the boy scurried farther away.

"You can't scare me that easily," Jonah said. "If you use earthquake magic, you'll die too."

"Gavin," Hope said in his ear, "Scott says there's a small cryovolcano just south of here discharging ice. We might be feeling some of the seismic effects of—"

"How sturdy is this plastic, Hope?" Gavin asked. "If the solids around this thing shift..."

"You've got to get Jonah out of there, Gavin," Hope said. "Those shafts definitely aren't load-bearing. We have safety shut-offs at each end too, so if there's a breach or a leak, they'll automatically seal."

"He doesn't want to come out," Gavin said. "Some of the techs from Earth have been pretending to be fairies from Jonah's books. He thinks they're down here somewhere and that I'm a 'bad fairy' who's trying to keep him out of their kingdom."

"Let me talk to him," Hope said.

Gavin tapped his fingers for voice command.

"Direct audio patch," he said, "Greenhouse 3 to external."

In the shaft, the homunculus's voice changed from a man's to a woman's.

"Jonah," Hope said. "Jonah, sweetie, I need you to come out of the tunnel. I'm in the greenhouse, okay? It's not safe down there and I need you to come out."

Jonah kicked out at the homunculus with a speed Gavin hadn't expected. The boy's foot hurled him into the corner where the shaft turned. Plastic bubbles flexed against Gavin's chest and back almost simultaneously, and with a force

that hurt. He moved to right the tiny avatar, and saw Jonah scrambling away from him in the shaft.

"You are a bad fairy," the boy said. "Good fairies don't use the sorcerer's voice."

Damn you, Arthur C. Clarke. "Any sufficiently advanced technology..."

Just then, the shaft shook more violently, and Gavin dove forward as he watched the polyethylene rupture under his feet. He heard the hiss of gas-driven emergency shut-off valves closing, and knew in an instant that the homunculus—and the boy—were trapped.

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"This just got really bad," Gavin said. "The plastic's a great insulator, but with a rupture, it's going to get cold down there—quick. I don't know if the gases are sealed inside either. Is there an emergency override to open the shutoff valve on your end?"

"We designed these before I had Jonah," Hope said. "We weren't figuring anyone would be in them for any reason. The ceiling clearance was actually designed for the homunculi if we needed to do maintenance, and there are thin wires woven in to detect breaks. The locks don't deactivate until the electrical connection is restored and/or the gas sensors don't pick up anything but nitrogen, CO₂, and oxygen. Well, *trace* amounts of methane, obviously—we didn't want a fart to shut down the ventilation."

"The problem is, the longer we're sealed off, the more carbon dioxide we have—and less oxygen," Gavin said. "The rock that's poking through and the gases won't be as thermally conductive as, say, water, but it's still going to get cold in here."

Gavin examined the rupture more closely. A liquid rivulet in the fissure outside the plastic seemed about to form a droplet, but as the rivulet approached the break in the plastic, it evaporated into a haze.

"I've got liquid methane or ethane evaporating down here," Gavin said. "It's not a lot, but it's definitely getting in. The evaporation's making the air colder too."

"I radioed Scott," Hope said. "He's closest to our heavy tools, but he's still got to get into his suit and drag them over. The truck's broken down right now."

I'm not sure we have that kind of time.

I could extract oxygen, maybe, if we had water or ice.

It'd drain my power pretty quickly, but I could use the battery to heat my carbon-fibers—which probably wouldn't be enough to keep the kid alive anyway.

Gavin made his way back to the door and found a rupture worse than the one nearest Jonah. A gap in the rock had opened several feet below the opening, and he could see a liquid swirling and wisping into gas beneath the shaft's plastic. He tapped his fingers together.

"Spectrometer," he said, and a pale blue circle with a *sample area* label appeared in the center of his view. Given the homunculi's original expeditionary purpose, they'd been outfitted with an array of test equipment. Below him, he found ethane rather than methane evaporating in the cavity near the door. Gavin knew that ethane was heavier than air, and would remain trapped in the cavity. Methane would've floated up to fill the shaft, killing Jonah.

"How long until Scott gets here?" he asked.

"Thirty minutes, maybe," Hope said. "The suit, the airlocks—"

"It'll take another ten to fifteen minutes to get through that hatch with hand-tools," Gavin said. "The temperature's dropping by about a degree a minute, and I've got hydrocarbon gases evaporating in from several breaks in the shaft. Jonah didn't bring his respirator on his adventure to find his friends, nor did he bring his electric coveralls."

"Gavin, you've got to—" Hope said, but a sob caught in her throat. It was easy to be a calm, collected astronaut when it was her own life at stake, or that of another rational adult—one who'd volunteered to accept the risks. Her child was a different story.

He looked down at his tiny hands and up at the 8-inch-thick plastic safety door.

"What can I *use*?" he whispered.

"Yourself."

It wasn't Hope's voice this time, but Lori's, that came through the radio.

"Remember the early days of lithium-ion batteries?" she asked. "Cell phones, laptops—"

"I wasn't born then, Lori," he said. "Neither were you."

"Well maybe it pays to be a history buff," she said. "They used lithium-ions with other metals in the anodes rather than straight lithium because they were more stable and could be recharged. They still had problems though, especially with cheap knock-off batteries with bad separators. Sometimes the batteries would catch fire or explode. They were prone to thermal runaway. Our batteries have a gel electrolyte now, but they're pretty much the same design, Gavin."

"Good thing we have top-notch separators, right?"

"Lithium's still unstable, and if you connect the cathode and anode directly—"

"It would catch fire, but I'd probably just burn up inside the—" Gavin said, then paused. He looked down at the hydrocarbon gas pool building under the break near the door. "Oh. I'm just the detonator."

"I can be there in one minute's flight," Lori said. "I'll have to go in and pull the kid out once the hatch is breached."

"Hope," Gavin said, "this is your call. We can wait for your husband, and risk gas filling up this shaft while the temperature drops. I don't think Jonah will get hypothermia, but he may run out of air. We might get another tremor, too."

Gavin waited.

"What's the worst thing that can happen if you blow the door?" she asked.

"The *worst* thing is that I don't actually blow it, and maybe the tunnel around the opening collapses. As long as Jonah stays around the corner, there's almost no risk of shrapnel."

"Shrapnel?"

"Well," Lori said, "if we wait too long, the methane and ethane concentrations mean you'll get a fireball inside the shaft also. You pretty much have to do this now or not at all."

"No," Hope said. "No no no. Wait for Scott. He'll get here, and we can get my baby in a respirator, and—"

She stopped talking, as though her attention had been taken by something on another channel. Gavin thought he might've lost his radio connection.

"Lori?"

"Yeah," Lori said, "I'm here, but you might only have me on the ship's internal."

"Scott says there's a fissure outside the toolshed," Hope said finally. "The frame on the airlock split and the inner door won't open. The safety circuit won't allow it."

"Can he pull the circuit and hotwire it?" Lori asked.

"I think so," Hope said, "but it's going to take time."

"Hope—" Lori said.

"Okay," Hope said. "Do it. I'll put on my respirator and get Jonah's. The air's going to get pretty foul."

"I'm flying to Greenhouse 3 now," Lori said. "I'll take the other respirator in with me."

Gavin walked back to where Jonah sat huddled in the shaft.

"Hey buddy," Gavin said. "Sorry about all the bad fairy tricks earlier. You passed the test. We're going to let you into the fairy kingdom, okay?"

"I don't feel good," Jonah said. "My head hurts."

"Yeah," Gavin said. "We can fix that in a minute. My friend Princess Lori is going to come show you where the gate to the fairy kingdom is."

"Really?"

"Really," Gavin said. "I just need one favor from you."

"What?" Jonah asked, eyeing him with renewed suspicion.

"I need you to pull my wings off. I don't have the strength to do it at that angle."

"Why?"

"Honestly," Gavin said, "it's so I can open a door for you. Don't worry—they'll grow back. It's fairy magic."

Gavin turned. Either the kid would do it, or he wouldn't.

After a moment, he felt a tug in the bubble box.

Error R999—came up in his display—*catastrophic damage to—*

"Yeah," Gavin whispered, "I know."

He turned, and picked up the folded wings from the floor of the shaft.

"Stay here kid," Gavin said. "Princess Lori won't come if you see the magical gate open, okay? You should really cover your ears and close your eyes too. The overpressure can make your ears bleed."

"What's overpressure?" Jonah asked.

"More fairy magic."

"Okay."

"How big's this fireball going to be?" Gavin asked when he rounded the corner.

"Most of the pictures I've seen were about a twelve-inch radius," Lori said. "The electrolyte burns will hit the far walls though. I'm inside the airlock now."

Gavin stepped up to the break near the safety door and pulled up the corner of the ruptured plastic, widening the gap enough to wedge himself inside. The safety door was only about an inch from the homunculus's face.

"Little man in a great big world," Gavin said. "Only way to make a difference is to tear your wings off and set yourself on fire."

"Don't get too dramatic down there, Babe," Lori said. "It's not your real body."

"It feels like it."

Gavin stripped the aramid-fiber cloth from one of his wings and separated a rib from the frame. He popped open the battery hatch on his back, and in one smooth motion, wedged the rib across the anode and cathode.

Error F451. Battery short—

Then nothing. Gavin's goggles went black and the bubbles stopped bubbling.

* * * * *

Lori heard a *WHUMP* at the same instant the plastic safety door flew out into the ventilation duct. She took Jonah's respirator from Hope and ignored the desperation in the mother's eyes.

"Jonah?"

Nothing.

She stepped over the charred remains of Gavin's homunculus, and traced the path to where he'd said Jonah was.

"Jonah?"

The boy looked at her, and she saw blood at the corner of his ear.

Ruptured eardrum. At least he'll survive to figure out when to take good advice.

Jonah seemed to be in a state of shock from the explosion and resultant pain, which Lori was half-thankful for as he numbly accepted her fitting the respirator to his face and leading him through the cloud of toxic fumes.

* * * * *

Two months later, when Jonah's eardrums had healed, he watched the two homunculi he'd known as Mr. Pickles and Lady Twilight wave and then dance while video of their controllers on Earth live-streamed behind them. He promised his mother he'd never venture into the shafts again.

Gavin and Lori put the finishing touches on their main habitat, and began work on their power and ventilation. Gavin had been given control of another homunculus, and corporate put a replacement unit on the next resupply rocket. They'd finished ahead of schedule, since Scott had taken time away from teaching online exobotany classes to help them build, and the other colonists had begun pitching in whenever they could.

"Thanks for saving my son when I couldn't," Scott said, as they admired their day's work.

"Thanks for helping us build," Gavin said. He hesitated before adding, "This may sound horrible, but I'm actually kind of glad it happened."

"Why's that?" Scott asked.

"Lori had been in a funk for about a month," Gavin said. "There wasn't a reason for it apart from the mental exhaustion of routine and confinement. She—well, after we rescued Jonah—she perked up. She actually told me that, 'seeing your charred little robot body turned me on.' Can you believe that? No offense meant. Of course I wouldn't want to see Jonah in danger again."

"No offense taken," Scott said. "If you were the sort of people who thrived in dull routine, you would've stayed on Earth, right?"

"I suppose. Lori wanted to be a pirate until she was fifteen."

"Hey, I got something from corporate you're going to want to see," Scott said. "Milton sent it to Hope first, since they'd collaborated on it."

"What's that?"

"The first data from the inside of a black hole," Scott said. "It's not *quite* what anyone thought it was. Maybe that's your next big adventure."

"If Lori lets me live long enough to reach Titan, you mean."

"Obviously."

