

VERTEX

(A STORY OF THE BLACK HOLE PROJECT)

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Illustration by William Warren

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Anything unique and powerful can be very useful—but different people will see different uses for it.

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About eight billion years ago, Shiva had been a Neptune-sized planet circling a newborn M3 Star. But stars lie close at the time of their birth, and within a couple of million years, a neighbor passed near the fledgling planetary system, perturbing it.

Nothing happened immediately, but as eccentricities waxed and waned in chaos, it moved closer to another world until, a hundred million years after their formation, they swung around each other in one final mad gravitational embrace and flew away from their former orbits. One planet dropped in toward the star, and the other fled outward with a few remaining moons to wander forever in the endless night.

In 2206, astronomer Chanda Rae found Shiva on a trip from UV Ceti to Ross 248 that passed near the center of the tetrahedron of stars chosen to power humanity's greatest experiment in physics. She took some deep infrared images and judged the lone planet's moon system contained enough lithium and hydrogen to supply the fusion reactors needed for starship operations. She named the lone planet "Shiva" and the outer moon "Vertex," in hopes that Dr. Zhou Tse Wen's project staff would find it a suitable place for their collision.

They did, and eighty-two years later, one by one, four billion-ton iron rods were being pushed by streams of relativistic pellets toward the most precise and energetic implosion ever arranged by human scientists. The result, they hoped, would be a micro black hole—the mass of an asteroid crammed into the volume of an atomic nucleus.

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Chapter 1

The Barrel, a space colony orbiting Luyten 789-6B, 18 September 2274 SST

Hi Mom, I got fired. Went walking on a virgin kuiperoid without asking and it turned out someone else was supposed to get the honor. What bullshit! But guess what? Hilda talked me into taking charge of the impactor launch at Lacaille 9352!

Katherine Avonford, sunning on the beach, grinned as she listened to the bioradio net message from Elizabeth. Her youngest daughter was far too much like her mother for the bureaucratic confines of the Solar System.

The full-spectrum artificial sun of *The Barrel* wasn't quite the same thing as a real sky, with nothing but air between her skin and a real star—but for a tan, it did much better than the mainly infrared light from the M-star, "Big Red," that fell on the outside of the space colony.

She'd gone into space when it was "Luyten 789-6B," the largest of a young triplet of nearby red dwarfs, but the old Earth-based catalog names were used less and less. Some of the new names were her doing. As the captain of various starships, she'd planted three colonies, including this one. Out here you could build a space colony and be *free!* Now Liz was out here, too.

She glanced sideways up the beach; from her sand-level viewpoint, it was hard to tell she was on the inside of a rotating barrel rather than on a planet. The far shore of the equatorial sea was at least a kilometer away—barely a light line in the mist. Hazy clouds, lit by the artificial sun, covered the opposite side of the colony. She might be on a Greek island.

This is pretty, she mused. The habitat was done; the colony was planted and ready to be lived in. She came here thinking it was time to give motherhood another try and maybe get it right this time. Why then were the vast empty reaches of space calling her? She wrestled with her thoughts.

The Black Hole Project was part of it. Someday, with tame black holes to power them, starships might range through space independent of the beams needed to push them in the present era. Both of her older daughters were now part of the project, and she was bit jealous.

...as you read this, I'll be on the C. E. Singer on my way to launch a piece of history and maybe pick up a squeeze.

Oops! Kate thought. The *Singer* was Pete DeRoot's ship. A brilliant star captain and leader of the first crewed expeditions to Barnard's Star and Ross 154, he had a dark side that was only whispered about when women who had starfared under him got together. A starship captain was a minor deity when light-years from any threat of correction. Power corrupts, Kate thought ruefully, and she'd had her own temptations. DeRoot liked power. On top of that, Liz was headed for a colony governed by the equally power-hungry Aussie, Roger Gunheim, and his mistress, Cyan Mutori—and Liz would be displacing Cyan on the Black Hole Project.

Kate sat up. The grass no longer felt like an enjoyable luxury. What was Liz getting into?

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Uneasy weeks followed, made no less uneasy by the knowledge that because of lightspeed delay, what had happened had already happened.

Hi Mom. DeRoot thinks he's a Casanova or something. I had to play up to him for a while, but my friend David helped me turn the tables, so that DeRoot shouldn't be any further problem. But what a disagreeable experience! Also, I understand that he and the System Council Chair at the Lacaille 9352 System—they're calling it Campbell now—are very thick and DeRoot's anger could be a problem for me there. I expect to be able to handle that. Meanwhile, David is a lot of fun, when he isn't being too principled.

Kate ran her fingers methodically through her long flowing hair as she scanned the other messages. One of the problems with living a very, very long time is that the stories live a very long time too. Cyan Mutori and Gunheim went way back and had as prickly a relationship as the one she'd had with Liz's father, Wotan Kremer. Cyan was every bit as ambitious as Gunheim, if a little more subtle, and loved to play with fire.

But Liz would have to handle them without any help from her. The impactor would be launched and on its way before anything she said would reach Campbell. Would her daughter stay there? No, she would probably head to Vertex to see what happened.

Maybe, Kate mused, she should go, too.

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Over the next two months, Kate's worries subsided. Liz wasn't any better than most children in keeping a parent informed, but usually, no news was good news. On the morning of the fourth celebration of *The Barrel's* "Suits-Off Day," Kate had a speech to give and woke early to get ready. As she stepped onto the shower platform and selected the standard program, she scanned on through the messages and smiled when she got to a message from Ivan Marenkov. Ivan had been her engineer on the *R. L. Forward* a hundred and twenty years ago.

Yo, love. Hope you are enjoying yourself at Big Red. We've got word that your daughter Liz is due here in a few weeks to supervise the BHP launch. Roger Gunheim's been paying a lot of attention to the BHP lately, wandering around asking questions like he was getting set to buy one. Or knowing his character, maybe steal it, if he could get away with it. Ha ha. Slim chance. Anyway, the good news is that people are a little sick of his act and just waiting for the next election. By the way, I'm single again if you're thinking of coming this way. The times with you were the best. Love, Ivan.

Kate smiled and shook water out of her hair. The drying cycle took over, and warm air gushed up from the grill. Gunheim? Stealing a black hole? Knowing Peter DeRoot's ego, Kate found the idea nowhere near as humorous as Ivan. Zhau Tse Wen was a dear, sweet man and extraordinarily competent in everything. But he had too rosy a view of human nature.

Stealing a black hole was an outrageous, absurd idea, but with DeRoot and Gunheim reinforcing each other's megalomania, it wasn't completely impossible. Well, at least if they wanted the black hole, they wouldn't interfere with making it, so maybe Liz would be okay.

But what then? DeRoot had been out in the deep too long and become a law unto himself. The same, of course, could be said of her. She touched the net for the timeline. The Campbell projectile would be launching soon. Big Red was about the same distance away from Vertex as Campbell. Her lips curved into a what-if smile.

Decision made, she called down the hair robot and unconsciously selected braids, a style suitable for space. The bot floated down around her head like an oversize crown of thorns, and hundreds of tiny hands began braiding. It would probably not be a good idea for DeRoot to know she was coming, but she would need a stream of pellets to decelerate her starship. Someone on site there would have to arrange it quietly. Pat Barrett had said his daughter Kelly was on her way to be a space operations shift leader at Shiva. Kelly had been her navigator's mate on the Tau Ceti expedition—a thoroughly competent officer. Kate sent the necessary messages on faith—she would have to be well on her way before any confirmation would be possible. After the robot was done with her hair, she took a plain pin and wove it thoughtfully through her braided bun as she composed a few more lines. Her Suits-Off Day speech would also be her farewell.

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Chapter 2

Chandrasekhar Station, in orbit about Shiva, 22 December 2284

Torsten Ried touched the net one last time for the facts on his *Popular Issues* interview subject, Kelly Barrett. An operations control shift leader, she'd been among the first to reach the Shiva system, betting fifteen years of her life that operations on four other stars would take place on time.

She'd very nearly lost the bet, he reflected, when the Consolidationist coalition, headed by Torsten's half-brother, Lars, finally won the presidency of the Solar System's Interplanetary Association Senate. The coalition didn't have the votes to make the IPA kill the project, however, and Torsten and Ried operative Anna Messenger had left for Shiva on the *Giovanni Vulpetti* on the heels of the impactor from Sol, passing it and arriving a week ago.

The door announced Barrett's arrival. Torsten told it to open with a gesture.

It revealed a medium height brunette with long wavy hair that flowed dramatically over one shoulder. She wore a bright white jumpsuit with the tetrahedral BHP logo on the right shoulder, dramatically open in

front. Amazing stuff, geckro, Torsten thought.

He beamed. “Nice of you to come, Kelly. I’m Torsten Ried, and this is my assistant, Anna.” Except for hairstyle and clothes, he thought, they might be sisters. Anna had chosen a long, flowing Hawaiian dress.

“Hi, Mr. Ried,” Kelly gushed, standing fixated like a deer caught in a spotlight. “Hi, Anna.”

“You can call me Torsten.” Torsten laughed. “You’ve never done an interview before, right?”

Kelly nodded nervously.

He smiled disarmingly. “Don’t worry, I’ll let you know when we’re on the record. Just come on in and make yourself comfortable.”

After she’d done so, he gave her a well-practiced, disarming smile. “Okay, let’s start!”

He held still for a second, then introduced her for the audience and asked, “How has it been, Kelly, waiting here ten years for an event that may or may not happen?”

She nodded seriously. “We formed a very close-knit community here at Chandrasekhar Station. In the early days, the complex was just a big empty ring.”

“Kelly, our viewers will see us floating in front of a holographic cutaway view of the station with the giant planet Shiva behind us. But I’m mainly interested in all the uncertainty about the project. How did you folks handle it?”

She shrugged. “The physics isn’t that uncertain. When the four impactors hit, the pressure exceeds what makes a neutron star collapse by an order of magnitude in an attosecond or so. So boom, you get an event horizon.”

“Thank you, Kelly. I take it that you are confident the black hole will form.”

“Huh? Oh, sure. The only thing to worry about was whether all the impactors got off, and we just got word they have. They even finished pushing Sol’s impactor out here despite all the political stuff.”

Torsten winced. *Johnson, crop everything after “out here.”*

He continued the interview. “It’s been lonely for you, hasn’t it?”

She giggled. “There are, uh, about forty-eight men and thirty-two women here. That is, there were until all the tourists from Campbell arrived. That was quite a surprise! Then the *Oberth’s* inbound from New Antarctica. And that’s not all.... “She cut herself off abruptly. “I, uh, didn’t say that last, okay?”

Torsten nodded. “I’ll cut it.” He’d been surprised himself to find a shipload of Campbell residents here. They were there, they said, as a tribute to Elizabeth Avonford, who’d lost her life in an effort to save a researcher from an asteroid impact, rather than divert BHP resources to prevent it. The whole thing smelled of a scandal to him. As for “...and that’s not all...” he’d wait until Barrett’s guard was down and probe in that direction again.

Anna came in, set Torsten’s lemonade down, and offered Kelly a glass, which Kelly drank eagerly.

“You must have protocols for every contingency, is that right?”

“Oh yes, we’re trained to handle everything. Flight clearances, accidents, resource conflicts, that kind of thing.” Kelly pulled at her neckline.

Oops, no geckro, Torsten noted. *Mark that, Johnson.*

“It’s a bit warm in here, isn’t it?”

Anna smiled. “I’ve lowered the room settings; you should be fine in a minute.”

“Kelly, what exactly do you do?” Torsten asked.

“I’m in charge of the operations room for six hours a day. A lot of times, decisions have to be made that can’t be made by the AI because they involve competing human interests. So I make those calls, or now that Dr. Zhou is here, bump them up to him.” She sighed.

Apparently, Torsten thought, she’d had a normal human reaction to project management showing up and starting to run the show. He smiled.

“So if, for example, some disastrous thing happened with the new black hole, you would jump into action?” Torsten prompted.

Kelly seemed much more relaxed now, even stifling a yawn. “Yeah. Look, what we’ll get is a big explosion. If the black hole forms, we get a tiny bright speck where Vertex used to be; if not, nothing. There’s not much in between that can happen unless...” She shook her head and took a deep breath as if trying to fight sleepiness. “Sorry. I’m awfully tired all of a sudden.”

Torsten shot Anna a look. Had she drugged Kelly, hoping to get more information out of her? Utterly unethical, and it looked like she’d given the woman too much.

“Anna,” he said sharply, “would you get some coffee?”

Kelly smiled. Then she yawned again. “Don’t understand this.” She shook herself. “Could we continue this another time...?” She fell back onto the couch with her eyes rolled upward.

“Kelly,” Torsten said hurriedly, realizing that he was losing her. “Just one more thing for now. You mentioned that the Campbell ship wasn’t all. Is there something else coming? Another ship? We know about the ship from New Antarctica, is that it?”

Kelly’s eyelids flickered and then she was sound asleep.

“Don’t call the medics,” Anna said. “I doped her.”

“I should have figured that. Anna, first you got the dose wrong, and second, we don’t do that. Ever. If anyone finds out ... God! What are you doing?!”

Anna took off her wig and pulled the muumuu over her head, revealing an outfit identical to Kelly Barrett's. Then she sprayed herself with something.

"You can't..." he started.

"I can. I'm covered with her DNA," she flashed her fingers, "I've got her fingerprints, and I'm going to take her place."

"Anna, they'll lock me up!"

She shrugged. "Sometimes sacrifices are needed. But you can finish off her lemonade and call the medics when you wake up. Say we all had the lemonade, fell asleep, and you woke up alone. Maybe they'll buy it." Anna took a white ring with a tiny tetrahedral logo from Kelly's finger. "This opens doors and keyboards—a fail-operational hedge against the system going down."

"Anna, those people know her. You can't pull this off."

"I can. Kelly Barrett basically does what the position description says. I've studied her job." She beamed a Kelly Barrett grin at him. "And I'm a really good actress!"

"But security..."

"They don't have any real security systems here; they counted on the Solar System's outbound checks. I'll use the keyboard, which isn't so unusual in Ops because people don't multitask well when their heads are in the net. I've got my own access to any net info I need. Piece of cake." She raised an eyebrow, daring him to say something. He knew better.

She laughed and pointed to Barrett's unconscious body. "Dump her."

"Me?"

"You're in this up to your neck now. Your brother expected you might grouse a bit, but he trusts you to follow orders first and recriminate later." Anna stared him in the eye.

Torsten took hold of his cousin's arm and held it tight. "Anna, I want her alive. No funny business like last time."

"That was Vitali's idea." Anna tantalized him with a finger under his chin and patted his cheek. "Anyway, your precious Hilda survived, blew our plans up in Vitali's face, and he got the blame. Then she went to New Antarctica and made a mess of the backup plan as well. So, no, dear, she didn't get killed and here we are with one last chance."

Hilda Kremer. A diffident, modest, intriguing scientist with a brilliant mind, utterly dedicated to the project. Twenty years ago, Anna's sabotage team had misjudged what "brilliant" meant. He sighed.

"She's coming here, too, you know," he told her.

"Huh? Who?"

"Hilda Kremer. Her father kicked her out of New Antarctica for overstepping her authority—probably something to do with Vitali's fake schedule change message. Her ship won't get here before the impact, though."

Anna laughed and shook her head. "Thank God for small favors. I keep telling Lars that you're too sensitive. Anyway, you don't have to kill Kelly Barrett." She gave him a wicked grin. "I just wanted to see if you would. We can put her in my Cold Sleep Unit; it's self-contained, I've got it off net, and a CSU controller isn't sentient—no Asimovian laws of robotics apply."

Anna, he remembered, had arranged to arrive in the coffin-shaped CSU from the *Vulpetti* and wake up in her room. No one on the starship had seen her and the CSU was still conveniently in her quarters. How was he going to get out of *this* when she got caught?

He sighed. "I see why Lars sent you out here, Anna. You're three steps ahead of everyone else. But look, the election is over, and the BHP is just a science story now. Why not leave it alone?"

She smiled. "Torsten, Dr. Zhau has become increasingly political. If he succeeds in this, he'll return a hero. It would be better if something went a little wrong."

Torsten shook his head. “Sabotage? Lars would never...”

Anna shook her head. “You poor, dear wimp. Lars has to play the statesman. That doesn’t mean he’s given up. And this is personal with me now. When I undertake something, I don’t give up either. Anyway, we’re all opportunists—you, me, Lars. There’s an opportunity to sabotage the impact and make political hay with this, and I’m grabbing it.”

Torsten nodded dumbly.

“Now let’s get her in the CSU, okay?”

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Anna bounced into the operations area. It was the biggest room on Chandrasekhar station, large enough that the curve of the floor was visible. The entire north wall of the room was a video screen with three banks of virtual consoles that rose from floor level halfway up the south wall of the room. The saddle-shaped ceiling glowed white.

The duty controller’s position was in the middle of the top rank of consoles. Only a couple of the other consoles were active; all spacecraft were docked until after the impact, and most of the other controllers were getting some sleep now. The impact was in twelve hours and nobody would want to sleep through that.

Security was almost nonexistent, as advertised. Nonetheless, Anna was nervous and excited. It was performance time—now or never. She took a breath, walked up behind the day-shift controller, and tapped him on the shoulder. The shift officer turned, his eyes passing only briefly at her face on their way down to more interesting scenery.

“Hi, Kelly.” He grinned.

So far so good. Anna grinned back at him and nodded to the 1.5-meter-long, half-meter-wide console display of graphics and touch zones.

He started his briefing. “The impactor from Campbell is a bit hot; it’s on full braking mode and we added all the pellet mass we could to its approach lane. It’s tight, but if nothing else goes wrong, we’ll have a

hole. It might have some residual momentum, though. The other three impactors are on phase within a couple of microradians. The hole retrieval vessels are ready. Nothing much else to do. The *C. E. Singer*, with half of the Campbell tourists, will be headed toward a position beyond the impact site opposite Campbell in a couple of hours. They want pictures of the impact with their star in the background.” He shook his head. “If that Campbell impactor stays hot, they may get more than they bargained for. Are you okay for taking the board through impact? The rest of us will be over in the Science Section.”

Anna nodded and whispered, “Sounds like a party. I drank some really hot coffee. Scalded my tongue, so I need to keep quiet a while anyway.”

“Sorry to hear that. Well, all’s quiet here now, but we’ll probably have more people soon. We have a ship coming in from New Antarctica at 2100. Reggie Terry has it covered over at services. I suspect some of them might want clearance to visit the hole, if we get one. If you need anything, check the on-call list.” He got up, glanced down at her chest one last time, and headed for the door with a grin. “Good night.”

Anna smiled and waved him good-bye. Then she surveyed the console display. It was close to what she’d studied—only two different keys and a new gauge—she looked those up quickly enough. She found the beacon controls. The impactor from Campbell was already on the knife-edge of being too early and was dragging at maximum thrust. If she were to move the guidance null just a couple of picoradians, it should deflect just enough to cause the implosion to fail. But she had to do it quickly, and without attracting notice. For practice, she sent an attoradian change—pushing the center point a few micrometers west of dead on. The AI asked if she was sure, but accepted her affirmative response. She started typing in the modifications to the beacon calibration.

“G’d evening, Miss,” said a male voice from somewhere in the remains of the British Empire.

Anna whirled around in her chair to see an amiable-looking heavy set man in trousers, turtleneck, and jacket, his hand in the jacket pocket.

“I’m Roger Gunheim from Campbell. Came by Ops to make sure everything is okay.”

Anna flashed her come-hither smile. “Is that so? Are folks from Campbell supervising us now?”

He eased himself into the seat beside her and laughed. “The BHP project sent someone in to take over our operation, so we thought we’d return the favor.”

Anna measured the man up and down. So this was Roger Gunheim, the former Campbell chief executive she'd heard about. It would be fun to discuss Nietzsche and the will to power with him someday, but that would be out of character for Kelly Barrett.

She arched an eyebrow. "Everything appears normal." She smiled seductively, "Is there anything you need?"

He smiled back. "Only to find out what your intentions are..."

Alarm bells started to ring in Anna's head. Hoping that was just a pickup line, she gently raised her chest to distract him. "I see a man of action. When and where?"

Gunheim laughed, pulled out a trunk gun, and waved it in her face. "Not so fast there, sheila. Hands off the keyboard. You're not Kelly Barrett, you're Lars Ried's cousin, Anna Messenger."

Anna froze, then relaxed a little. He knew, but he hadn't shot her or called the authorities. What was his game? She lifted her chin. "How did you know?"

Gunheim gave a short laugh. "I've compromised the net. Item one, Anna Messenger is listed on the news staff and present in the Operations Center but seems invisible. Item two, Kelly Barrett is supposed to be on duty but is not physically present. Item three, Lars Ried never gives up—commendable. I always liked his style, never liked his politics, but he did a few favors for me once. Item four, Peter recognized you despite your disguise. He did you at Earthport, about thirty years ago? It must have been memorable."

Anna groaned. It had seemed like a good idea at the time. "*I did him,*" she said. "Okay, you haven't shot me or called security. Why? What do you want?"

He might have compromised the system, but maybe not the press encryption within it. She sent a note to the press file. *Torsten, I've been caught...*

Gunheim folded his arms. "My suggestion is that what we have planned might be as useful to Lars Ried as your sabotage. More useful, even."

Anna turned to look at him. The trunk gun was a palm-sized Cavalli twin-barrel of the kind that had been standard issue for security forces for the last half century. It fired two-millimeter flechettes that dissolved

in blood.

“More useful?” she asked coolly.

He nodded, looking her over. “If the experiment fails through sabotage, and that becomes known, there would be a political backlash of the sort he might not survive. Whereas, if some of the darker predictions come true, he’ll look like a bloody prophet.”

“Darker predictions?”

Gunheim just smiled.

Anna raised an eyebrow. “I have to take that on faith?”

“For now.” His smile vanished. “You just keep your Kelly Barrett persona and do nothing she wouldn’t do until the impact. And after the impact, you do nothing she would do. Is it a deal?”

“Hi, Kelly!” Torsten said, finally arriving.

Gunheim smoothly pocketed the Cavalli.

Just play it cool, Anna sent to Torsten. Distract him. I only need a second or two.

Anna, You’re nuts!

Do it!

Her cousin’s expression resolved itself into a media man’s public mask. “Good evening, Mr. Gunheim,” Torsten said, affecting his best Ried smile. “What brings you to operations?”

“I’m busy, Ried.” Gunheim glanced toward him.

While he did, Anna silently finished her inputs.

A woman's voice boomed from across the room. "Messenger, move away from the console."

Anna froze. The computer was flashing at her, asking if she really wanted to do the guidance change. She had only to acknowledge the command. She moved her arm.

The dart felt like a wasp had stung her. With her hand inches from the console, she went numb. As she fell, she heard Roger Gunheim's answer to Torsten.

"What's going on, Mr. Ried, is perhaps the most significant event in human history. With a few changes. As you have probably gathered, we are taking over the station. This is Magda Lobacz, who will be in charge while my party heads out to collect the black hole."

So that was their game! Even lying paralyzed on the floor, Anna was thrilled by the audacity of it. Yes indeed, it would be one of Lars' worst propaganda nightmares confirmed. And if everything people said they could do with tame black holes was true, Roger Gunheim would become the most powerful man in the universe. Maybe, just maybe...

Lobacz was a grim-faced butch-cut blonde at least two meters tall and not in the least bit willowy. Her jumpsuit was solid black and she had a full security belt. She picked Anna up off the floor as if Anna were a feather, placed her in the chair, and slapped pieces of yellow tape around her to pin her arms and keep her there.

"Next time I say something to you, you do it and ask questions later, understand?"

Anna found she couldn't move her mouth. The question, of course, was purely rhetorical. But if she read Lobacz's tone of voice correctly, a long line of power-seeking females lay between her and Roger Gunheim.

Torsten, answer yes to the system prompt. Now. Do it even if they shoot you!

"Mr. Gunheim, Ms. Lobacz," Torsten said. "Uh, I see the board's calling for an automated guidance

adjustment to be okayed. I hate to bother you, but if you want a black hole, you probably shouldn't hold it up."

Lobacz turned and looked at the board, then at Gunheim.

Gunheim stared at the panel for a minute, looked at Anna, then looked back at the board.

"It's routine," he said finally. "I studied this setup on the way in; the adjustments are automatic, but the system gets a human okay to let them think they're doing something."

Trust Torsten to know people, Anna thought. Gunheim apparently liked to impress people and pretend he knew what was going on. Lobacz nodded obediently to him and hit the okay herself.

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Dr. Bradford Adams watched the data come in and tension mount. Ten hours and counting. Over a century of work behind them. His mouth was dry. They'd replicated his favorite Melbourne pub in the recreation area of Chandrasekhar Station, and he intended to spend some time with a Victoria Bitter there when this was done.

He tore his eyes from the displays. Gunheim's people were everywhere. Why weren't they all on the *Singer*? The starship turned excursion boat had just left for the impact point. Maybe these were just the cautious ones.

"Dr. Adams?"

"Yes?" He turned and saw an Asian woman of medium height.

"Kim Soh Young," she introduced herself with a big smile, "representing *InterplaNet News*. How do you feel about making the black hole tonight? You are working on this a very long time."

Brad smiled. "You might say we all have our fingers crossed."

Kim smiled. "Everything is coming out okay, then?"

"She'll be right. Some problems with the Campbell impactor, but..." He looked at the board just to be sure. Brad couldn't believe his eyes. "Pardon me, Miss."

Sarah, Tse Wen. Check Hilda's impactor.

Brad, this is Sarah. It's right down the pipe.

Brad, Sarah, Tse Wen here. Brad's concern, I believe, is that it should not be right down the pipe. It was under full deceleration only two hours ago. It may be wise to question the instruments.

"What's going on?" a new voice said.

Brad turned and saw another Campbell person, a tall, grim-faced man with short hair. Brad frowned. "Could you wait a moment, mate? I've got an interview in progress."

He looked at the data again—normal. Something was bloody rooted. *System, who's on Ops Control?*

It is Kelly Barrett's shift. However, Anna Messenger of Popular Issues magazine is currently occupying the control seat.

What did that mean? A news interview? *Who else is there?* he asked.

Magda Lobacz, of Campbell security.

Brad shot a look at the Campbell person near him. *Where is Barrett?*

She is not responding.

We have an emergency! Get someone on the staff there!

Magda Lobacz is authorized staff, the system replied.

Since when?

“Problem happening now?” Kim asked.

“Do you have a problem, Dr. Adams?” the Campbell man asked.

Brad was on the point of wheeling around and yelling that yes, he bloody well had a problem—but caught himself in time. If he did something like that, he’d likely end up wherever Kelly Barrett was.

“No,” he said evenly. “Just some adjustments need to be made.” He changed the view field from the Campbell impactor to the one from Earth, which had a dramatic effect on the screen and did nothing whatsoever to the impactors. “There, Ms. Kim. She’ll be right.”

He turned to see the Campbell man looking over his shoulder and gave him a big phony smile. Kim had vanished.

“Nothing special here, mate,” he said, laying his Australian accent on a bit heavy, hoping they would underestimate him. “Lots to look at, but she’s all nominal, right down the pipe. Here, why don’t you sit down yourself for a bit? Something to tell your wallies about, right?”

The man smiled, nodded, and sat down eagerly. “Is that one of the impactors?” he asked, pointing to a long line in an upper left-hand screen.

“Sure is, mate. That’s the one from Earth. Up the mag and look on the front end.”

He did so. “It’s dark out there. How can I see it?”

“We’re illuminating it with lasers and we’ve got a synthetic aperture a million kilometers across staring at it. The big can on the front end is the brains. We send out a string of pulses, kind of like road signs on a rally. The impactor has to pass each road sign at just the right time.”

“What if it doesn’t?”

“The big magsail off the back—you can’t see it at this magnification—is set to drag at thirty kilonewtons, but it can increase or decrease that to make up a difference. That’s not much thrust for a billion tons, but we’d only need to move it a few wavelengths back or forward. Let’s go max on the magnification,”

Brad’s mouth dropped open as the video magnified. The bloody idiots back home had done just what he’d done on the sim, painted his initials, B.A., right on the nose of the thing, like it was a bomb in some old war. He shook his head, laughing.

“What’s so funny?”

“Just what the guys painted on the thing’s nose.” Brad laughed. Then the laugh died in his throat as he saw an “S2” below the initials, for “simulation two.” That wasn’t the real impactor.

“Something wrong?”

“No, no, mate. Just gotta run for the bloody loo, I’ve been sitting here five hours, worrying and drinking coffee.”

The man laughed. “I know how that goes.”

“See if anyone else has painted stuff on the noses of the other ones. I’ll be right back.”

Whoever hacked that image could probably listen in on anything he sent to Sarah or Tse Wen. He didn’t dare let anyone know he’d caught on. Even so, he might have only a few minutes. He gave a quick look at Sarah, whose head was buried in her displays, and then Tse Wen, who looked up at the right time. Their eyes met. From the frown on his face, Brad thought Tse Wen knew things were amiss as well. Brad tossed his head ever so lightly at the exit and Tse Wen gave a barely perceptible nod. The exchange might have taken two seconds.

Brad then turned away and headed out of the operations room. He passed the rest room, headed for the elevator, opened the service panel, and pulled it off the net. He then told the lift to take him to the

maintenance floor; elevators were designed to work autonomously in emergencies.

At maintenance, he picked up a spare central processor for the *Martinez*, an in-system shuttle equipped for monitoring the black hole. That would be duly reported, but as he was scheduled to be on the post-event inspection crew, it probably wouldn't ring any AI alarms. He could only hope the Campbell crowd hadn't anticipated everything. Worried that any exceptionally hurried activity might trigger concern, he pulled himself along with the handholds at normal speed through the access tube to the lock. Once aboard the *Martinez*, he headed right for the engineering bay and threw the manual comm disconnect. He had the processors swapped in seconds and touched the local net secure. Would this work? He bit his lip and touched the ship's net.

Martinez, Bradford Adams commanding, secure. We have a hijacking emergency involving the Chandrasekhar Station AI. It must not know I am aboard and am giving instructions.

Understood. Bioradios were self-authenticating; no two were alike any more than fingerprints. But Brad sighed with relief anyway. Halfway out. Can you get us pumped down and out of here without the station knowing in time to stop us?

You have authority for such an emergency bypass.

Right. I'm going to restore com. Give them a couple minutes to think that everything is okay and I'm heading back to shuttle ops. Then get us the hell out of here.

Prepare for acceleration in three minutes. Where are we headed?

Good question. He quickly abandoned any notion of trying to attack the *Singer*. Its AI was probably fully compliant to DeRoot and Gunheim at this point. Even without a beam to ride on, a starship still had three hundred megawatts of nuclear-powered lasers and fusion torch drives to play with. There was no point in trying to challenge that in a runabout. The *Oberth* from New Antarctica was less than a light-minute out and decelerating. He didn't know her captain, but Hilda was on board. It would be good to have her head on this.

Rendezvous with the Oberth, minimum time trajectory. I'll take the acceleration. Get a direct link to the Vertex site. Transfer control here without notification to central. Did he have sufficient authority? Had the site been hacked, too? Seconds of lightspeed lag passed.

Emergency transfer authenticated.

Various audible clanks and whirs confirmed the *Martinez's* departure.

He shut his eyes and scanned the data flowing into his head—the real data. The Campbell impactor was still hot, though decelerating on schedule. But it was also off line, almost a hundred nanometers—barely a quarter of the wavelength the guidance beacons used, but a huge error given the requirements.

The Campbell takeover, a Consolidationist in the ops chair—what the hell was going on?

He had to put that out of his mind and concentrate on the impactor. What was making it go off course? Something to do with the phase of the guidance beams? What was the command history? He read. He checked. He thought. He checked again.

“Prepare for deceleration,” the *Martinez* said over audio speakers.

“Deceleration? When did we bloody accelerate?”

“Almost two hours ago, at four gravities.”

Bradford Adams laughed. “Well, that’s concentration for you.”

An unmagnified view of the *Oberth* filled his screen. It was a standard three spheres on a solenoid ring design, with long grazing incidence cones ahead of each sphere. A smaller, coaxial “choke ring” that improved the plasma reflection performance lay about fifty meters forward of the main ring. Relative velocities were low enough there to allow docking on the inside surface of the ring while the starship rotated. Brad monitored the process with interest.

When he turned back to the problem, he thought he knew what was going on and why.

* * * *

Chapter 3

Near Vertex in orbit around Shiva,

23 December 2284

Brad and *Oberth's* captain, Ada Chenhansa, scanned a virtual screen showing current locations of each of the four impactors, Gunheim and DeRoot's ship, theirs, and Chandrasekhar Station. A petite woman with shiny black hair, Chenhansa moved and spoke with grace, economy, and deliberation. The aura of command, he thought.

She pointed to one of the impactors. "From Campbell, on time?"

Brad nodded. "It's a bit off center and has a little too much energy. I did what I could about that. But it will be on time. With three groups of human beings playing tug of war for it."

The *Oberth's* AI called for attention with the soft and deep tone of a large gong.

"Yes?" Chenhansa said.

"Dr. Adams wished to be notified when Hilda was about to awaken."

Chenhansa caught his eye and nodded.

Brad hurriedly left the captain for Hilda's stateroom, threading his way down from the dome to the deck below and into the tube connecting the *Oberth's* spheres. How many years had it been? About twenty-five since the Ten-Ten experiment validated her model. Most of that in relativistic spaceships for her. It would only be like a year or two for her, fifteen for him.

A robotic attendant met him at the door. "She's awake and expecting you. It may be a few minutes before she's fully oriented."

"Understand. If I might? It is urgent." The machine smiled and stepped aside, somewhat more slowly than Brad thought was necessary, which was silly because it was just part of the *Oberth*, which bloody

well knew what was going on. Probably just impatience on his part. Hilda, looking a little dazed, was rubbing her limbs. Her eyes focused on him.

“Brad!”

“How’s it going, Hilda?”

“Bones and muscles ache. Brain’s intact. I’ll be on the net in a moment.” She looked at him carefully, then zeroed in on his eyes. “You’re not supposed to be here. Something’s happened.”

He told her what, ending with, “If I’m right, they intend to take possession of the black hole.”

“My sister, Liz, is at Campbell...”

She wouldn’t know yet. Of course not, he realized. He’d have to tell her. Oh, what the hell had he been thinking? This should be Tse Wen’s job, but Tse Wen wasn’t available just now. A knot formed in his stomach. Things couldn’t wait; he would just have to tell her and pick up the pieces later.

Hilda looked at him dumbly after he finished. “Dead?”

“It’s too big a thing,” he said softly. “Too big to think we weren’t going to pay a price. Bloody rotten thing to wake up to. Really sorry.”

She tottered to her feet and fell into his arms. “Brad, people just don’t die any more.” Tears were beginning to form in her eyes.

He nodded and held her, rocking her gently back and forth. That was what biological immortality was supposed to be all about, to live for bloody ever. “I pray to whatever runs this crazy universe that I’m wrong, but I’m not entirely sure it was all an accident.”

She sobbed softly, then seemed to come out of it. “How did eliminating Liz help them? There should be a small armada of robotic craft around the impact site to take data. You’ve taken control of that.”

Brad shook his head. “When Mutori took back the project, she arranged for the Campbell impactor to be just a little hot. The extra momentum will pop the black hole out beyond our containment arrangements and off toward where Gunheim’s positioning his starship.” He explained the fake data from the Science Section video feed. “Nobody would have painted ‘S2’ on them, for ‘simulation two.’ They bummed that video right from the sim, and I almost dropped the load when I recognized it.”

He watched anger flow over Hilda’s face like it was morphing in some video movie. When she looked up, her eyes burned and her jaw was set. Brad had only the sketchiest details of what Hilda had been through on New Antarctica, but the coldness and resolution in her voice told him that, if anything, she had changed more in three years than he had in fifteen.

He shook his head. “I do have a surprise for them. I couldn’t fully correct the perturbation from Anna Messenger’s sabotage attempt, so this hole is going to squirt out a little sideways of what they thought. We can be there first.”

“How long do you think before they catch on?” Hilda asked.

Brad shrugged. “The system AI’s got a split personality now, half of it helping us under the security emergency codes, the rest of it pretending nothing’s going on. I suspect something will give it away eventually.”

The robot came in with clothes.

“Give me a few minutes.”

He nodded and, with a quick hug, left. As he did, a cold cramp grew in his stomach. There had never, in any history that had reached him, been a fight between starships before. One of them may have been modified in anticipation of it—and that wasn’t the one he was on.

* * * *

Peter DeRoot stood in the center of *C. E. Singer’s* dome, looking at the impact site. The tiny moon seemed curiously soft in the shadowless glow of amplified starlight.

Roger Gunheim walked over to him and put a hand on his shoulder. “Do you feel like bloody Caesar

looking across the Rubicon, Peter?" he asked.

DeRoot smiled and nodded. Roger might play the *boerenkinkel*, but from time to time let on that he knew more of the world. "A good analogy," he whispered. Caesar, not Moses. A lout would have said Moses.

Gunheim waved a hand toward the left of the impact site. "The *Oberth's* coming on."

A tiny speck of light lay at the head of a trail of glowing gas. He touched the net and got the flight plan. Captain Chenhansa was stationing herself safely away from the line of any impactor. DeRoot shook his head. "Magda has Operations under control?"

Gunheim paused a moment to get a report. His fellow Aussie, Dr. Bradford Adams, was apparently missing and being looked for, but otherwise Magda had no problems. "Yeah, she's right there. That bloke, Adams, is missing, but we've got him locked out of the system; there's nothing he can do there. So no worries."

"Then I would say that Hilda Kremer has come to see the show. She will see more than she's bargained for."

Gunheim laughed, perhaps a little too loudly. "Bloody right about that! Still, we're ready to deal with it if she tries something."

DeRoot gave a quick smile. They had been busier than normal during the passage from Campbell. The *Singer* now boasted a laser array a hundred times more powerful than what was needed to ionize debris in her path. They'd also manufactured some forty homing missiles. The one-meter layer of shielding water surrounding three of the *Singer's* spheres had been jelled with fullerene tubes and frozen steel-hard at three degrees above absolute zero.

It had all been unnecessary. Their surprise had been complete, there were no station security forces to speak of, and they had complete control. In a few minutes, they could even be magnanimous.

* * * *

Hilda arrived at Sphere One and took the lift up to the park dome. The screens showed the exterior

view, starlit objects amplified to dim ghosts, and symbology labeling everything. Brad and Captain Chenhansa were sitting in lawn chairs, staring at the display. Dotted lines raced across the dome to a convergent point. Hilda touched Brad's hand as she took a chair next to him, and he squeezed back.

"If Captain DeRoot were to capture the black hole first," Captain Chenhansa asked, "what can he do with it? He cannot go anywhere tied to a four-billion-ton astronomical anomaly!"

Hilda shook her head. "It's big enough that its gravity can overcome the pressure of the Hawking radiation. If you can dump mass into the hole, it should act like other spinning black holes; it will spit most of it back out in plasma jets from its poles at relativistic velocity and most of that from the pole opposite the incoming mass. From the starship's point of view, it should act like a pulse fusion drive with a higher exhaust velocity. All DeRoot needs is a mass roughly equivalent to that of the hole."

"A ring rock?" Brad asked.

Hilda shrugged. "Or something."

"What is he going to do?" Captain Chenhansa asked. "Build a fleet of black hole-powered starships and conquer the Solar System? What is he thinking?"

"We don't know with any certainty that one black hole can make others. But if it can, they don't need to conquer the Solar System; they just need to make it irrelevant."

"A bunch of dingoes trying to put their own piss on the cosmos, if you ask me," Brad added.

Hilda touched his arm. "Chaos, Brad, the Consolidationists will let them. They'll say 'we told you so' and use it to stay in power in the Solar System, which is all they care about."

Captain Chenhansa sighed. "There is much at stake ... but I have a ship full of passengers in cold sleep who cannot be risked."

They were all silent.

"We can put them on the *Martinez*," Brad said. "You'll need to give them enough fuel to get home."

Chenhansa frowned and nodded. “We will wait until we are at lower relative velocity.”

Hilda went over Brad’s contingency plan and the trajectories of the impactors again, adding every factor she could think of. Unfortunately, it all came up with DeRoot closer than them. There was something she could try. In theory, it would work; in practice, it would be taking an awful risk.

“Brad, I’m thinking of a drag reduction on the Groombridge 34 and Epsilon Eridani impactors. They’re coming in with the nominal drag allowed by the mission rules, but it isn’t zero. Less and they would come in slightly faster and produce a component of postimpact momentum in the Earth’s direction. Watch.”

Lines converged on the dome again, coming together at a spot somewhat farther away from them but at less of an angle to their present course.

“We should get another kilometer per second or so of reserve,” Captain Chenhansa remarked. “I like that.”

Brad touched the net and pulled up the project sim. In principle there was some margin for off-center impact, but it was literally measured in nanometers. “We can try. If anything goes wrong...”

Brad looked at Hilda. Almost a century of work was at stake, and the political environment was such that it might be centuries from now before it was attempted again. If ever. Twenty years earlier, Hilda would not have taken the chance.

“It already has gone wrong,” Hilda said. “We have to try to make it right. Tse Wen?”

Brad shook his head. “We don’t dare try to talk to him.”

“I shall wake the rest of the passengers and get the evacuation under way,” Chenhansa informed them. She closed her eyes for a moment, then said, “It’s done. I’ve ordered a lighter to meet the *Martinez* at a rendezvous point.”

“Did they ask why?” Brad asked her, worried about alerting Gunheim.

Chenhansa smiled faintly. “I did not bother the duty controller, and the computer did not ask why. They seldom do.”

Brad nodded and smiled. He was beginning to like this captain.

“Are Tse Wen and Sarah okay?” Hilda asked.

Brad thought of all the Campbell people around. Not tourists at all but, essentially, Campbell government forces. No, he amended that. Pirates. They were bloody pirates. He smiled at Hilda darkly. “As okay as any people staring down the barrels of loaded guns are okay.”

Her eyes went wide. “Hostages?”

Brad winced. He hadn’t thought of that one. Not at all.

* * * *

Anna watched the main display, biting her lip. Torsten stood behind one of the consoles in the amphitheater of the Science Section, quietly speaking into his news feed, too softly for Anna to hear. He had actually asked Magda’s permission to continue with the news operation. The Campbell security people laughed and said go ahead, even letting him have her to assist him.

And why not? Any reaction from Earth would take nearly twenty years to get back here, thirty or so to get to Campbell. By then, one way or another, the situation would be entirely different. The broadcasters were still, of course, being watched very carefully.

The Campbell people, all in red coveralls now, were everywhere in the Operations Section, and everywhere else. A glance behind her showed that her own personal minder—a dark, narrow-faced man with no hint of a smile—had his full attention on her. The guidance change had been sent, but she’d had no console access since.

One minute now. It would either work or it would not. If it did not, and if the Campbell people got the hole, Lars would be furious. He would self-righteously scream, “I told you so,” to everyone who would listen.

It would be a short-term political bonanza for him. But in the long term? Would the Solar System itself be safe from DeRoot and Gunheim? Conventional wisdom was that interstellar war was impossible. She looked around her as if seeing what had happened for the first time. Impossible? She was sitting in the middle of what was arguably the first attempt at interstellar warfare, and one that looked to be completely successful.

Whatever the political benefits of “I told you so,” the Rieds would become irrelevant. The future now looked to be Gunheim’s. Ultimately, Gunheim and DeRoot would want someone who knew the Solar System, knew where the keys to power were hidden, someone whose will to power might match their own. Gunheim had women waiting in line, but DeRoot was rumored to be insatiable. She smiled to herself. She knew how to use her body. Perhaps...

Torsten’s voice became loud with excitement. “If ever there was a time when everyone in the known universe was focused on one single moment, this would be it. We are in the last six seconds.”

“...four, three, two, one...”

* * * *

Someone on the *Singer* started counting backward from twenty. “...nineteen, eighteen...”

Conversations hushed. “...twelve, eleven...”

“...two, one...”

Peter DeRoot may have seen the slightest flash. For the tiniest fraction of a second, the tiny moon did nothing. Then it turned into a perfect, shining sphere of plasma, only slightly marbled, which first lit up the spacecraft arrayed around the impact site, then expanded through them at incredible speed.

Peter caught his breath as the huge translucent plasma bubble struck the *Singer* and rocked it firmly. Behind the bubble, a miniature nebula formed and also expanded, though much more slowly. The prize for all their efforts should be in there somewhere. It should be a brilliant spark coming right toward them. He strained to see it.

* * * *

It had already happened, Anna thought. The light had just not gotten here yet.

There was a brief flicker as the impactors zipped across the screen and vanished into the targeted moonlet, which, after a fraction of a second, was replaced by a rapidly expanding glowing bubble. It was translucent. Anna could see stars through it. Where was the hole?

“...we have impact.”

“Look at Shiva!”

Heads turned in unison to the right as the ringed planet and its moon system flashed into view from the light of the implosion. A giant blue Saturn, slightly gibbous, with huge broad white rings, hung over them, or was it below them? It faded quickly back to black.

Anna glanced back at the impact site; the plasma shell generated by the impact moved more slowly than light, but now filled a quarter of the large screen and rushed toward them. Such a perfect, pearl-like sphere, she thought. A cosmic soap bubble. A new universe? Death?

Before she could complete the thought, the front passed them without any discernible physical effect. So much for five decades worth of propaganda!

She looked toward the *C. E. Singer* and saw an invisible speck of light, unrecognizable on the screen except for the symbology that floated along with it. The hole should be brilliant, glowing with megawatts of Hawking radiation. It wasn't there.

Had she succeeded? She gripped the arms of her chair in excitement.

“The instant of impact itself was an anticlimax,” Torsten announced to posterity. “The impactor rods flashed through the field of view, end to end, and vanished into the moonlet in thirty-three millionths of a second. At the vertex, what happened was done in three millionths of a second. That seems a very short time to us, but as these physicists tell us, that is an eternity of three trillion attoseconds at the nuclear scale.

“In the first few million attoseconds, the center of the impact fills up with collision-produced matter to make a nut so dense not even neutrinos can penetrate it. Nor can the force of any one impactor move it against the force of the other impactors. A stream of matter flows into the implosion at five billion tons a second, but is brought to a halt in a little less than a centimeter.

“There are no common words to describe the central pressure. Dr. Kremer’s calculation was that at 4.3 with thirty zeros after it times standard atmospheric pressure, the last resistance to compression is exceeded and the entire mass collapses into one irreducibly small loop, or set of loops, separated by fractional dimensions of Planck scale. Something like that anyway. Maybe. We can’t tell what happens actually, because at that density, gravity has produced a black hole.

“Which won’t be black because of something called Hawking radiation, which I will not attempt to explain, but which will make this object not black but a tiny quantum-scale star that radiates its mass away with a power of millions of watts!

“So it is supposed to have happened. Most of the outer layers of the moon were vaporized and blown away in the spectacular bubble of plasma you saw. This was expected. We are not, however, seeing the brilliant speck that should be there in the center of where the moon was.”

Murmuring and muttering filled the room.

Anna could hardly contain herself. Had she won? Had she? Oh yes, it had worked! She’d prevailed! *Her* will had trumped all the others! A manic grin began to spread across her face. This was better than sex. Better than sex with drugs. Oh, she would savor this moment!

* * * *

Zhau Tse Wen looked from his guard, a burly mustachioed man introduced to him as “Micky,” to the stateroom wall screen, then back. After Brad had escaped to warn Hilda, the Campbell people had removed all the project management from the net. There was nothing for him to do but watch. He must be content with that. For now.

There was irony, Tse Wen reflected, that this stateroom had originally been assigned to Anna Messenger, the cousin of Lars Ried who had probably been the mysterious woman who had impersonated Hilda Kremer in a previous sabotage effort. Messenger’s modus operandi, apparently. She had reappeared after the conservative coalition had gained power and was now on station, ostensibly to assist reporter

Torsten Ried. Whatever plans she'd had must have been preempted by the Campbell takeover. The usurpation seemed to be fairly complete and did not, apparently, include sabotaging the project.

"Micky, could I have a view of Shiva?" he asked.

The minder pulled on his mustache. "Instead of the impact? After all these years?"

"It may succeed, or it may not. Either way, there will not be that much to see. But when the flash of light from the implosion hits Shiva's rings, that will be a sight unlike any other."

"Yeah? Okay if I keep a corner of the screen on the vertex?"

Tse Wen nodded. "As you wish."

He almost missed the impactors' flash across the screen by blinking, but a couple of seconds later the light echo of the implosion racing across the rings and body of Shiva was, indeed, a wonder to behold. The rings and the few high clouds on the planet changed color as the flash faded from violet to deep red. The bulk of the planet itself was momentarily a brilliant blue, which darkened and darkened until it seemed that a few ruddy-gold clouds floated in the darkness of the void itself.

He looked at the Campbell man again. He was big enough, but there was a softness about him. He nodded to the man and smiled. "Imagine that for several weeks."

The man frowned. "A supernova?"

"A hypernova. That is the way nature makes black holes."

"You just want to study it, right?"

Tse Wen shrugged his shoulders innocently.

"Maybe the boss man will let you do that, if you behave yourself."

Tse Wen allowed himself the slightest frown. He had conceived the project and managed it to fruition across four star systems and this lone planet. Now, “maybe” he would be allowed to study its results. But the game was not over yet. There were hidden strategies in this game, moves placed in advance to stand guard against an unknown. A step here and a gesture there, and everything could change. But he would have to wait his turn.

“I shall have to ask him,” Tse Wen said mildly.

“Do you know where the black hole is?” the man said. “I don’t see anything.”

Tse Wen frowned. “The light echo was beautiful. We can return to a full-screen view of the implosion area now.”

* * * *

Hilda Kremer braced herself. Even ten thousand kilometers away, the wave of plasma from the vaporized moonlet grabbed their magnetic fields like a gust from a hurricane as it swept by them. The floor felt like it had been shoved sideways and everything trembled.

In a few seconds, they each gained almost a kilometer a second of velocity away from the implosion center. Both ships were fully prepared for this, of course, and the velocity increment was factored into their plans.

The plasma cleared in seconds.

Where is it? she thought as the star field faded in through the last aurora-like shreds of implosion debris.
Oh, please, please, where is it?

Their eyes and every instrument in the ship scanned the area in front of them.

“Since when,” Captain Chenhansa said very softly, “does Orion’s belt have four stars?”

“Tally ho!” Brad cried as the clearing plasma revealed an impossibly brilliant spark heading right for them. “It’s coming right at us!”

Hilda’s estimate hadn’t been perfect, but they hadn’t gotten to the predicted point in time either. The errors had canceled almost exactly in space.

“The *Oberth* has acquired it. We’re maneuvering to match velocities.”

The maneuver went smoothly; the only thing Hilda noticed was a slight increase in weight as the rockets came on before spin reduction was complete.

Hilda looked at the *C. E. Singer*, less than five thousand kilometers away. It continued to scud away on its too-high velocity vector, but was braking at its maximum thrust.

“We will be on it about fifteen minutes before they get here, assuming they decelerate,” the captain said. “Two hundred megawatts of Hawking radiation.”

Hilda nodded. A gong sounded both in her ears and in her head.

We are beginning the capture sequence, the Oberth’s voice said. Please lie down, sit, or otherwise secure yourselves. There will be an instantaneous acceleration of approximately fifteen gravities.

“It has the mass of a bloody asteroid,” Brad said with a laugh. “We go where it goes.”

They lay down on the grass and looked up at their version of the night sky. It was disconcerting to Hilda that when the acceleration came, it was in the opposite direction of the relative movement of the hole. The cameras, of course, were pointed backward. The bump was more like falling out of bed than a sustained acceleration, though. After it was done, she saw the brilliant point floating between the *Oberth’s* field generators.

“It’s spinning!” Hilda said. “We’re picking up frame drag on the accelerometers.”

“It’s a ring singularity?” Captain Chenhansa asked.

“Kerr-Neumann geometry?” Brad asked.

“Near the limit, I think,” Hilda said. “It’s got a slight positive charge, too ... not enough electrons left within a thousand kilometers to neutralize it, I suspect ... big, strong magnetic field.”

“We have secured it. Or rather, we have secured the ship around it,” the captain said. Then she looked from Hilda to Brad and back to Hilda. “Now what do we do?”

* * * *

Chapter 4

BHP Operations base, in orbit about Shiva, 24 December 2284

Torsten watched events unfold with the sort of awe one has for a superlative player of any sport, even if on the opposing team. In spite of everything, and it had been quite a lot in his estimation, Hilda Kremer appeared to be in possession of a mini black hole.

“Damn, damn, damn, damn,” Anna said in front of him.

She had almost literally wilted when the black hole had finally turned up. He put a hand on her shoulder. She shrugged it off.

He looked around. The Campbell people were grim faced. Magda Lobacz went from urgent conversation to urgent conversation, then left the room.

On the screen, it looked as if two starships were about to contest for ownership of a black hole. Neither answered to Lars’ interest. “Anna...”

“Go to hell.”

“Anna, you need to let go.”

She spun and looked at him. “Well, they might still knock each other off out there.”

Torsten shook his head. Gunheim had anticipated even that. “Then the Campbell people here pick up the pieces.”

Anna motioned him closer and whispered, “*If* they are still in charge. This is still a Solar System government project. I am, kind of, a Solar System government agent. Maybe I should be in charge.”

Torsten’s jaw dropped at the audacity of it. Was she now considering a rebellion here to save the project she came here to sabotage? He glanced at their minder. The man’s eyes were riveted to the unfolding drama on the big display screen.

“What are you thinking?” he asked.

She grinned madly at him. “Watch. Just watch,” she whispered.

Then she turned to the minder. “I need to use the head.”

He motioned for one of the Campbell women to escort her, a gangling dark-haired woman with an earnest expression on her face.

His power-mad cousin could easily kill her. Or vice versa—the other woman was armed. He should say something. Stop this before it made even more of a mess. What would Lars want him to do? He opened his mouth.

The minder looked at him expectantly.

He shook his head and turned back to the screen. What would happen would happen. It was none of his doing, he told himself.

Roger Gunheim's image appeared on the screen. He was dressed casually, seated at a clean desk with a starscape behind him.

"I am addressing all of you in the Shiva system. The Campbell government that I represent is claiming possession of the black hole on behalf of the Campbell system as compensation for the Black Hole Project's interference in Campbell's internal affairs. But beyond that immediate objective is the need, indeed the destiny manifest, for the control and direction of the expansion of the human race to come under the control of those of us who are already out here.

"Imperial Earth is a thing of the past. This marks the end of the Interplanetary Association Senate's attempts to dictate events light-years beyond its natural setting, and the beginning of an era in which the colonial worlds stand up to the home planetary system as equals and claim the right to make their own destinies.

"We know that in the hands of the government of the Solar System, the near-limitless power that black hole technology will bring would be used to further the ends of that government in places far beyond its natural reach.

"We ask for your support in this effort. Under the Campbell government, genuine scientific study of the black hole will not be inhibited. Indeed, it may proceed with more freedom than the present Consolidationist Solar System government would allow.

"Most of you have expansionist sympathies. We ask you to join us, or at least not impede what we must do to secure the future for all independent men and women.

"Specifically, we plead with Captain Chenhansa to withdraw from the hole. Our ship has been prepared, as hers has not, to move it to a more suitable location. It is also prepared, as misunderstandings were anticipated, to disable spacecraft operated in such a way as to interfere with such progress. We will do this only with great reluctance, given the risk to life involved.

"I repeat. Please withdraw peacefully.

"Those at Chandrasekhar Station who wish to declare allegiance to our cause need only explain this to one of the uniformed officials of our administration. Their declaration will be noted, and with reasonable precautions, of course, they will be integrated into the new operations; in most cases with positions and authorities similar to those exercised prior to the advent of the new administration.

“This is all I have to say for now. G’day, all.”

Torsten looked around him as Gunheim’s larger-than-life image faded from the screen. Already, here and there, researchers and technicians were talking to their red-shirted minders.

A chill went down his spine. The world of science and technology was still a little distant and difficult to comprehend for him, but this he understood only too well. Napoleon, Hitler, Marsdale, and Ramachandra must have sounded like that at some point in their careers.

So Lars now had a rival whose skill, ambition, and ruthlessness seemed limitless in time and space, and who was, or shortly would be, in possession of a power that not even the Solar System’s hundred-billion-person economy could match. The seven light-years between here and home seemed not to matter so much—a speed bump. Whatever Anna had in mind, Torsten suddenly wished her luck.

* * * *

Brad glared back at Gunheim’s image on the wall of Chenhansa’s wardroom. Buried in the center of Sphere One and equipped with padded chairs and elastic restraints for use in zero gravity, it seemed a better place to ride out whatever. “That’s a bunch of bloody nonsense! Catch a beam out of here!”

Gunheim’s image was replaced by DeRoot’s.

“This is Captain Peter DeRoot. I have been commissioned by the System Government of Campbell to take possession of the black hole. Disengage from the black hole.”

“I don’t believe this,” Brad said. “DeRoot, just what is it you intend?”

“I have weapons and will use them. I also note that Dr. Zhau, Dr. Levine, and all the others, including those passengers you dropped off, are guests of our security people at the station.”

“It’s been over a hundred and eighty years since one spaceship took a shot at another; and neither of those had crew aboard! You’ll be put away for the rest of eternity.”

DeRoot raised an eyebrow and laughed. “I’m betting not. You have, what shall we say, thirty minutes?”

DeRoot out.”

Hilda called up a magnified image of the *Singer*. “Brad, Captain, look at the *Singer*’s deflector cones.”

As they watched, sections slid away to reveal ranks of tubes. Missiles. The starships were still about four thousand kilometers from each other—too far to use lasers effectively.

Brad looked at Hilda.

“It could be an empty threat,” she said. “Or not. In the larger context, it may matter politically, if we do not give in until he actually commits an act of violence, rather than merely threatens. Personally ... Liz died for this. I can take the risk.”

Brad nodded. “If it were me, I’d call his bluff, too. But it’s not really our call. The people on this ship didn’t sign up to fight a bloody war.”

Captain Chenhansa shook her head. “Dr. Adams, I am commissioned by the IPA. With Dr. Zhou unavailable, you are the legitimate representative of the Project and carry, I think, the authority of the Solar System government in this place. My ship and I are at your service. Those who stayed aboard were volunteers. We are all of one mind. *Oberth*, notify everyone to find vacuum suits and helmets. Secure the ship for despin and zero gee.”

Chenhansa looked at him and Hilda. “He is, unfortunately, positioned in our roll plane. Neither the dust deflection lasers nor the particle detonator lasers can bear on him or his missiles in this geometry.”

That was a challenge to Brad. How could they bend the laser light sideways? With mirrors! “Look. We can rig up a mirror to redirect one of the anti-debris lasers and send a robot up the deflector cone with it. Not much compared to what he’s got, but he won’t be expecting it.”

Chenhansa barely paused for a moment. “I have directed it be done.”

Chenhansa’s *sangfroid* surprised Brad. “We can’t fire first.”

She was silent.

A robot brought them their helmets and vacuum suits. They put them on in silence.

Precisely thirty minutes later, DeRoot's image was on the screen.

"Brad Adams here. Mate, what is all this nonsense? This is a research station. Everyone gets to share whatever we find out here. There's not a bloody imperial thing about it."

"Where is Captain Chenhansa?"

"I am here. We have decided that Dr. Adams' authority is highest in this matter. He speaks for the Black Hole Project and the Solar System government."

DeRoot laughed. "Which is seven light-years away and has no say in the matter. Very well. It is your ship, Captain, and on your shoulders rest the consequences. Ada, we were friends once, very good friends. You know I wish harm to no one."

Chenhansa's face was unreadable. "I was eighteen, Captain. However much I idolized you then, what happened was not friendship. I have a different role to play now."

Brad looked back and forth between them, realizing they had a history. The fraternity of starship captains was a small one, filled with large egos.

"Look, no one's been hurt yet," Brad said. "You can still back off. Take the long view, if you will. History would never see this as anything but piracy."

"That depends on who writes the history. It would be interesting to ask Francis Drake. Begin to disengage from the hole. Now."

"No," Brad said, before he could double—and triple-guess himself. This is what we planned, so this is what we do, he thought.

The *Oberth's* gong sounded.

Missile launch, fifteen gravities acceleration. Helmets on, now. Prepare for loss of air pressure!

“You bloody bastard!” Brad screamed.

I am depressurizing to ten millibars, Captain Chenhansa sent. This will prevent a blowout and still leave enough pressure to let us check for leaks. She looked at Brad then Hilda, her lips tight and her eyes narrowed. Our mirrors are deployed, and we will fire on the missile when it is close enough.

As they watched, the approaching missile fragmented into a large number of submunitions. One vanished in a vapor that let them see laser beams striking the others, reducing the swarm, but not rapidly enough.

There was a shudder throughout the ship and a great groaning noise as if the ship itself were crying out in pain. The deck rolled sickeningly. The screen blinked momentarily, then showed a cloud of vapor expanding around part of the smaller, forward magnetic field generation ring. Suddenly, as terajoules of magnetic energy became heat, the whole ring sprouted a crown of mist that was blown away by the black hole’s Hawking radiation.

“The forward ring has quenched destructively,” Chenhansa said, stating the obvious. “They’ve also taken out primary power in hulls one and two. I suggest we have no choice but to back off now.”

Brad nodded. DeRoot had damned himself; there was no point now in losing lives.

“I’m quenching the main loop,” Captain Chenhansa informed them. “We can use its stored energy to stay at full power for another half hour. We can back away from the hole as soon as its magnetic field is down to zero.”

Brad ran through the spacecraft systems status. The main drive solenoid ring ran through all the spheres; an uncontrolled quench of that much energy would be like setting off a line charge through the middle of each of them.

Without the forward ring intact, the ship’s structural integrity would be badly compromised. The structure screamed like a wounded animal as auxiliary thrusters attempted to counter the angular momentum imparted by the attack.

“DeRoot, this is the *Oberth*,” screamed Captain Chenhansa. “We are leaving. Cease firing! We have to clear the black hole.”

Another explosion shook the ship, and they lurched downward, then back up as the black hole’s magnetic field tried to snap them back into alignment.

The floor below lurched sideways and buckled up. He felt queasy. Lights blurred and dimmed. Brad’s chair broke free and he slammed into the ceiling. Everything went black except the red lights on his helmet heads-up display.

* * * *

This, decided Zhou Tse Wen, was the appropriate and auspicious time to act. His guard, Micky, was fully occupied watching the drama playing out on the screen of the stateroom.

It was a small matter to step up behind the man unnoticed and close his hand around Micky’s trunk gun.

Regretably, Micky chose to resist. Unable to point the gun, he tried to pull away. Tse Wen placed a leg behind Micky’s ankle and Micky lost his balance. He also lost his grip on the gun as the edge of Tse Wen’s hand broke the bones in his wrist.

Tse Wen did not hesitate once he had the gun. He calmly shot trunks into the three other armed men before they finished turning from the screen to see what the commotion was, moving as he did so to complicate any possible return fire. There was none. He saw Micky writhing in pain on the floor and shot him, too. The tranquilizer charge would ease the poor man’s discomfort until medical help could reach him.

Then he went into the bedroom and shot the two Campbell women who were minding Sarah Levine and the three other project personnel. Sarah rushed up to him, and after a brief but embarrassingly intimate hug, said, “So you think we have a chance?”

Tse Wen nodded and motioned to the CSU parked along the bedroom partition. “Kelly Barrett, one of the duty controllers, is in there. She would be most helpful. I need to go to cybernetics before they react. The Campbell AI program is looking for a way out of the box that the contingency program Brad activated has built around it. As things stand, orders from both sides are being ignored. We need to gain full control from here.”

Sarah nodded. "Tse Wen, you might grab a red shirt on your way out."

He smiled. "It is not my color. But one of you should do so and replace the person I will shoot outside the door."

Tse Wen did so and moved quickly. No Campbell person stood outside cybernetics when he reached it, a somewhat surprising circumstance, but he heard footsteps in the corridor. He moved quickly to the door, hoping. It slid open. In one motion, he stepped through, moved to the side, shot the person in a red Campbell uniform shirt in front of one of the consoles and dropped into a crouch. The person, a woman, turned in surprise. As she did, two other Campbell people entered the door, aimed at Tse Wen, missed, and shot the woman.

There was no time to do anything but react. Tse Wen shot the Campbell people before they could react. As the door slid shut, he scanned the room; a fourth Campbell man lay on the floor not too far from him. He locked the door manually and rushed to the fallen woman who had, by this point, received a potentially lethal dose of tranquilizer.

It was Anna Messenger. If Tse Wen called for medical assistance now, she might be saved, but he would be unlikely to have time to regain control of the system. With great regret, he turned to the more important task.

His part of the system had informed him that while the Campbell AI was distributed throughout the system, an essential part of it was physically located in maintenance memory module eighteen. He located the maintenance memory rack, a box barely the size of his hand installed over the maintenance console. Its access panel had already been removed.

He reached in and pulled out number eighteen. He should be in full control now.

Medical emergency, trunk overdose, this location. Do not notify Magda Lobacz.

He waited beside the door in a crouch. It hissed open and a robot gurney entered.

There were no Campbell people with it.

* * * *

For Kelly Barrett, doing her job from a plush chair in front of an ordinary stateroom screen seemed surreal. But the main operations and science amphitheaters were now essentially prisons from which people were being released only with due screening. And she had a lot to do.

Two starships were inbound, one on a vector from south of Campbell, and the other from Epsilon Eridani. Neither radiated anything, not even a beacon, on her instructions. Her heart pounded; they were flying into a hornets' nest and she had to keep the hornets ignorant long enough for these ships to finish deceleration.

The *Admiral Byrd* was scheduled, but vulnerable. On a closed beam, she advised them of the situation and recommended a silent and slow approach.

The other ship was coming from the right part of the sky, but way early and well off her deceleration beam. Tendrils of worry began to pick at her. It did not look like any human starship she had seen before. Four rings—three of them arranged small-to-large in *front* of the ship. The structure connecting the rings was skeletal, and the rings seemed thicker than normal. The aft ring looked almost familiar, with a sphere at the base of each connecting truss, but the cones were truncated, with various pieces of equipment exposed. *Identify?* she asked.

Unrecognized, the system said.

She smiled. The ship transformed as she watched it. Then structures began to vanish as if being eaten away. But the empty space that replaced it seemed distorted somehow.

What is that star field? she asked.

It is the one that lies behind us, as if reflected from a spherical mirror.

Or a shield, Kelly thought. A shield. It had to be her.

“Dr. Levine, come look at this. Peter DeRoot isn't the only starship captain who can rebuild his ship in flight!”

Sarah Levine looked at the strange ship, eyes wide. “Who...?”

“That is, or was,” Kelly said, “the *Farseeker* out of Big Red, Kate Avonford commanding.”

“How do you know?” Levine asked.

“I was one of her mates on the Tau Ceti mission. She wanted to come in unannounced, so she asked me to get the deceleration trail laid and tell no one.”

“So here comes the cavalry,” Sarah whispered, her voice full of wonder.

* * * *

In the *Singer*'s wardroom, Gunheim looked at DeRoot. “What are you bloody waiting for, Peter?”

“Patience. I want a little more clearance between the wreck and the black hole.”

Gunheim frowned at him. “Magda's lost control of the station. It's only a matter of time before they come up with something effective. The *Vulpetti*'s lasers, for example.”

“We are the only armed spacecraft in the area, and in a few hours, we will be the most powerful armed spacecraft in history. We will deal with that situation then. This has to be done right. While the hole is minute, it has enough gravity to exceed all countervailing forces. It can, and will, suck in any matter that comes within a meter or so.”

“Huh? The electron shells of atoms withstand...”

“The electron shells of atoms will be eaten first, then electrostatic forces will add to gravity. I must proceed carefully. If I do not...”

An attention tone from the *Singer* interrupted him. *A mass of about four thousand tons is approaching at twenty kilometers per second. On its present trajectory, it will pass ... has passed, by within three kilometers.*

“What the bloody hell? On screen, magnify.”

The screen showed nothing but a distorted star field.

It is almost perfectly reflecting, the Singer told them. Doppler measurements indicate the reflections are decelerating at eight gravities.

“Bloody aliens, Peter. They must have been watching.”

“That doesn’t seem reasonable to me, but if so, there will be very little we can do. If they want something, they will let us know. More likely, Hilda Kremer is playing some kind of trick.”

The *Singer’s* approach to the hole was agonizing. Two minutes went by, then four. The unknown vessel was now accelerating toward them.

Finally, they were hailed. A stern woman in a full vacuum suit stared from the screen at them. Incredibly, there was music in the background.

“Captain DeRoot, Roger Gunheim, crew of the *C. E. Singer*, and occupation forces aboard the Chandrasekhar Station: This is Captain Katherine Avonford of the Solar System Starship *Farseeker*. I am declaring this area to be under martial law under IPA code, Chapter Four. Any Lacaille 9352 residents holding weapons are ordered to put them down now. *C. E. Singer*, close your weapons bays.”

Gunheim turned to DeRoot. “What the bloody hell is *she* doing here? What kind of starship is that? And why the background music?”

DeRoot looked at Gunheim in surprise, then straightened his face. “I would venture that what we see reflects modifications she made while traveling here. The music was Wagner’s *Ride of the Valkyries*, which could have several meanings in this context. But I’d say she knows about Elizabeth and is ready for hostilities.”

Gunheim raised an eyebrow. “Then we should shoot first, Peter.” Gunheim flipped his hand as he would against a fly.

DeRoot’s shook his head. “That mirror is over ten kilometers across. The *Farseeker* is only two hundred meters across. We don’t know where she is behind there.”

“Well, shoot the bloody missiles through it. They’ll find ‘er.”

“Not in time to prevent her from shooting back, Roger.”

Gunheim laughed. “Well, that’s why we built this fort, isn’t it, mate? You’re giving her too much time to think. Get rid of ‘er.”

Peter nodded. He had much less confidence in the result than Roger, but it was either fight or lose the whole effort. And if to fight, best to strike first.

* * * *

Kate Avonford sat tense in front of her screens. Hailing was a calculated risk, designed to save lives. DeRoot knew his classics; *Valkyries* should unsettle him a little, reinforce the notion that she was crazy enough to fight. So he should know he was in deep trouble—but there was always a chance that wouldn’t matter to him.

“*Oberth*, this is *Farseeker*. Katherine Avonford in command. How are you doing, Ada?”

Kate heard Chenhansa’s distinctive voice, “Kate, Ada. Please stand by.... We’re a mess. We didn’t get the main quenched in time to detach from the hole, and the last blast from DeRoot got us resonating with it. The sphere shells are intact, but everything inside was wrecked. Sphere Two is leaking, Three has minor damage, and our floor got bent up and back again, with lots of torn composite. Muck from the park pond is all over everything. We’re in suits.”

The *Farseeker*’s parks were frozen solid. “Sorry to hear. I’ll try to give you some time. Hilda?”

“Mother, I’m here. I know about Liz.”

Oh, to want to hold your child or have her hold you! And there was no time, no time.

“A heroine’s death, Hilda. We honor it now. Are you injured?”

“I got a bump on the head, but it seems okay now.”

About the same time as Hilda said bump, Kate felt a hard pull to the left.

Incoming missiles. Six, ten, fourteen. We are initiating evasive maneuvers and engaging them with lasers.

Kate’s blood ran cold. “Later, Hilda, I’m under attack.”

She would have to launch her counterstrike while she still could. The hundred relativistic kinetic energy weapons in her trail were now entering the Shiva system at fifteen-minute intervals. The bottle-sized objects were calculated to punch holes—to cripple, not destroy—but that was only a calculation. People would die. She sighed.

Activate the trailers, two groups. Take out the forward ring and the missile magazines in the cones.

Kate was shoved down and forward as she sent that. Behind its reflective screen, pushed by the thrust of its fusion engines in two directions, the *Farseeker* began to accelerate on a complex compound curve with continuous random changes designed to confuse the guidance of incoming missiles.

But there were limits. The homing missiles were literally a million times more agile than the massive *Farseeker*. Despite evasion, lasers, and last-second warhead-disabling magnetic pulses, three of DeRoot’s missiles got lucky. One cone-based laser battery, then another, went off line. The third smashed the fusion rocket module off the bottom of Sphere Two, with shrapnel damage to the other two. The *Farseeker* was down to lateral thrusters only until repairs could be made.

The flood of missiles stopped. The screen was essentially intact—the pinprick points where the missiles

went through healed themselves in seconds, and the magnetic fields kept the screen in shape and in its well off-center position. With luck DeRoot wouldn't even know the results of his strike.

The trailer command system is off line, the Farseeker reported. Mode A went with the Cone Two laser battery, and mode B was damaged by shrapnel from the Cone Three hit. Estimate time of repair: three hours.

Kate bit her lip. Until then she had one laser battery and a flimsy mirror. Reality sank in. Bravado had not worked, her brilliant bubble had not worked, and she was down to her last chance and only one shot at that. Meanwhile, another strike from DeRoot could arrive at any moment. She told the crew to abandon ship while the robots did the repairs.

* * * *

“Did we get her?”

Peter DeRoot frowned at Gunheim, hesitated, then nodded. “The mirror screen's still there, but there's been no response. I think so.”

“Okay, now let's stop yabbering and take the black hole before anything else happens!”

A warning clang and red lights erupted through the ship. *Interstellar debris deflection system activated.*

“What the bloody hell? We aren't moving,” Gunheim said.

But Peter, trained to react instead of question in such circumstances, already had his helmet on.

One, two, three, four loud explosions echoed through the ship in rapid succession before a brilliant flash filled the room, followed by a blast from the bulkhead behind Roger. It threw Roger's body into DeRoot with a force that knocked the wind out of him. Chairs tore off their mountings. Debris flew past him and bounced off walls, ceilings, and floors. A tremendous low-toned howl drowned out all other sounds.

Incredibly, in the direction of the blast, Peter glimpsed a patch of empty space, maybe six centimeters

across, through the metal and ice. Objects streamed out through it. A relativistic kinetic energy weapon, he thought, an RKEW. A grim smile spread over his face. Too fast. The real explosion must have taken place a kilometer or so beyond where the mass flew through the ship.

What was left of the wardroom filled with damage control robots. Moving with incredible rapidity, they plugged the holes and began taking out the debris.

One look at Roger confirmed the worst. The RKEW had punched a hole right through where the man's heart had been.

"Thanks for the ride, Roger," he said to himself quietly, and left the cleanup to the robots.

Damage, casualties, status? he asked the ship.

The forward ring quenched, estimate six days to return to operational. Major damage to all missile batteries. After repair, we may have ten missiles left.

There would, he thought, probably be a second wave.

Shed the cones and fly the rest of us away from them on fusion rockets. Casualties?

Five dead by decompression. All in this sphere.

I'll move command to Sphere Two, if the passage is clear. What's the status elsewhere?

There's another starship inbound, unannounced. The Admiral Byrd, from Epsilon Eridani.

Captain Lee, he recalled, who was as cool-headed as Kate was hot blooded. There was only one way to success now. The black hole itself could be used as a power source and a weapon, with the proper preparations. They had made the preparations—once they had the hole, they would be invincible. But they had to get it *now*.

After getting out of the wreckage of the wardroom, DeRoot was a little more heartened. The structure had pretty much held two meters away from the strike line.

In Sphere Two, he watched the second wave of RKEWs punch holes through what was left of the *Singer's* cones and his remaining missiles. He addressed the remaining crew.

“I have every reason to believe that was the *Farseeker's* best shot, and it may well have been posthumous—they are silent. Our maneuvering engines are intact. We have three batteries of lasers, two intact spheres with one repairable. Once we possess the hole, nobody will be able to interfere with us. We are going to proceed with the mission. Just in case Avonford is not done, we will approach the black hole so that the wreck of the *Oberth* lies between us and the direction of her RKEWs. Once in position, we'll use the sphere base laser batteries to quench the *Oberth's* main ring, blow holes in her spheres, and vaporize her shielding water. The reaction of escaping steam should be sufficient to push it away from the hole. DeRoot out.”

* * * *

Chapter 5

On the *Oberth* in orbit about Shiva,

25 December 2284

What was left of the ship was a complete wreck, Brad thought. Utilities were off line; there was still energy in the main ring, but no way to distribute it. Cybernetics had fallen off line for lack of power. Some robots were still active, uselessly trying to bail an ocean of debris. Captain Chenhansa, to do something, was trying to help them.

Kate Avonford, in the immobile *Farseeker*, was trying to keep them informed over their suit radios. “What's left of him is coming for you,” she said. “Can you get out of the way? I should be maneuvering again in ten minutes. I may outgun him now.”

Captain Chenhansa answered. “Almost everything here is down from the shaking. Our maneuvering engines are probably intact, but we can't get power or data to them. This ship was not designed to fight battles.”

“The two that were, kind of, are wrecks as well,” Kate said. “In hindsight, this was all a very bad idea. Fortunately, so far, everyone was shooting to disable. So you’re still stuck to the black hole?”

“With our systems down, we have no way to quench the main ring field,” Chenhansa replied, “so it is still coupled to the black hole’s field. That is just as well—we do not want to drift into it.”

“Also,” Hilda added, “the particle component of the Hawking radiation would be bad if it were not for the field’s protection.”

Brad unstrapped and pushed himself away from the chair. The ceiling above was almost touching the wardroom’s small central table. “There’s more elbow room here near the walls, mates. I’ve got an idea. It’s a bit dicey, but if we dump some water on that thing, it should behave like a small version of a galactic nucleus, with a bipolar pair of plasma balls.”

“I can’t do any simulations,” Hilda said as she joined him, “but I don’t think you get symmetric outflow unless the input is equatorial.”

“Exactly. If I dump stuff in the north end, it gets spit out the south end faster. We get a big plasma ball behind us and that should push us away from the hole with more force than the magnetic field holds onto it.”

“It could work ... if the ship can take the stress,” Hilda said.

“It should if the stress is small, steady, and on axis,” Captain Chenhansa said. “Large oscillations are the problem.” There was a creak and a groan as the captain pushed a piece of intruding partition out of the way and joined Brad and Hilda.

“Hi everyone, Sarah Levine here. Sorry for the delay; we had some fun figuring out the *Oberth’s* suit radio protocol. The Project is fully back in control of the base. We’re trying to come up with a way to aid you with the propulsion beam drivers, but they aren’t pointed anywhere near the right direction. It takes hours to rotate them a milliradian. Brad, Hilda, we *can* do simulations and your mass dump into the hole will work, though exactly how well is very dependent on initial conditions. Brad, more help is on the way. *Admiral Byrd* is inbound. Captain Lee Hyun Sil and Dr. Bruce Macready.”

“Brad Adams here. Hi, Sarah. This ship won’t endure another blast from DeRoot either. He’s taken casualties, and my guess is he won’t be aiming to wound this time. Regards to Dr. Macready and tell them to bloody *hurry*.”

“Zhou Tse Wen on. The *Admiral Byrd*'s arrival may have already forced this move on DeRoot's part. He may believe that gaining the black hole is his only option now. That is not incorrect.”

“Captain Chenhansa on. At this point, we would give it to him, but it is magnetically stuck to us. Dr. Adams ... Dr. Adams has left the area.”

There was very little time, Brad realized. He pulled himself out of the wardroom into the central section of the sphere. The park floor had split, dumping tons of wet soil and dirty water into the area. It was pitch black and turning on his helmet light didn't improve things.

“Adams on. I'm going to try to find some way to throw water into the black hole. The resulting plasma blast should push us free.” It also might do a number of other things, Brad thought, but there was no time for analysis. “I'm on my way to the rotary joint between the sphere and the ring. That's the strongest place on these ships and should be intact. There's a galley and a head there, so maybe water and something to put it in.”

“Chenhansa on. I'll try to get some people there to help. We have several with extravehicular activity experience, but as you can tell, it's difficult to move around.”

“Adams on. Roger that. No problems there, but I'll likely have as much EVA time as anyone.”

He didn't add that he was inventing what to do as he went along, and that went more efficiently alone. He worked his way through debris and around a collapsed floor section to the galley. The part near the sphere's hull was reasonably intact, but everything was badly bent and twisted inboard.

He felt a hand on his shoulder and turned his body to see a long spacesuited figure.

“Dr. Adams, Jomo Oboto.” The male voice was very faint in the rarefied atmosphere. “I'm a botanist, but cooking's my hobby. I was hoping to salvage something, but...”

“It's a bloody mess,” Brad said, in sympathy. “Look, we're looking to feed some mass into the black hole. There's plenty of water, but we need some kind of container. Something that will hold up to a lot of radiation for a few seconds, at any rate.”

“Understood. One of our standard trash bags might do. They’re designed to withstand a drive flare long enough to avoid splattering the hull. Properly sealed, they might hold up to a dozen atmospheres in vacuum.”

“That sounds good,” Brad said. It would have to do.

Oboto rotated his body and reached for a cabinet door under the counter. The whole structure was warped, and it wouldn’t open. He motioned for Brad to help. “Grab the sink with one hand and hold my belt with the other.”

Brad maneuvered into position and grabbed Oboto’s belt firmly.

Oboto gave a mighty kick at the reluctant door. It broke open with a loud snap.

“Kremer on. Careful of Ada’s spaceship, Brad.”

That produced a round of ironic laughter.

They were able to pull the pieces off separately. In the cabinet, there were three rolls of bags of different sizes.

“Looks good,” Brad said. “Where do I get water?”

Oboto tried the kitchen tap. Nothing. “A safety valve probably cut off the line. There’s a feed/drain line outside the main connecting ring that will open mechanically from inside the ring opposite the emergency access hatch. You’ll need a hose.” He reached under the sink, disconnected one of the water lines and handed it to Brad. “Standard push/pull fitting.”

Brad recognized it and smiled to himself about the contrast between this ordinary object and the extraordinary circumstance in which it would be used. “Right. Bag sealers?”

Oboto shook his head. “Just twist it around and stretch it a bit. The stuff will bind itself.”

“Right. I best get at it.”

Hilda Kremer appeared. “Nothing to do where I was.”

It took all three to push open the door from the sphere into the connecting tube just outside the rotary joint. In contrast to the devastation in the sphere, the passageway in the tube showed no sign of damage. They closed the door after them to limit air loss to the connecting passage.

Brad found the emergency exit in the “forward” side of the tube that would be overhead under thrust. He removed the access panel, revealing a tiny view port and a levered sliding seal designed to be opened manually against pressure.

“We’ll need a tether,” he said.

Oboto nodded. “There should be an emergency kit in a red box near the hatch. In it will be a tether spool, space tape, a spare recycle catalyst canister, an EVA maneuver pack, and a net.”

“Roger that,” Brad said. He found the red box and opened it.

“Let’s see. Hilda, you can belay the line while Oboto operates the valve.”

“That sounds like a plan,” Hilda said.

Brad nodded and Oboto opened the hatch, creating a small gale as what was left of the atmosphere in the connecting tube rushed into space.

They put the net out first and shoved the roll of water bags into it. Hilda attached the EVA maneuver pack over the life support unit on Brad’s back. Its telltales blinked green in Brad’s helmet display as it came on line. She gave him a hug and touched her helmet to his.

“Brad, if we get out of this...”

He gave her a brief, one-armed squeeze back. “She’ll be right. Just you watch.”

Then he exited the hatch feet first, letting himself be blown into the net on top of the water bags. His radiation alarms went off—the Hawking radiation was still over limits with the black hole a hundred meters away.

That, he thought grimly, was nothing compared to what he was about to get.

The rush of air from the hatch helped push him out and gave him the feeling of hanging down. Oboto handed him the tether reel, and he clipped its free end to a stanchion near the hatch and the reel to his belt. Then he shut the hatch.

He had no time to feel isolated. He found recessed handholds in the connecting tube hull and used them to pull himself over to the outboard side of the ring. With the ring between him and the hole, it was suddenly very dark. His helmet light came on, illuminating an almost featureless hull.

He spotted the spigot cover about ten meters from where he’d come round the hull.

“Adams on. Got it.”

The cover popped open at his touch, revealing a handhold as well as the spigot. He attached the hose Oboto had given him and felt the connector click hold.

“Adams on. Give me just a bit of water, mate,” he said, holding the thumb of his suit glove over the end of the line.

“Oboto on. Wilco.”

When Brad felt the tube stiffen with pressure, he released his thumb and a cloud of steaming water jetted out. The temperature of the water was barely over freezing, but that was enough to make it boil in vacuum.

“Close,” he said.

“Oboto. Wilco.”

Brad hooked his toes under the handhold to steady himself, pulled a bag off the roll, and worked the end of the tube into the open end. Then he gathered the material around it and wrapped space tape around that.

“Adams on. Okay, give me a little again.” The bag inflated instantly with water vapor, rigid and spherical. It looked like it might hold almost a cubic meter of water, if it would fill.

It was too dark to see anything in the bag. He would just have to trust. “Okay, more.”

The line vibrated and the bag began to feel heavier if he moved it. The volume of vapor would get less, condensing back to liquid as the pressure in the bag increased. With luck, he would end up with a bag full of cold water.

He did. As his eyes adapted to the night, he could see the brighter stars through it, distorted as if through a great lens. The internal pressure kept it stiff, more like a huge basketball than a blob of jelly.

He filled four bags altogether and put them into the net. Then he worked his way back over the hull into the brilliance of the black hole’s Hawking radiation.

The gravity of the black hole was very slight at the distance of the ring, but enough to give direction and pull the tether taut as Brad lowered himself and the water bags toward it.

“Hilda on. Brad, we’ve got AI restored. I can give you guidance.”

Her face filled the tiny view port in the emergency hatch. She sounded much more confident, Brad thought. He used his maneuvering unit to gently push himself a little bit forward of the spin plane. He stared through one of the bags. It formed an ersatz lens, providing a distorted, magnified view of DeRoot’s *C. E. Singer*, approaching.

“Adams on. I can see the *Singer*. It’s missing its cones. No radiator area—they’ll be limited in how much power they can use.”

“Avonford on. We’re maneuvering, but not fast. Maybe thirty minutes to laser range. Give us some time if you can.”

“Chenhansa on. Roger that. We’re going to try to push ourselves free of the hole.”

Brad watched the *Singer* approach. If it kept on that course, he thought, it would be within a degree or two of the black hole’s spin axis in a minute. Of course. Since they meant to get the hole, they would approach on its spin and magnetic axis. There was no saying for sure, but the results could be bad. Should he warn the *Singer*? It was a volunteer crew, he told himself.

“Kremer on. Come forward four degrees if you can, tether taut.”

“Adams. Roger.”

Damn, he told himself. Keeping silent would be murder. Simple bloody murder. “Adams on. Check the geometry. If we get polar jets, we might toast the whole mob.”

“Kremer on, roger that. Brad, push the bag directly toward the hole from your present position. I’ll start the countdown.”

“Starship *C. E. Singer*, this is Captain Chenhansa, *Oberth*, issuing a maneuver exhaust warning. Clear aft. Now. Repeat, maneuver warning. Clear our aft now.”

“Kremer on. Four, three, two, one...”

Brad released the bubble forward with a gentle push as Hilda hit zero and held his breath. The bubble moved toward the hole with ever increasing speed. He immediately began reeling in tether, damping the swing with his maneuvering unit. He wanted to be in the equatorial plane of the hole when the bag hit. “Hilda, the bag is rotating. Will it...?”

“It’s on course. Hang tight, Brad. Watch through the other water bags.”

“Wilco.” At twenty meters, the bubble began to accelerate. It took on the shape of a teardrop, pointed end at the hole. The back end of the bag burst as it accelerated into the hole, but it was too late for any of the mass to escape. Suddenly it was gone.

* * * *

Captain Peter DeRoot played the message again with a sardonic grin on his face. “Starship *C. E. Singer*. This is Captain Chenhansa, *Oberth*. Maneuver warning. Clear aft. Now. Repeat Maneuver warning. Clear our aft now.”

“Don’t believe it,” Peter DeRoot told his crew. “They just want us to give the next waves of RKEWs a clear shot at us. This we are not going to allow. We will fire presently.”

DeRoot’s view of his target was not clear. The black hole’s brilliant Hawking radiation cast everything in harsh contrast, and the area was cluttered with all sorts of debris. The main spheres of and ring of the helpless *Oberth* showed up well enough, however. He would fire his three laser weapons in two rounds. The first would quench the *Oberth*’s main ring, releasing the hole. The next would turn the habitat spheres into steam rockets, pushing the remainder of the doomed ship away.

He’d known Ada Chenhansa for over a century. If circumstances were different ... But this was no time for sentimentality—the project people were back in control of the operations base, all his bridges were burned, and Roger’s legacy was at stake—the vision of a humanity spurred on by great thoughts and great deeds, rather than the mundane compromises of timorous bureaucrats. No, this was no time for weakness. Still, he did not want Ada on his conscience for eternity. The great man controls events to his will, he told himself, rather than lets events control him.

“Ada, Peter. Sorry, but this is a bigger thing that I am about than either of us. Abandon your ship now if you can. Someone will pick you up in ... what?”

The black hole appeared to have exploded, with brilliant plasma covering everything before the screen went dark. Alarms and red lights burst out everywhere.

“Oh, shit.” He felt like he had a terrible fever and saw objects all around bursting into flames. In one last moment he saw that he, himself, was burning and lifted one flaming hand in wonder. Then a thunderous boom ended it all.

* * * *

Brad found himself suddenly in a shadow. It was as if the black hole had vanished for a moment. Then two violet searchlights lanced out from where it had been—along the ship's and the hole's lateral axis. The rearward one might have been the brighter, but he couldn't be sure. The tether jerked him firmly. In a moment of recovered focus, he dumped the net and jetted forward and out toward the ring hatch. He had only time for a glance in the *Singer's* direction and saw only what looked like a cloud at the end of the violet beam.

The emergency hatch opened as he arrived, and a robot's arm reached out and pulled him in with ruthless, painful efficiency. He realized he was hot and feverish. The robot pulled him along into the galley. He felt queasy, sick. He couldn't see.

Someone jammed a hypo against his arm, right through the pressure suit.

“Hey, ouch...”

He was suddenly tired, very tired. He managed to retch once into his helmet.

“Sorry for the mess...”

* * * *

In the Operations Section amphitheater, Zhou Tse Wen watched the screen fill with the expanding cloud of vapor that had been the *C. E. Singer*. Somebody cheered.

It was, he reflected, his fault in a way. Had he anticipated an effort to steal the black hole, the people on that ship might still be alive. He raised a hand for silence and sent his voice through the address system.

“Friends. Whatever the flaws of his last adventure, Captain Peter DeRoot was legend among the stars. He was an extraordinary astronaut who opened five new planetary systems, rescued three disabled starships, and had a vast love for the history and continuity of the urge for humanity to explore and seek beyond what we know. What has just happened is tragic on many levels. I ask all to observe a moment in silence for those who are no more and to contemplate our own misadventures.”

Quiet spread among the project staff, reporters, and Campbell people who had surrendered weapons and pretense of authority—some literally ripping the red shirts from their bodies.

After what he thought was a decent time, Tse Wen set people about the work of adjusting the carefully prepared postimpact plan to actual events.

Kelly Barrett was still on station.

“You seem to need no rest,” he observed.

She turned to look at him with a smile that took any sense of irritation out of her words. “Dr. Zhou, I slept through the most important event in human history, damn it. I may never sleep again!”

He had to smile at that.

“*Farseeker* is in her final approach to Dock Seven. The hatches should be open in ten minutes. The *Admiral Byrd* is due in fifteen minutes at Dock Three.”

“Thank you,” Tse Wen said. “I will go to the Science Section and get Dr. Levine. We shall go up to meet it together.”

The door to the Science Section slid open as he walked in. The mood here was one of quiet business. They had lost a heartbreaking amount of data, but what they had still filled banks of qubit memory files. There was not a little element of tension in here; if any radically new science was to be found, the chances were that it would show up in these first hours, and everyone wanted to be the first to spot it.

Sarah walked by Torsten Ried, who was talking to his pickup. He turned toward her, but she passed by, barely acknowledging his presence. Tse Wen frowned. Ried was still, after all, a chronicler of the event and an important person in the long run.

“He gives me the creeps,” Sarah Levine said when she reached him, as if she had read his mind.

He simply nodded and followed her to the central docking complex to await the arrival of *Farseeker* and its load of radiation and trauma casualties from the *Oberth*.

When the lock opened, the crews of two damaged starships emerged, some heavily bandaged, others obviously not feeling well, many seeming dazed, but almost all with smiles of a victory that at least for now anesthetized their discomfort. Tse Wen greeted each of them with a handshake, thanking them for their efforts and sacrifice. Sarah Levine hugged everyone who seemed willing to receive one. Finally, Hilda Kremer and Ada Chenhansa came out. Sarah got to Hilda first, so Tse Wen took Captain Chenhansa's hand.

"We haven't met before. I am honored," he said.

Her eyes glistened. "And I as well," she said.

Sarah brought Hilda over to them. Hilda looked like she should be on a stretcher, and had she not been in zero gravity, Tse Wen thought, she might well be.

Then a ghostly parade of coffin-like CSUs emerged. Many inside were clinically dead before freezing, though for a short enough time that revival in some form at least seemed possible. Moving on magnetics and turning with flywheels, they floated out of the *Farseeker*, across the anteroom, into the cargo lift door, rotated ninety degrees, and vanished down the tube headed for the station infirmary. Bradford Adams would be in one of those. *Which one?* Tse Wen asked.

F29. It is exiting the lock now.

Tse Wen pointed to it and Hilda rushed forward to put her hand on it, then walked it across the anteroom with tears in her eyes. Tse Wen touched the CSU briefly as it went by. He collected Hilda at the exit and gently pulled her back to the group.

As the last CSU left, an average sized man in a trim dark tunic and trousers entered.

"Glad I'm nae in one of those!"

His accent identified him instantly. Dr. Bruce Macready, the Scottish science historian who had inherited leadership of the Epsilon Eridani impactor project and managed his way to a successful launch under extraordinary difficulty.

“Bruce!” Tse Wen exclaimed. “You help lift a heavy heart. Welcome!”

“Aye, but if we could have only been a bit earlier.”

Tse Wen stepped forward to embrace the Scot—a gesture so out of place for both of them that it signified the most profound of circumstances. They released each other and shook hands.

“Do you have any left?” Tse Wen asked.

“One bottle,” Macready said, shaking his head. “Which I fear will be gone tonight!”

Sarah smiled and held up her hand. “Okay guys, I have some physics news. You heard it here first. They’ve just finished the before-and-after mass and energy totals for the water Brad dumped into the black hole. And, by the way, we need to thank Peter DeRoot for putting his starship where it could provide a calibration point in the bipolar flow.”

“Sarah,” Tse Wen said, reprovingly.

She laughed and a brief smile flashed across Chenhansa’s face.

“Anyway,” Sarah continued, “we’re short about three kilograms.”

“Three?!” Tse Wen was intrigued. While it might sound small, it was, in fact, enormous. If the result held up, two hundred seventy thousand terajoules of mass-energy had simply vanished.

“Where did the rest of the mass go?” Captain Chenhansa asked.

Tse Wen shook his head. “For almost three hundred years, people have speculated that there is no way to know what happens to mass that enters a spinning, charged black hole along its polar axis. The singularity is ring shaped. There is an event horizon, but it is essentially flat within the ring—what goes that way is not crushed into a three-dimensional singularity.”

“For all we know, it may have left this universe without a trace,” Sarah said.

“Left this universe?” someone asked.

Tse Wen shook his head. “That is very speculative. We will have to review the bookkeeping of mass-energy very carefully.”

“Tse Wen, Sarah,” Hilda said. “If that can happen here, it would happen elsewhere. Much of cosmology assumes that the mass/energy density of the universe is constant. If it can change like this, cosmological issues that have been thought settled for centuries would be open again.”

Tse Wen still felt very skeptical about this, but it was good to see some life in Hilda’s eyes.

“Well, maybe,” he said. “There is no good model for what happens on the other side of a Kerr-Neumann geometry.”

Captain Chenhansa smiled benignly, hands folded. “I have always wanted a wormhole drive.”

“We would not know how to build one,” Tse Wen said.

“Yet,” Hilda added pensively. “But we’ve paid a high enough price for one, I think.”

“Hello from Big Red!” Kate Avonford’s voice rang out as she walked from the access tube. She wore a tight-fitting, coal black jumpsuit with a flashing diamond captain’s badge over her left breast. Platinum hair cascaded dramatically over her shoulders. She looked around and shook her head. “You would have thought you’d lost the battle instead of saving the culminating achievement of human history!”

“Mom!” Hilda said.

“Hilda, cheer up. The dragon is dead, the would-be gods are vanquished, our fallen will be immortalized, our wounded are being cared for, and we Rhine maidens have our ring back! So let’s head for the *Melbourne* and raise a pint to Brad!”

Even Tse Wen had to smile for a moment, before his mind went back to questions of missing mass and missing people. The culminating achievement of human history? He considered Big Red, a star that would still be shining a trillion years from now. They stood, he thought, not at the culmination of human history, but at its very beginning.

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(EDITOR'S NOTE: Earlier stories of the Black Hole Project include "Kremer's Limit" [July/August 2006], "Imperfect Gods" [December 2006], "The Small Pond" [March 2007], and "Loki's Realm" [July/August 2007].)