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**Kremer's Limit**  
**G. Sanford Lowe and G. David Nordley**  
**Analog**  
**July-August, 2006**

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**Chapter 1**  
**Black Hole Project Headquarters,**  
**Santa Cruz Mountains,**  
**10 April 2257**

"But what if you're wrong?" the reporter asked.

Hilda Kremer tried to compose herself. The Black Hole Project auditorium became so silent that the gentle whoosh of maglev traffic on the grassway down the hill could be heard. Even the small gaggle of protesters outside the auditorium were quiet, leaving the air to the calls of birds about their business in the two century-old redwoods that had grown up around the mountainside building. The four story Mediterranean style mansion had once served as a satellite campus for the University of California at Santa Cruz and before that, a Buddhist retreat. The speaker's platform faced the rose window that once stood over the Buddhist altar, and Hilda often drew a sense of inner peace looking in that direction.

She needed it. They had spent twenty minutes explaining why trying to make a black hole would not destroy the known universe, and here was yet another hostile question.

Project director Dr. Zhou Tse Wen, who had the floor, turned to her. Did he want her to reply to the question? On one hand, his turning to her was a form of recognition; on the other, she didn't want to venture into the minefield of loaded questions. She shook her head. She created intricate, massive computer simulations of subnuclear processes; others strove to make them happen. Desire to make things happen was the enemy of equanimity and clear-headedness.

Tse Wen's mouth turned up just slightly at the corners and he winked. When Tse Wen smiled he reminded her of a contented, if undernourished, Buddhist monk. He'd lost his hair before taking his initial telomerase treatments and preferred that look, as it simplified his life. His thinness was not from any asceticism; he simply forgot to eat for days on end. Not infrequently, Hilda and Sarah Levine kidnapped him from his office and dragged him over to Sarah's room for a feast of chicken soup and bagel sandwiches filled with kosher sausage slices.

He turned back to the reporter who'd asked the question. "Theory tells us the forces between the electron shells of atoms keep us from collapsing into a tiny ball of neutronium in the center of the Earth. What if we were wrong about that?"

"We don't collapse..." the reporter said.

Tse Wen smiled and bowed slightly. "And neither has any naturally formed black hole ever created a new universe on top of us. Please remember, we live here, too."

A titter ran through the room. Hilda smiled. Tse Wen was a student of martial arts among many other things, but had the kind of mind that could apply those lessons to conflict with words and ideas. Here he had gotten the opponent going in one direction and

effortlessly pulled him past his objective and onto the floor. But another reporter rose to take a shot.

"Dr. Zhau, is or is not the Ten-Ten experiment an attempt to create a black hole right in our own asteroid belt before final review of the project?"

"It is not. It is far too small, only ten milligrams, and not the right geometry, to create a black hole. Many years ago, it was thought that quantum black holes might form in such experiments, only to evaporate instantly. But according to the 2135 Wilson-Lu synthetic model of quantum gravity, the minimum area of an event horizon is approximately 1/720th that of a proton—far too big to be made with the amount of energy the Ten-Ten experiment provides. It should, however, help us calibrate Kremer's limit and understand what kind of phenomena to watch for in the main event. I should let Dr. Kremer describe the model."

Tse Wen gave her a cautionary glance.

"Less technical," she thought he meant. No escape this time. Hilda took a deep breath, stared up at great dark wooden beams, and imagined herself up there, calm and removed.

"Think of neutrons as tiny balloons filled with quarks," she began. "Squeeze them and heat them enough, they dissolve into a 'quagma,' a kind of bubble of free quarks buzzing around like angry bees. Push more, and the quarks buzz around faster and push back, but they get heavier and change in the process. At a high enough pressure, there's a transition to an ultra dense state of what we call 'strange matter' that is normally unstable, but can exist under extreme pressure.

"Increase the pressure and we think one gets a condensed Planck-scale Lu superposition of all the original mass. I say 'think' because by this time a stellar mass is so dense that it warps spacetime around it to the point where light cannot escape, becoming the unobservable inside of a black hole. The central pressure of a quark star of 3.18 solar masses is enough to cause that collapse.

"To make a black hole without a star, we need to force enough mass-energy into a small enough volume to exceed the critical pressure for long enough for the mass to implode within an event horizon. The Ten-Ten experiment will confirm the model where we can see it and help us with the precise design of the final experiment."

Hilda touched the net for Sarah. *I'm getting into your territory now, and you like attention.* "Dr. Levine?"

Sarah beamed and brushed a wave of thick brunette hair aside. "When we try to make the black hole some thirty years from now, we'll be using most of the interstellar propulsion capacity of four stars for several months. To use more would needlessly take resources from other interstellar commerce and exploration. Also, the resulting black hole would be heavier and harder to handle than needed. But if we use too little, we'd have to try again and decades of work would be lost. So to get it just right we're going to calibrate the model first."

The reporter frowned and looked as if he were searching for a follow-up that would make sense. Finally he just sighed, shook his head and sat down. Hilda almost sympathized with him; the poor man had been looking for something sensational or at least controversial and what he'd ended up with was "calibrate the model." Granted, it sounded sexy when Sarah said it.

"I think we should take one more question," Tse Wen said.

A well-groomed reporter stood up and stared almost accusingly at Hilda.

*Torsten Ried, from Popular Issues, Sarah sent. He's the brother of our nemesis, Senator Lars Ried. Watch out.*

Hilda bit her lip. Sen. Ried was the leader of the consolidationist coalition in the

Interplanetary Association Senate and a frequent project critic. If his coalition got a majority, he could be the new IPA president. Hilda shivered. Consolidationists wanted to limit cultural change and typically opposed research that might cause it. If the demographic analysis of consolidationist gains was right, humanity might be in for as profound an inward turn as that of China a millennium ago. She might get only one chance to make a black hole.

Tse Wen acknowledged the reporter. "Mr. Ried?"

"Yes. Setting aside the uncertainties and the possibility of wiping this universe out with a new big bang, have any of you considered what you might unleash if you succeed? Are the leaders of humanity ready for the kind of power that having its own black hole would mean?"

Hostile as it was, Hilda realized it was a fair question. To her relief, Tse Wen nodded to Bradford Adams. Brad was a gifted engineer and practical problem solver. He'd thought and written more about what to do with a black hole, if they made one, than any of them.

"No problems, I think. Now our society lets people be people, so we still have gangs, power trips, and police actions here and there. But there has not been a war, or anything resembling one, among the advanced nations of the world, for over a century. Our cybernetic tools for monitoring and preventing misuse of resources are increasingly effective.

"Anyway, the black hole will be created six light-years from any concentration of human population. No bloody politicians there, just scientists." The audience chuckled. Brad's normally standard English lapsed into his native Australian dialect, or 'strine as he called it, when he got excited or wanted to sound folksy. "And many people *are* excited about this," Brad continued. "Even Bruce Macready, my old science history professor, wants in on it."

"The author of *Unification Quest*?" the reporter asked.

"Right you are. He's even offered to leave Broadfield College on the Isle of Skye to go along on the Epsilon Eridani mission as an historian. That's probably the most challenging star in the project, technically, because it's so young..."

Dr. Zhau held up a hand. "I must thank you all for this fascinating discussion. So fascinating that indeed we have gone a bit overtime and our food is waiting. Please, everyone, join us for the reception in the atrium and perhaps these conversations can continue in a more relaxed setting."

He bowed and motioned for the team to rise, signaling the end of the press conference.

Hilda and Sarah were first on their feet and quickly off the podium and out the door at the rear of the stage before the applause faded. They'd programmed the food and wanted to check on it. Sarah handed her jacket to a robot, revealing a dark, low-cut, strapless dress.

Hilda sighed. She hadn't considered looking any different at the reception than at the press conference, and her loose black tunic and pants, while simple and elegant, were about as unsexy as a nun's habit. Well, she thought, there was something to be said for truth in packaging.

They sampled some sausage and cheese; Sarah grinned and nodded.

Hilda touched the net to let Brad and Tse-Wen know they were ready.

The team lined up and the guests entered. After all the handshaking was done, knots of people formed. Sarah was surrounded by four major infonet editors, all male. Dr. Zhau had quietly slipped into a corner with the editors of *Scientific American* and *Nature* while Brad was sitting at a table in deep political discussion with some of the *Coriolis* media corps.

"Dr. Kremer?"

She turned. It was the reporter with the political point of view. She would have to watch what she said. Misquotes by a journalist with a political point of view could be a real

problem. "Yes?"

"Torsten Ried. *Popular Issues*."

"Oh, yes." They shook hands. Hilda forced a smile and focused in on him. He seemed normal enough, about 180 cm and trim. His slightly sun-bleached brown hair was short with a part on the left. He wore cologne, maybe a little too liberally for her taste.

"It's a nice spread," he said. "I detect a woman's touch in the programming."

She laughed. "Found us out, I'm afraid. Sarah Levine and I spent all afternoon yesterday on it."

"Dr. Levine, yes." Ried followed Hilda's eyes and did a double take.

"Well, I'd like to talk to her, but she seems occupied just now." He turned back toward Hilda.

"Off the record, there's some real risk, isn't there or you wouldn't be doing this experiment?"

Hilda thought about Sarah tasting her sausage and laughed. "It's just a calibration, a little like what Sarah and I did before this reception. The food was programmed down to the atom, but we still had to slip in and taste it first, to see what it was like."

He smiled disarmingly. "Isn't there any result that would cause you to give up the project?"

Hilda shook her head. "Black holes exist. The only question is how much trouble one needs to take to make one."

A deep, resonant *thud* broke the quiet. She wasn't conscious of falling, rather, the floor seemed to rise to strike her, fall away, and then clobber her again. Antique glass exploded into the room from the high windows. Wine glasses toppled to the floor and food dishes followed.

Smoke and dust filled the atrium instantly. People started to get up off the floor and head for the exits. Hilda sat where she was a moment, not realizing her mouth was open in shock until the dust began to tickle her throat. She tried to touch the net. *What happened?*

No answer. The building's comm must be down, she thought. She shivered. One got used to the near-instant access bioradio provided, and being cut off felt, momentarily, like suddenly being deaf, or in a lightless room.

"Dr. Kremer, are you okay?"

Hilda looked up at Ried's dust-covered face and clothes. "Ried? Yes, I'm okay. The local net's down."

He nodded and offered his hand, which she took and flowed up to her feet.

"Do you see Dr. Zhau and Dr. Levine?"

"He's okay—over by the buffet, I think. I'll see if I can find Dr. Levine."

Hilda found Brad and Dr. Zhau under the same table where she'd left them. Brad looked angry, Tse Wen looked calm but very, very serious. She felt another slight jolt then, and some dust came down on her. One look at the cracked wall towering over them and she slipped under the table between them.

"Aftershocks?" she asked.

"That was no bloody earthquake," Brad said. "I'd say it was a subterranean bomb and the cavity it created is collapsing—hard to believe that level of animosity. Fortunately, it was matched by their level of incompetence; the damage seems pretty superficial."

Tse Wen shook his head. "We should not assume incompetence, but rather that it achieved exactly the physical result they wanted. Now, what purpose would that result serve? It would frighten people. It could also serve to make the political opposition seem more moderate by comparison."

Brad nodded. "A good cop, bad cop ploy. Just another argument for them—see, we still have these fanatics and therefore we shouldn't have black holes. Machiavellian, it is."

Hilda shuddered, looked up at the table top, then over at Tse Wen sitting cross-legged under it. She did a quick calculation and smiled. "Well, I think we should have black holes. If we had a 16-billion-ton black hole on top of this table, Tse Wen, you could levitate!"

Tse Wen smiled. "Truly a demonstration to impress the greatest critic."

Brad laughed and put an arm around her shoulder; his body felt good next to hers, reminding her of the one night they'd spent together some twenty years earlier, when they'd gotten the go-ahead for the initial phase of the Black Hole Project.

They'd been at a conference in Lillehamar, Norway, talked impactor design and done simulations until the Sun rose at nine the next morning. Then, when the maid knocked and they realized it was getting near checkout time, Brad had held her hands and suggested that, as they were going to have the name for it anyway, they might as well play the game.

It had made her happy to make him happy. When she'd confessed to his girlfriend a year later, she'd gotten a laugh and a hug and the statement that boys will be boys. But there'd somehow never been another such occasion with Brad. Now, feeling him next to her brought back that the pleasant memory. She shut her eyes and tried to exist in the immediate moment, banishing explosions from her mind.

When she opened her eyes, there was Ried, staring at her as if registering something that hadn't occurred to him before.

"I couldn't find Dr. Levine, but I think we're in the clear," he said, relieved. "The net's back up."

With a nonchalant smile that she didn't feel at all, she extricated herself from Brad and under the table. The two of them helped Dr. Zhou to his feet. Maintenance robots were already whirring around, picking up the debris.

She touched the net, comforted by its familiar presence. No one had been seriously hurt, the damage was superficial, and the building would be usable again tomorrow.

"Well, Mr. Ried," Dr. Zhou said while brushing the dust from his shirt and pants, "do you know anything about who might be behind this?"

Ried shook his head. "The Public Safety Administration puts the explosion almost half a kilometer under the institute building—it's as if someone loaded a mining mole with a half ton of chemical explosives. It was more likely intended to scare than injure."

"Really, mate?" Brad asked, his voice laced with irony. "Did your brother tell you..."

Ried cut him off. "My brother's politics are his business. We're just half brothers anyway, and raised fifty years apart. I'm doing my best to be a reporter, that's all. But I think I can assure you that being connected with any kind of terrorism is the last thing he'd want politically."

Brad snorted. "Is that so? He wouldn't make danger from antiproject terrorists just another argument for shutting us down?"

There was an embarrassed silence. Hilda had never seen Brad so angry about something that didn't involve a steering magnet or a photon field lens. She reached for his hand and gave a light squeeze. *Let's not be too antagonistic*, she sent

Brad squeezed her hand back and took a deep breath. Then he offered a hand to Ried. "Sorry, mate...a bit shaken, it seems."

"Me too," Ried replied with a softer face and shook hands. "No offense taken."

Dr. Zhou smiled. "Well, Brad, Hilda, if things are back in harmony, perhaps we should check to see if our things are still on our shelves. The upper floors are cleared for reentry, it seems."

Hilda shut her eyes. Not surprisingly, her office cam was still offline.

Then it hit. "Cleared for reentry?"

Dr. Zhou shrugged and smiled. "I thought there would be less chance of injury in a fairly mild shake if we took cover here. Everyone else went out the exits. Afterwards, we were not missed, except by you. It appears we were not as important as the other events today might have led us to believe."

Sarah appeared. "Was I the only one here with the presence of mind to get out of the building?"

Brad started laughing uncontrollably. Soon they had all joined in, and the tension drained away.

Ried put a hand on Hilda's shoulder. "They've ID'd the group responsible for this mess. Another small fringe group I've never heard of that wants recognition. Dr. Kremer, I'd be happy to help you put things back in order. Of course I might have a few more questions over dinner afterwards."

Hilda saw the reporter's face lighten up. It seemed an earnest offer. Brad gave her an "it's okay" look.

"Okay, Ried," she said. "But only if you agree to call me Hilda. I've had about as much of 'Dr. Kremer' as I can take today."

"That," Brad added, "is another kind of Kremer's limit."

Ried smiled and stuck out his hand towards Hilda. "Torsten, then."

Zhou Tse Wen gestured to the stairwell.

Hilda sighed. The elevators would be down for a few more hours.

Dinner was at the Ridge House in North Boulder Creek. The meat was replicated, but the crepes and the soup were house-made and smelled delicious. The view sitting just above the pine tops was dramatic. At dessert, the fog rolled in below them like some kind of alien flood.

Knowing Torsten would eventually break the quiet mood with questions, Hilda ventured one of her own first. "Tell me what it's like to be in a political family. I can't imagine the pressures it must place on everyone around your brother."

Torsten chuckled. "No probably not. In my family, everything revolves around my brother's political career. He's the *Vaterfuhrer*. Anyone can do anything they want as long as it doesn't get in the way of his vision for the family."

"It sounds a little autocratic."

Torsten shrugged. "It takes a lot of effort to put someone in office. You need a support team, and what better a team than a family. I'm kind of the black sheep in the family because of my independence.

"Quite a sacrifice, I would think," Hilda said, not entirely convinced of the independence

or the sacrifice.

He shrugged. "Not for me. I always wanted to be a journalist. So I told them to leave me out of their political games. I just want to do my work the best way I know and leave the family politics out of it. You're Kate Avonford's daughter, aren't you, as well as Wotan Kremer's? That must have made for an eventful home life."

Hilda smiled wryly; she knew about living with famous parents. Her starship-captain mother and planet-molding father couldn't live with each other and couldn't stay away from each other, living a soap opera story that had spread to every human habitation in known space.

"Until I was sixteen; then Mom left and Dad sent me back to Earth to go to school. I had other ideas; I wanted to come right back, so I asked the crew to let me stay awake on the voyage and I studied on my own. I pretty much grew up on that starship; I learned to pilot on the ship's runabout, learned zero-g sports from the crew."

"Relationships?"

"No. The only ones up were three women and a couple of very married men who weren't interested." She shrugged. "I wasn't that interested either."

Torsten looked vaguely disappointed, and switched topics. "I see you don't have a school certificate or bachelor's degree?"

"No, just the Ph.D. I'd passed all the tests for entrance to grad school by the time I arrived and went right into research." She smiled, somewhat embarrassed. "I've gone to some lectures, but never actually attended a regular class since leaving New Antarctica. So much for Dad sending me away to school!" She laughed. "At least your family's politics are external," she said. "You act like an objective journalist, but your questions seem, well, biased towards your brother's political bent."

"*Popular Issues* considers the consolidationist viewpoint a legitimate one. I try to ask the kind of questions my reading public would ask if they were here. Having a point of view doesn't make me unobjective or untruthful. Our readership has serious questions about what you folks are doing. My job is to address their concerns."

Hilda nodded, trying to understand his point of view. "I suppose every new thing ever done has been terrifying to someone. Automobiles—people thought human beings wouldn't survive 50 kilometers an hour. Now we approach the speed of light. Some thought these genetically engineered radios we grow in our heads were going to turn us into computer-controlled zombies; now they're so natural to us, we forget about them. Change happens. We adjust."

"Hilda," he said earnestly. "This black hole project is terrifying to ordinary people who don't understand it. It's just way out of anyone's intuitive range. I don't know if I can really explain it, but at least help me understand it."

She made herself smile and replayed the simulation she'd shown at the press conference on the restaurant table screen.

Finally he asked, "But a new universe is possible, isn't it? I mean, anything can come out of the quantum foam, can't it?"

"Look, according to statistical mechanics, every air molecule in this room might suddenly find itself on a trajectory toward the upper left corner of the room, leaving us in vacuum. Well, don't hold your breath."

Ried sighed. "Okay, I guess it's something I don't have to worry about right now. You don't mind if I use this interview on the net, do you?"

"Huh? How?"

"Watch the table screen. I'll play back the view from the restaurant's surveillance camera."

Hilda saw herself and Torsten from above, with the simulation on the tiny image of the table screen, looking for all the world like some weird place mat art.

"But what about privacy?" she asked. "How can you do that?"

"I'm licensed media, remember; I have access. We can use security video because otherwise everyone would be running around with cameras making a nuisance of themselves."

"I didn't know." She mulled over his revelation.

"Most people don't. As for privacy, we have to ask before using it, or lose our license."

She smiled as she saw herself talk and gesture.

"No problem?" he asked.

Maybe it was the wine, but she looked all right to herself. "No problem. " Hilda laughed. "But, for the project information. Sarah's the key person right now."

"Does she understand it as well as you do? How do you work as a team?"

Hilda thought about that one. "We all work well together; Dr. Zhou asks the right questions, Sarah generates all the possible answers, I winnow the answers down to those that make sense and can predict something. Brad figures out how to test the predictions. Then Dr. Zhou and I go over everything that Brad does with anal-retentive thoroughness, and Sarah generates worst case scenarios—she has the most imagination. Occasionally, I decide whether a worry is real or not."

"But if some new theoretical concern came up at the last minute, you'd be the one they'd turn to, wouldn't you?" Torsten pressed. "They'd be reluctant to go on without you."

Hilda laughed and waved a hand expansively, "Okay, I'll admit it. I'm probably essential." Four glasses of wine, she thought, was what it took to let her say something like that. "It's getting late."

Torsten nodded. "Yes. But I'd like to continue this some day."

The conversation had been pleasant, Hilda thought, and the offer sounded innocent enough. "Okay, when and where."

"Well, I'm supposed to cover one of my quote brother's unquote speeches next week. Any chance you'd like to come hear it? Nobody needs to know who you are, of course. Then we can discuss it over dinner, on or off the record, as you like."

She did need to understand these people better. "Okay, it's a date."

They arrived at her car, the car door opened for her, and she flowed languidly into it. Torsten, grinned foolishly as he touched her shoulder, then let the door shut after her. She fell asleep on the seat as the car steered itself down the grass-way and rocked gently as it caught the buried maglev track. Her last waking thoughts were that she was going to feel a bit silly the next morning, assuming some idiot with a bomb didn't blow her up for real because if she was really as important as all that, maybe the opposition would...do...something.

## Chapter 2

### The Hillside home of Rolf and Anna Messenger,



**Milbrae, CA,  
12 April 2257**

"Ever the daydreamer, eh?"

Torsten looked up, mildly irritated. He'd been working on the net—not daydreaming.

"Hi, Anna."

Anna Messenger, cousin Rolf's wife and a distant Ried cousin herself, was his hostess when he was in the San Francisco Bay area. She was tall, with straight auburn hair parted in the middle, and casually dressed in a plain gray long shift. When she moved, it was pretty clear that was all she was wearing. Such casualness, he knew, was sheer art—as an actress, she had learned how to gain advantage with men. An advantage Torsten had long since conceded to her.

He waved a hand in the air. "On the net, studying BHP simulations."

"Full access? How did you get by their blocks?"

"As far as I can tell, there are no blocks. No need. The explanatory text is in a foreign language—physics."

She rolled her eyes. "Come on inside, the fog's rolling in and I'm chilly. Any penetration?"

"I didn't get anywhere with Levine," Torsten said. "She's suspicious of me. But Kremer seemed less on guard. So I got her woozy enough over dinner, but she backed away. We may have the beginnings of a relationship, though. She's curious about us; she accepted an invitation to come to the forum next week."

Anna shot a glance at him. "Kremer? The black hole science geek? A wonder she'd let you get close. Levine looked more amenable to drugs and seduction. Kremer doesn't look the type. You think she'll really come to the forum?"

Torsten shrugged. "She says she needs to understand why we're doing it."

Anna spat. "Now you're swallowing *her* BS She more than anyone knows damn well that they're rolling the dice with everyone's lives—and I mean everyone in creation—all for their own damn hubris. Torsten, politically, we need to get someone with inside credentials to say something embarrassing about the project. We don't have enough people scared yet. Did you get DNA samples?"

"We had dinner. I got her fork. What do you need that for?"

That got a wicked grin. "Opposition research. The less you know about it the better. Anyway, Lars wants to see you about your reportage. He's downstairs."

"Here?"

Anna shrugged. "I didn't think that was a good idea either. He insisted on coming with me."

As they came down the stairs, Torsten saw Lars and Mono Tukapo, his bodyguard and political secretary. Lars was actually shorter than Torsten, but so toned and barrel-chested that he looked bigger. His professionally styled hair was so neatly cropped that he looked more artificial than a humanoid robot. He reeked of the presence and self-confidence of a successful politician, and had for as long as Torsten had known him.

Torsten reached out a hand. "Hello, Lars. Something wrong with one of my stories?"

Lars flashed his best campaign commercial smile. "Hey, what kind of brother would I be

if I didn't pester you once in a while? I'm worried that you might be doing the disinterested reporter bit a little too much, and thought we should have a chat. The polls being where they are, we could use a little more of a boost, and everyone knows *Popular Issues'* lean, anyway."

Anna chuckled and ordered some drinks.

Torsten shook his head. Only a tiny handful of physicists really challenged the physics, and they did so in a language he couldn't understand any better than Hilda's. "Lars, I've got a reputation to maintain—my stuff is much more effective if I appear objective; a point for their side for every two of ours." To do even that much he had to be careful.

A robot floated in with the drinks. Lars latched onto one and sipped it as he stared off into space. Anna played with her ice cubes. It was clearly up to Torsten to fill the silence.

"Maybe I could go to three points for our side for every one of theirs?"

Lars shook his head. "No, if anything, get the ratio more even. AI's look at ratios like that and report bias. No, the points for our side need to be more telling, the ones for the other side more trivial. Present the issue in our language instead of theirs. Weight it that way. The public's not scared enough yet."

Torsten stifled a moment of irritation with Lars for telling him his own business—and worse, being right about it. He just nodded.

"Torsten, my committee is hearing rumors that the BHP is carrying on some secret experiments, even more dangerous than the Ten-Ten. We're not ready to go public with that, so it's off the record."

"Funny thing," Anna said. "The same things have been going around my production set. The studio is owned by Wu-Lake Ltd.; one of their divisions is the prime contractor on the experiment instrumentation—the stuff that's supposed to take quarter-nanosecond pictures of the Ten-Ten experiment until it gets vaporized."

Torsten laughed. "I've looked, and there's nothing there. I couldn't..."

"Sounds like you have two independent sources, Torsten," Lars said.

Was Lars crazy? The sources were hardly independent. "You want me to go with that?"

Lars settled back against his chair and made himself comfortable. "Torsten, there's a time for objectivity, but this election is about pulling in all the resources of our family to help win. It's not about individual pride, status, and reputation. No, this is about our people and what we can give back to them, what we can give back to our world. This election is about much greater issues than making governmental policies and keeping the constituency happy. It could be about saving humanity itself. We need to sell people on the idea that the public experiment is only the tip of the iceberg, that things are happening in the Black Hole Project that could destroy everyone if we don't expose this Ten-Ten experiment."

Torsten was silent for a while, contemplating his place in the family and the overall scheme of things. He had no choice. "Okay, you want a make-or-break issue to pull out of the hat just before the election? For that, timing is as important as content. You don't want to give them time to refute. Mark Twain said that a lie can get halfway around the world before truth has even put its boots on. We have to time it so the boots come on *after* the election."

Anna smiled at Torsten as if to say, "You're starting to enjoy this, aren't you?" "Well, we're stuck five percent behind. We need to switch two percent to you and another two percent of the expansionist leaners to undecided. Simulations show that a scandal on the Black Hole Project could do that, if it stinks enough."

Lars nodded. "Even the appearance of scandal, of stonewalling, or of something not

entirely right could do it. Our side is the safe side."

Torsten sighed. "Okay. It's dueling experts and people-like-us can't decide. So, where there's smoke, there's fire. That will certainly bring in magazine hits; but..."

Lars cut him off with a wave of the hand. "This is the kind of gut-worry issue that binds voters together. Make them fear."

"As I said, it will be more effective closer to the election."

"Perhaps." Lars sighed. "Well go with your judgment on that, for now. But make no mistake: this is a good cause to fight for. I believe in it. I'm told by some of the most brilliant scientists we have that existence itself is at stake here." Lars stopped for another dramatic pause, convincing enough that Torsten wondered if he might be sincere.

Lars continued quietly, "This is big stuff. So big I'm pulling in the whole family on this one. I need you. Everything might depend on a few good breaks."

"I understand fully, Lars, and I'm on it. I just have to be a little subtle, or it could backfire before the election." He didn't add that it was certain to backfire sometime after the election; that was irrelevant. If Lars won, he'd be in power and he knew how to use it.

Anna touched him on the shoulder. "We may need to do something to this Kremer woman before she does something to us."

"Journalistically, of course," Lars added.

"Of course," Torsten answered. "But, if I'm going to gain Kremer's confidence, I can't irritate her too much now."

Lars raised an eyebrow, then nodded slowly.

The day of the speech, Torsten watched Kremer walk into the Mark Hopkins Hotel. Her costume was pedestrian, a black tunic and slacks—indistinguishable from what she'd been wearing at the news conference. A typical geek, he thought. She walked closer to the inner walls, looking up, and she wasn't the only one. The bomb at the institute had left its mark on everyone's thoughts—even at a Lars Ried rally. Anna's friends had meant to scare people about the BHP but the immediate result was a kind of generalized fear that affected any potentially controversial gathering.

It was as if they'd let a genie out of the bottle, one that had supposedly been capped centuries ago. People were screaming for a review of antiturveillance laws and robotic restrictions. If Lars won, he'd probably get enough government policing power to prevent anyone from doing to him what his people had done to create the current mood. The irony of it made Torsten smile, however uncomfortably.

Kremer stopped and looked across the outer hallway through the transparent walls, a distinctive feature added in reconstruction after the 2221 quake. The view of the bay was one of Torsten's favorite sights, too. The only visible security was signs at the entrances that said "By invitation only," but the party's AI's would discreetly check everyone entering with multispectral cameras and microwave scans from overhead. Plainclothes operatives near the doors would be cued to offer gentle reminders to anyone who wandered in without reading the sign. Anna's work; she'd artfully arranged the appearance of openness and Kremer walked into the room unaware of the checks. Torsten went down to meet her.

She sat in the back of the room, running her hands through her short blond hair, clearly feeling uncomfortable. What would she know about Lars going in? He asked the net for a quick-look data scan to see what an outsider like Kremer might get. *Noted consolidationist within the Conservative Union Party—Geology degree—apolitical through grad*

*school—gregarious—desire for order—politician since age of 42—drive for power came early—What did he want to be when he grew up? " 'n charge," quoted from an undergraduate friend. Family home lies outside Leipzig...*" Nothing particularly scary there. He went up to introduce himself.

"Hello, Torsten. I've been reading reviews of your brother's political life. Some aren't very flattering—'unsophisticated,' 'a will to impose order,' and so on."

Torsten shrugged. "He's got a consolidationist constituency to play to. But beyond that, I think he's a pretty good leader."

"Is that your job, to balance the news?"

Torsten smiled and shook his head. For all her naiveté, this lady was quick—a lot quicker than he was, and he'd have to keep that in mind. He would have to work at his own pace and avoid getting into a contest of wits with her.

"I like to think I'm fair-minded about him, though. You know I don't know him as well as I should. He's more like a grandparent than a brother. Now keep in mind that he's preaching to the choir here. His job is to pump these people up and motivate them to go out and work for the election."

Lars Ried strode into the room and waved to the crowd amid applause and cheers. Dressed in a high-fashion single-piece navy-blue suit in the loose-cut Scandinavian fashion over a powder blue turtleneck set off by a red-jeweled medallion on a gold chain, he exuded urbane executive authority. Political posters rose up as if on queue as he took the podium. Lars nodded in appreciation and finally held his hand up to quiet the room.

"Tonight I would like to talk to you frankly about an issue that confronts each of us in this room and those I seek to represent. It is the undeniable and palpable suspicion, even fear, which divides the people of our planet today.

"Issues of pure scientific research that don't even have an economic value are dividing our world.

"Too often, those of us who believe in letting humanity adjust to the changes that technology has already made before embarking on new and questionable endeavors may, find ourselves caricatured and stereotyped as a danger to tolerance. Some have suggested that the Conservative Union Party is motivated by political opportunism with the ultimate goal of denying freedom to researchers, many of whom are doing the enriching and rewarding work of consolidating, understanding, and applying the huge mass of data accumulated over the last two centuries.

"My friends, the Conservative Union seeks merely to point out that the social and cultural implications of research can no longer be ignored. We say, let the people decide if they are ready for yet another new technology to complicate their lives. We say, let the people decide if they want to take the risk of playing around with the basic fabric of the universe when *there is no pressing need for it.*"

Kremer squirmed in her seat at the applause. Torsten patted her hand. Lars was in good form, Torsten thought, as the elder Ried's rhetoric flowed over its spellbound audience.

Kremer leaned over to Torsten and whispered. "I fear the beginnings of an inquisition."

Torsten put a hand on hers. "Not an inquisition; a regaining of control. This isn't the Middle Ages. The AI infrastructure can't be the instrument of an inquisition and it will defend individuals who resist it. An inquisition is impossible. Lars just wants efforts refocused. Politics is perception, Hilda. Yours are different from most of these people's. Hear him out for me. Then we can talk, okay?"

Hilda rolled her eyes and returned her attention to the platform.

Lars Ried continued. "I come before this audience tonight with the explicit purpose of reconciliation with the scientific community.

"Let us bridge together the gap of misunderstanding. Let us help the scientific community understand that humanity is in danger of losing itself and cannot afford the disruption that the Black Hole Project might bring. Enough is enough."

"You call that reconciliation?" Kremer whispered to Torsten who winked back at her.

"History has much to teach us about scientific research run amok," Lars continued.

"Friends, just as we have citizen oversight committees guiding our legislation, we need citizen oversight committees watching over scientific research projects. Even if they may be right, we have to hold back until at least a majority understands what they are doing! It's our necks on the line.

"My first priority if elected will be to put at least a temporary hold on any other experiments that may have societal implications, including, on the face of it, the Black Hole Project. My second priority will be to put in place a citizen watchdog committee to curtail aberrant research earlier. The expansionist coalition is on record opposing both initiatives. The choice of responsible people should be clear.

"Thank you for your support!"

The resulting ovation rang in Torsten's ears. Kremer sat shaking her head and looking distinctly unhappy.

"It's all about power, isn't it?" she said. "Who is the alpha male? Who gets to beat on whom? Your brother reduces the work of the entire scientific community, never mind the Black Hole Project, to a political beauty contest, with him and a bunch of politically correct toadies as the judges."

He winced at "toadies" and the hostility it implied. "I'll ignore the moral issue for the moment, but at least consider that it is simply impossible for a democratic politician to pander only to elitists and stay in office."

"Elitist? Look, I don't know the first thing about, say, hypnoactive kinetic art. Does that make the artists 'elitist?' It's just different areas of interest. Leave cobblers to their lasts."

Damn, she was bullheaded! "When the last is creation itself? I think not."

"But..." She seemed confused, and a bit angry. "You journalists can affect so many things yourselves. Are you really objective, or is that just a power trip, too? Excuse me a moment."

She whirled and walked off toward the toilets.

Torsten waited by the hotel foyer. He wondered once more if she was angry enough to duck out of their dinner date. But Kremer returned, noticeably more composed than when she left.

"I hope this doesn't mean we have to postpone dinner..." he began.

She shook her head and smiled fleetingly. "I'm fine."

They wandered downhill in silence and ended up, not so accidentally, at a small Thai restaurant Torsten knew. An elegant little hideaway on the third floor, it had leanings towards the exotic spices of Pattaya—served, of course, by elegantly painted young men dressed in stunning silk dresses. He'd taken dates there before, often with good effect.

Kun Srichard, who knew the Ried men well, provided Torsten with a table in a quiet corner of the petite room with a secluded view of the ancient Golden Gate Bridge sinking

into the fog, now rolling in from the ocean.

A message from Anna announced itself as they finished a dessert of candied rice and fruit. He touched the net for the playback.

*Good news—they've got problems with the experiment. Your sweetie doesn't know it yet, but she's going on a space voyage. So are we.*

*We? Space?* he replied.

*I'll tell you all about it when you get here.*

His heart beat a little faster than could be explained by the curry.

### **Chapter 3**

**Dr. Hilda Kremer's Office,**

**BHP Headquarters,**

**15 April 2257**

Brad's image on Hilda's wall screen pointed to a section of the array imaged on the wall screen of his office. Hilda thought briefly of the nesting of images of ever-decreasing size and resolution collapsing to a precisely located point with no information content.

"If those radiation levels are isotropic," he said, "the experiment is putting out more energy in gamma radiation alone than we are putting in with kinetic energy." He turned to her. "I don't buy that, but I don't see how the results could be strongly directional. We've only collided milligrams; not nearly enough for any shielding effect."

Hilda shook her head, feeling frustrated; the results made no sense and screamed of bad data or bad instrumentation. But, she reminded herself, much great physics had come from results that were contrary to all expectations, at first. "Brad, even in these precursor collisions, we're into new territory; quagmas a million times denser than have ever been produced before. We ought to expect something new."

"I know," Brad said. "If we only didn't have the whole bloody world breathing down our necks expecting everything to be perfect and just like predicted or else. I look at the political sims and wonder if there will ever be another chance." He scratched his right temple.

"I know how you feel," Hilda said. "Bombs, grandstanding politicians, idiot journalists... I didn't think it would be such a fight," she said. A pang of guilt joined her frustration. Dating Torsten Ried and getting a worms-eye view of ultra-suspicious populism and its panderers had given Hilda lots of insight into the political problems they faced. In the last two weeks she'd seen political networking that put even academic kingdom-builders to shame. On her own part, she'd offered her services to the project's outreach group, talking to high schools, futurist groups, and even a journalist's convention.

Torsten, to his credit, had introduced her to several journalists who at least had an inkling of how the scientific community worked and encouraged her to reach out to them, while cautioning her not to voice too many technical words. But, outreach sucked away her time and energy. She hadn't touched her toroidal spin web transformations in two weeks and felt a growing void within her.

Brad snorted. "It's a bloody law of nature; the bigger the advance, the more you have to fight for it. But we have to stay with it. You'll be able to concentrate a lot better when you get out to the test site, away from these distractions."

"Is that why Tse Wen is sending Sarah and me out?"

Brad shook his head in frustration. "I'm not sure what you two can do to the experiment on-site that you both can't do here. But she'll be a right place to think."

"Well, we're sure not getting anywhere here," Hilda said. "So maybe being there will work—just seeing the stuff with our own eyes and touching the equipment with our own fingers."

She recognized Tse Wen's wisdom in sending them to the experiment site. They needed focus, focus away from this political mess. But frustration crowded into her thoughts. She turned to her long-time friend. "Thirty years of work and things feel like they're coming completely unglued—bombs, Lars Ried's political pandering, crazy experiment results..." She sighed. "It's getting late. Talk to you later. I'm going to sleep." Hilda often stayed overnight and slept on a fold-out cot. She pulled it vigorously from her closet.

Brad smiled. "Oh, she'll be right in the end, you'll see. G'night."

The screen went blank.

Chaos, I just hope I can sleep, she thought as she threw her clothes into the closet.

Morning was bright in her window when she realized she hadn't thought about black holes, quantum gravity, or protesters for at least eight hours.

She took that thought back—she hadn't thought of it *consciously*. But from somewhere in her deep sleep at least three plausible explanations for what had happened had formed in her head. Smiling, she sat down at her terminal, grabbed her sketch pad, and started setting up the simulations.

Her stomach growled. She was, she noted, still stark naked, and ravenously hungry. Time for a break. But plausibility started to change to possibility before her eyes, and she kept on. One of the possible explanations might mean that the darker side of Lars Ried's political constituency had penetrated into the project far deeper and with much more sophistication than any of them realized.

She sent a note to Tse Wen and grabbed her long shirt in case he called back.

He did.

"I was wondering if we might have lunch. There are things I'd like to talk to you about—in person."

"I am available," he said with a smile.

Tse Wen stroked the slight goatee he affected which, along with his bald head and thinness, gave him the aura of an ageless oriental sage. He'd been about forty when the antiaging retrovirus was spread—it was all for effect, which he'd cheerfully admit if called on it.

"Now what is all this being mysterious about?" he asked.

Hilda's hamburger was too good to believe. Grill smoke leaking into the dining room of the cafe added to the taste of the food without being overly noticeable. She swallowed her last bite and had a sip of lemonade to clear her throat.

"I see three possibilities for what's happening at the experiment site. One, of course, is that it's new physics—perhaps a virtual quantum black hole did form and there was a kind of leak-through of energy from another universe, or another part of our universe."

Tse Wen nodded politely. He didn't think so either, she could tell, but completeness

required mentioning the possibility.

"The second is that the anisotropy is caused by advanced wave Mota crystallization."

He frowned. "General relativity permits such a solution, but I think that is only because it is incomplete. Even at the Planck level, the causality implications are disturbing."

"Aren't they? I can't say that there aren't any other possibilities for anisotropism, but that was the only one I could find that made even that much sense. Which brings me to my third idea." Her face sobered. "Maybe we aren't getting the real data."

Now Tse Wen really frowned. "The last thing a theorist should do is to claim that data is bad which does not fit previous theory."

Hilda nodded. "That's why I mentioned it last. But the falsification of data does fit within the existing theoretical structure, perhaps better and more simply than time travel or multidimensional teleportation."

Tse Wen shook his head, then grinned. "I would not put out press releases. But you have convinced me some caution is warranted. I shall have conversations. Do you still see the reporter, Torsten Ried?"

"Occasionally."

"Do you think that wise?"

Hilda ran a hand through her hair. "Torsten's a nice guy. Lovely smile, and he thinks and listens. I'm making progress; he's not certain that the Black Hole Project is such an evil thing, he just doesn't know and he's got a lot of family pressure. And you know, I'm not sure Lars sees it as anything more than a political issue that he can use to play his political game. If it became a non-issue, or even worked for him in some way, I don't think he'd bother to oppose it. I think we just have to do a better job of educating people."

"Ah, very brilliant! After a few years of such an education program, the proportion of people who tunnel bombs under our building may decrease by a statistically significant amount!"

Hilda felt deflated. "I'm sorry."

"And I, too, am sorry for using humor to disguise my frustration, which is as great as yours. I shall trust you and Sarah to deal with any possible physical causes of the anomaly, in the distraction-free field location. Brad will continue to supervise the work here. It will be left to me to talk to people to try to bring things back into harmony again. I think next year, *you* should chair the project."

Nobody had ever said or done anything to scare Hilda as much as that pronouncement. It left her open-mouthed and staring at Tse Wen in abject horror. She could not think of anything to say.

Tse Wen laughed and reached out to touch her. "No, no, I was only kidding."

Hilda began to giggle a bit in a reaction that soon dissolved into the kind of uncontrollable laughter that was for her but a micrometer from uncontrollable tears.

"You'll need to go soon. Your certification is current?"

Hilda nodded.. One of the results of being awake for eight years on a starship was being a qualified spacecraft commander.

"You can work out the details of the investigation on the *Psi Naught* en route.

It took a week to get clean up loose ends and get underway, but once the *Psi Naught*



finished acceleration and settled into the routine of interplanetary travel, Hilda buried herself in simulations, changing parameters and discarding approximations in an effort to make theory fit the data. She came up only to eat and sleep. For her, this was what physics was all about—the driving compulsion to work through a compelling problem.

Three days after they departed, Sarah came to Hilda's cabin.

"Any luck with the theory?"

Hilda shook her head. "If those results are real, they don't fit theory. But the main data-handling software seems very clean"

Sara frowned "I think we can verify the anisotropy question by placing new Ragi probes away from the collision plane and firing another round of tests."

Hilda nodded. "That leaves bugs in the data stream itself." A century or two ago, spy services developed a very thin technology that could be inserted in a fiber optic cable joint. The bug could read data and pass it on with or without modifications.

"The controller would have to be very sophisticated, possibly even a non-Asimovian AI," Sarah said.

The idea of an AI not limited by the laws of robotics disquieted Hilda. "Chaos, these people have blinders on if they'd do that!"

"You've seen them in action. Using an illegal AI would be exactly what Consolidationists should be against. But power is what they're about, not principle."

Hilda shook her head. "They'd undercut themselves if it ever got out. Too big a risk, I think."

"So maybe they think that we wouldn't be looking for it," Sarah said. "Anyway, the Rieds aren't the whole story. The project is a big target. There are other more fanatic Consolidationists and people who need to make their own mark on the cosmos. They could do anything."

"Our AI's should help us against that kind of threat."

Sarah shrugged. "They'd try to protect us, but remember that our opponents are people, too. Typically Asimovian AI's stay out of people conflicts until physical harm to someone becomes a real possibility, whatever their evaluation of the potential perpetrators."

"I'm not sure I'd want to change that," Hilda said after some thought.

"Me neither—which is why we have some work to do ourselves, and quietly." Sarah stood up. "I've got the equipment ready to go. My thinking is that we should get it in place first thing before the opposition figures out that anything is happening, let alone what."

"Okay." Hilda nodded and smiled. "It's been a while since I did anything experimental. I may be all thumbs."

Sarah smiled. "We have time and a fully equipped nanoscale fabrication facility on board."

Six weeks later, Hilda watched the fountain of glowing plasma corkscrew ahead of the *Psi Naught* as the ship decelerated toward the main habitat for the Ten-Ten experiment personnel. Her weight fell as magnetic fields transferred the spacecraft's spin angular momentum to its exhaust.

As the rotation slowed, she could watch long enough to follow the long white tubes of the Ten-Ten experiment's pellet accelerators all the way in either direction from the

Macrocollider Experiment Station. The faded to the thinness of spider silk but never quite vanished, even ten thousand kilometers distant. The beauty of it never ceased to thrill her.

The project's cylindrical habitat and control center swung tethered to an asteroid about ten kilometers from the planned collision vertex. The complex seemed to grow as they got closer and she watched the cylinder of the habitat module swing around its asteroid anchor once a minute like the second hand of a giant clock. A tiny elevator climbed inward from the habitat to meet them at the central rock.

The plasma fountain ceased as the *Psi Naught's* relative velocity decayed to a few meters per second. Hilda and Sarah felt a momentary queasiness as they returned to zero gravity. Hilda took personal control of the spacecraft docking for practice, goosing this thruster and that to bring them to the counter-rotating dock assembly at the north pole of the little asteroid. There were three other spacecraft present, including the Interplanet News ship, *Gulliver*

"I thought we were going to get away from that," Hilda said.

Sarah shrugged.

As she settled in among three other spacecraft, Hilda watched insect-like limbs deploy from a half dozen places around the *Psi Naught's* toroidal hull and grasp the open latticework of the docking platform. A flexible tube rose like a cobra from the platform and mated itself to the main door of the cabin. Sarah supervised the shutdown.

"Your helmet." Sarah handed Hilda her helmet with a slightly defiant look. The chances of her needing it were about as close to infinitesimal as any AI could calculate, but Sarah liked all her stones turned over.

Hilda laughed and took it. "I feel like I'm headed for another giant leap for woman-kind instead of a docking tube."

The entrance into the air-filled docking tube was as normal as ever, though, as was the trip down the elevator to the habitat cylinder. There was a surprise when they got there, however: Torsten Ried

"Uh!" was all Hilda could manage.

"Mr. Ried," Sarah said, drawing out the "Ried."

"Torsten, we're going to be kind of busy," Hilda said, apologetically.

He nodded, but looked at her more like a puppy than a predator. "Don't worry, the media room's on the *Gulliver*. We'll all be there, anchoring, when the thing actually happens. Besides, you don't have to work all the time, do you? Dinner's being served in the level six atrium now. That's where everyone is."

His questions over their last meetings had been getting less and less hostile, and their conversations had ranged over the known universe, from Hilda's memories of New Antarctica to the debate about the genetically unmodified New Reformationist colony at Proxima II. Hilda felt repelled at the loss of life and Torsten listened; he'd been a good listener.

Hilda nodded. "Good. We'll be up after we get settled in. I didn't mean to be cold, Torsten. It was just, well, a surprise."

He laughed. "That was the general idea. May I offer you a tour?"

Sarah waved him off. "We spent a year out here helping set this place up."

"Oh. Well, okay, I'll see you ladies later."

The walk was a pleasant stretch. Hilda reviewed the layout on her net to locate their

assigned quarters. The can was about thirty meters in diameter with staterooms arranged in rings around the outside of each of the first nine levels. The center sections were given over to equipment, labs, and common functions. There were three elevators spaced equilaterally. The tenth level was a domed combination of park and vegetable garden, with a swimming pool that Hilda had been dreaming about since the *Psi Naught* shipped out. The corridors were lined with hydroponic flower boxes as well; a thornless yellow rose with just enough scent adorned either side of her room, Number 502. Sarah was in 503 next door, with petunias.

Later, they went through an uncomfortable dinner in which almost everyone was either a media jackal looking for meat or a potential saboteur.

Hilda took Sarah's arm. "I'm not sure I can take another one of these."

"I know how you feel. Ready?"

"You mean, just go and do it? Now?"

Sarah grinned. "Now."

They wandered out of the cafeteria separately, then checked out a shuttle and arrived at the MES at 2300 universal. The ten-meter-radius sphere of the Macrocollider Experiment Station was so covered with various protuberances, antennae, and boxes that it looked to Hilda as if someone had dipped a gecko-covered volleyball into a bin of miscellaneous electronic parts. Formally, it was called the MES, informally, the "mess." Their shuttle headed for a tubular protuberance that turned out to be an airlock. They docked.

Pressures equalized, the doors opened.

The spherical room was brightly lit. Narrow boxes, tubes, and lattice frames radiated from the very center of the complex like an outsized metallic forest growing from the tiniest asteroid imaginable—a one-meter radius ball. It looked like random junk. But a second look showed Hilda that the long axes of most of the equipment lay in a circular plane centered on the vertex, as they should be to investigate a sheet of debris normal to the collision axis. Black patches of photovoltaic cells and infrared data bus windows glinted on most of the equipment.

Hilda examined one of several huge boxes around the outer wall of the sphere and found what she was looking for. "Sarah, here's the neutrino detector. Neutrino radiation from the experiment *should* be approximately isotropic and proportional to the total energy. Let's see if this one is telling us the truth."

"Got it," Sara said, and shoved herself over to the device.

Meanwhile, Hilda placed a number of simple, disk-shaped neutron detectors, each about two centimeters across and a couple of millimeters thick, at various places around the collision site.

"Good evening, ladies," a voice announced.

Hilda felt a chill down her back.

She turned and saw a large ruddy man wearing a BHP staff sweatshirt glide out from behind the central globe. He was calm, inexpressive, neither smiling nor frowning, but his eyes darted restlessly.

"Good evening," she said. "You are?"

"Dr. Vitaly Rossov, Dr. Kremer; I am new site engineer. Anything I can do to help?"

Sarah stopped her with a hand on her arm and smiled at Rossov. Hilda noted that the

front of Sarah's skin-tight pressure suit had opened almost down to her navel.

"Nothing we needed to bother you with, Dr. Rossof," Sarah said. "We're putting some equipment in place for tomorrow's test shots and adjusting camera fields. Trying to get a handle on the anomaly."

"I'll be about my calibrations then," he said. "We have a test shot at 0900 and everything should be ready. Not expecting visitors. Will be done in hour or so."

"We'll manage," Sarah said. "Thanks, Dr. Rossof."

Rossof nodded and floated back to where he'd come from.

Sarah made a hush gesture to cut Hilda off, then pointed to the terminal end of the neutrino detector cable on the outer wall of the facility. "Hold that," she whispered, positioning Hilda so her body hid the work site.

Sarah, Hilda decided, really didn't trust Rossof.

Silently, Hilda held the cable, floating so her body hid what they were doing while Sarah slipped the tiny, transparent disk over the optical cable end and reconnected. Then she followed Sarah to the airlock and the shuttle.

"Is Rossof a spy?" Hilda asked, in the privacy of the shuttle.

"Someone is," Sarah said. "He gives me the creeps, so that makes him a suspect. He's also in the right place. "If Rossof were working for them, he'd know how to fake it. I'm going to set an agent watching with an radio link back to the *Psi Naught*. If there's any tampering, we should see it."

Everyone gathered in the habitat auditorium to watch the data come in from the shot—staff, investigators, and press. Sarah wore a thin T-shirt and loose, clingy shorts—artlessly practical in the warm controlled temperature of the habitat, but Hilda thought it made her look like a teen age pin-up instead of one of the top physicists in the solar system.

Hilda wore a much more dignified plain black jumpsuit and had her vacuum tights underneath, in case they needed to go to the experiment site on short notice. What an odd couple we make, she thought. Hilda found a spot next to Sarah, then Torsten Ried planted himself next to them.

"Morning, Hilda! Hi, Sarah."

"Good morning, Torsten," they said, almost simultaneously, and with about the same weary inflection, then laughed.

He smiled. "Yes, uh, what are we going to find out new today?"

If we knew that, thought Hilda, we wouldn't be doing the experiment. But be nice, she told herself. "For one thing, we'll be able to put some limits on anisotropy and get a better idea of radiation losses."

"Anything that would detect the beginnings of a new universe?"

Some people, Hilda thought, had one-track minds. She shook her head.

"T minus three minutes and counting," the experiment control software reported.

She scanned the situation display. A green color raced down the two beam-line representations, indicating that the accumulators for each set of coils along the line were fully charged, each coil ready to come on at the appropriate time to push the pellets ever faster.

The count reached ten. Torsten, she saw, looked confused. Too bad, she thought, I'm

not going to launch into a lecture now.

"...3, 2, 1, fire."

The green lights went off down the line at an accelerating rate until they were all off.

"Good shot," the controller reported.

*/ don't believe this, Sarah sent. It's completely nominal. Hilda?*

Hilda was already comparing the readings from these instruments with those reported on the previous shots that had brought them out here. The anomaly had vanished entirely.

*Nothing*, she reported

"It looks completely nominal so far," Hilda said aloud.

"So far?" Torsten asked. "What does that mean? Why wasn't it like the first shot?"

Hilda stared at him, searching for words. She was not, she realized, ready to accuse nameless parties of falsifying the experimental results, even though that was what had clearly happened.

"Something in the instrumentation setup itself may have caused the first set of anomalous readings. That's the only thing that's changed."

"An observer effect? Like Schrodinger's cat—half dead and half alive until someone looks?"

Hilda groaned. "No, we physically moved the detectors. Besides, it's not 'half,' it's a superposition..."

"Excuse me, Mr. Ried," Sarah said. "Hilda and I need to have a chat. In private."

"You're in over your heads, then, aren't you?"

Sarah smiled. "Not exactly, Mr. Ried."

Hilda followed Sarah, but instead of heading for their rooms, she headed for the airlock. Hilda smiled to herself—when Sarah said private, she meant private. Fifteen minutes later, they were outside gliding over the small asteroid's surface near its center of rotation, with Sarah trailing an emergency survival pod along. Sarah said nothing for a while, but appeared to be looking for something. Finally she motioned for Hilda to follow her. Then, amazingly, Sarah seemed to vanish straight into the ground.

It was a cave entrance, Hilda discovered, as she got to where Sarah vanished. "Sarah?"

No response. The asteroid had a high nickel-iron content, though, and might be screening Sarah from her radio. There was no other cave entrance around, so Hilda gulped and pulled herself in afterward. It was pitch black.

"Sarah?"

An intermittent signal light started blinking on the display reflected in Hilda's helmet faceplate. As her eyes adapted to the dark, she began to detect a very dim glow and smiled. She activated her own suit lights so she could follow the passage, and in a minute was floating next to Sarah in a small, roughly spherical room.

Sarah put her helmet next to Hilda's.

"I think I know who," she said.

"Isn't this getting a bit melodramatic? I almost didn't follow you in here!"

Sara laughed. "We might be bugged. The station net might be bugged. If your radio

signal couldn't reach me in here, then the signal from any bug can't get out. Now, help me with the vacuum tent."

The two-person emergency tent was a tight fit, but they managed to wiggle inside and inflate it. As soon as the pressure was up, Sarah made a hush sign and started to take off everything, motioning for Hilda to do the same.

Their clothing might even be bugged, Hilda realized.

They pushed their clothes into a pallet, and sealed it. Donning the emergency gear, they deflated the tent, and pushed the pallet out. Then they reinflated the tent.

"There's no reasonable theoretical explanation for this, is there?" Sarah asked.

Hilda thought hard, giving that question a lot more effort coming from Sarah than from Torsten. Maybe she owed him an apology. "The results are inconsistent and the second set are the right ones. It's Rossov."

Sarah nodded. "Besides, he may have intimate connections to the Ried family; he had an affair with one of the cousins, someone named Anna, years ago."

"Sarah, that's personal data. How did you...?"

"Pillow talk."

"Sarah!"

She laughed again. "I got it from Irene Simmons, who has odd tastes in men. Anyway, Rossov tends to brag after too much vodka. Years ago, he studied voice in Nurnberg then and appeared in a low-budget opera. Our Anna was the only Ried of the right age in the area at the time. Rossov was not a very good basso, but a really clever set designer. Later he got a Ph.D. in physics, but had problems with getting published and ended up in instrumentation. So we have professional jealousy and a sexual connection."

Hilda pondered this. "We can't let everyone know about the telltales or the bad guys will know, too."

Sarah nodded. "So we've got to play it like we don't know. With a couple more tests, we'll have enough information to argue convincingly that the anomalous results aren't real. Or, we might catch him tampering again."

What a tangled web we weave, Hilda thought. But Sarah was right. "Okay. We can go ahead with the Ten-Ten without Rossov being aware that we're onto him, but we need him out of the picture before he can think of anything else to screw it up. Doesn't anyone have the authority to simply remove Rossov, without making explanations?"

"Tse Wen could, which I think he will, if we have data to convince the personnel review board," Sarah explained. "With Rossov out of the way, all we have to worry about is physics."

Hilda bit her lip. The election was less than a week away, and the Senate's control of the vast resources for the project was at stake. "What if Lars Ried becomes president?"

Sarah shook her head. "That's another worry. One more thing—we can't talk about this to anyone where they can plant microbugs. Rossov is good at this kind of thing. The net here is his, so he can defeat that encryption, too. If we use another encryption, he'll think we're onto him. Nix on the net chat, too. Just in case. But we can bring dates here."

Hilda groaned. "Sarah, I just want to do physics."

Sarah grinned. "I'll take care of the dating part. Let's get back."

**Chapter 4**  
**BHP Solar System Experimental Station,**  
**1 June 2257**

Hilda, in the holographic simulation room, found herself biting her nails for the first time since she was a teenager. The experiment itself was not the source of her nervousness. Three more runs at the milligram level showed no anomalies, and they got the go-ahead to do the Ten-Ten experiment—only two days before voting began in the senate election. The opposition was certain to do something, and there was no time to recover. She filed a final prediction run, leaned back to stretch, and saw Torsten Ried enter.

She fought irritation; there were no rules barring media from the work areas, but by a kind of implicit mutual consent, the physicists were allowed to work undisturbed in those areas. "We've got company."

Sarah sighed softly. "I noticed."

"Hilda, Sarah," Torsten said, "sorry for the intrusion, but we've got nineteen-plus hours of virtual dead time to fill until you fire the Ten-Ten experiment, and I wondered if you'd help with a piece out at old Duluth Station—what things were like before the new facility—Captain Sally Duluth slept here and so on."

"Can we wiggle out of it?" Hilda asked Torsten. "There's still stuff to do."

"You're not completely ready?" Torsten suddenly seemed very serious.

Sarah shook her head. "We're more than ready enough, but we can always squeeze a little more out of the shot. Hilda, I have things in hand if you want to go."

Hilda nodded. Sarah was essential to their plans and having Torsten elsewhere would be a good thing.

"It won't be long," Torsten said. "I think we'll need three hours on site at the outside. We'll have her back here watching the MES eight hours before  $T = 0$ ."

Hilda noted with a smile that, after a week out here, Torsten was calling the Macrocollider Experiment Station "the mess" and talking about " $T = 0$ " like everyone else. "Tse Wen thinks it's a good idea to be as open with the media as we can and cooperate in every way possible. 'The silence of many hands not clapping is louder than the sound of few cheers,' he says."

Sarah sighed. "They won't applaud what they don't get. You've had practice with Torsten, of course."

Torsten smiled wryly and spread his hands as if to say that was simply the reality of his business.

Hilda shook her head. There were, she thought, people all alone in kuiperoid stations a thousand astronomical units from nowhere perfectly happy with research problems that could be done with one mind, a good cybersystem, and no interference. Why, she asked herself, had she chosen something so public? Or had it chosen her?

"Hilda?" Torsten asked, and smiled. "You look frustrated."

"Just working things out." In spite of everything, the man still attracted her. A challenge? A response to the special attention he paid to her, even if it gave her a headache at times?

"Okay, I'll do it." She smiled at Torsten. "I'll meet you at the shuttle port in an hour."

As they approached Duluth Station airlock, Torsten asked, "I hear your father's back on New Antarctica and Tse Wen wants you to go back to head up the project there."

Hilda looked at him quickly. "Word travels fast. That wasn't supposed to be announced until we finished up the Ten-Ten. I haven't really decided. There are still some issues between Wotan Kremer and me. That's off the record, though, please."

Torsten shrugged. "Don't worry. We'd just say you were weighing it."

Hilda nodded curtly. To give her mind something else to think about, she took manual control of their approach and swooped in on the shuttle's belly thrusters, pinning them to the floor with a gee and a half while the AI squawked helplessly. At the end of it, she kicked in the minus-x jets for a hard two seconds of eyeballs-out to leave them floating dead in space above the docking mechanism.

"Jesus!" Torsten exclaimed, looking green.

Hilda laughed. "I learned to drive on a starship's runabout, Torsten. It's what we do for recreation out here."

Once secured, they made their way to the lock. Hilda was almost into the tube, before turning back for her helmet. There was no net here, but it felt almost like Sarah was sending her a message. At the Station entry lock, they stowed their gear and headed for the old command center beneath the port area. Hilda floated over to a console and let microgravity bring her body into the footholds beside it.

She chuckled. "This is more advanced than it was in Duluth's day, but it seems primitive," compared to what we use now."

Torsten looked at a bank of dead gray touch screens, wondering. "Can you explain what's changed in language people can understand?"

She felt irritated for only a moment. "I can try. This panel controlled a millimeter-wave system; we could punch straight through an atmosphere with that, but the data rate was a millionth of the multiplexed x-ray frequencies we use now. Also, at the higher frequency, we can focus to a spot a million times smaller with the same size aperture at the same distance. That helps with the BHP's interstellar com."

"That's done from here?"

"About fifty kilometers away."

"So right now, even though the project hasn't been approved yet, there are messages going out toward Groombridge 34, Epsilon Eridani, and, uh . . ." Torsten hesitated.

"...Lacaille 9352," Hilda filled in, "and Chandresekhar Station at the BHP's vertex. The power systems being built there will be used for interstellar exploration, commerce and settlements as well as for the Black Hole Project. This project requires a lot of lead time."

"You seem to have a great deal of confidence. Uh, zero gee is getting to me. Where's the..."

Hilda smiled. "Door three, then left."

Alone, she glanced around the room, remembered, then wondered what it would be like to remember it a million years from now, or a billion. The BHP was not the culmination of human history, she realized, but part of the beginning.

A dark, space-suited figure floated into the room and raised a spray can, which hissed. *Sarah*... There was no net in here. It got very dark as she fell slowly in the minuscule gravity.

"Mr. Ried, Anna sent me," a low, slightly Russian-accented voice announced when Torsten



emerged. It was Vitaly Rossov, the site engineer. He wondered what the man's relationship was to the family. He held out his hand.

"Why are you here?"

Rossov tossed him a duffel bag. "EVA kit. Put it on. I have something to show you. Channel ten."

Torsten complied and accessed channel ten in the suit's comm system. A star field filled his heads up display. An arrow indicated one of the stars. A dim asteroid was moving toward it.

"Electing Lars is plan A. This is plan B. Arrow points to New Antarctica from Groombridge 34 antenna five years from now. Asteroid, we have just given a slight push, to cause an occultation."

Groombridge 34 dimmed and vanished for about thirty seconds as they watched. Then it blinked in again

"How does this help anything?"

"When eclipse happens, we substitute our own message for a couple of milliseconds, in dead time before cut off. Then, fifteen years from now, the Groombridge 34 impactor has a new launch time. Wrong launch time. Clever, yes?"

Torsten nodded dumbly. Somehow it didn't seem fair. What possible good it could do Lars here in the Solar System? Well, he thought. Maybe it wouldn't work.

Rossov powered down the console to standby condition, then handed him a data stick.

"Codes. In case I am incapacitated, and the backup is not needed. It could give us away, so it shouldn't be used unless nothing else works. The AI inside knows what to do."

Torsten grimaced, wishing someone else had that mission.

Rossov put his helmet on and turned up the visor reflectivity. "You wait here."

"But Dr. Kremer..."

"She will join us shortly. You wait here."

The first thing Hilda noticed as awareness slowly returned was that her head ached. She groaned and stretched. Then she remembered where she was—someone had done this to her. You should pretend you're still out until you get your bearings, she thought.

Too late. The figure with the spray can was in the room and headed for her. It had been six decades since she'd done any zero-g wrestling—but the fact that she'd done it at all might be an advantage. She took a deep breath, moved her legs against a nearby wall panel and with a quick movement, shoved off from the panel and lunged at him. He reached for her, but she caught his arm, pulled it by her, and wrapped herself over his back, starfish-like. The two tangled bodies cartwheeled toward the door while the spray can went flying across the room.

Hilda pulled on the release lock on his helmet and tried to twist it off.

"Who are you and what do you want? What did you do with Torsten?" she screamed.

The man grabbed the door jam to stop them, then tried to pull her arms away from his helmet.

With one foot planted, she stomped on the door jam, the sudden acceleration slamming his helmet into the door jam and his head into the top of the helmet. He let go of her hands, then slammed his helmet back into her head, stunning her. Then he kicked himself free and

went after the spray.

Hilda launched himself after him, but he remembered to avoid her "starfish maneuver." They collided, grappled, and she went for his helmet. The clumsiness of his full vacuum gear and lack of purchase or leverage canceled any strength and size advantage he might have had, and the helmet began to turn. But he got his hands between them pushed her away and smashed a fist directly into her stomach.

She gasped and loosened her grip on his helmet and he kicked himself away. He reached the spray can before she could get to him again, and got her full in the face.

"Damn you!" she gasped, pushed him away, and tried to jump for the door but lost consciousness before she got there.

Torsten heard thuds, clangs, and what might have been a woman screaming. What the hell? He started to pull himself down the corridor back to the control room; but Rossof met him halfway, going the other direction.

"Okay." Rossof said. "We go."

"But Dr. Kremer..."

Rossof smiled. "She will not be around to interfere with our plans, now."

As the men left the old station's airlock for Hilda's shuttle, Rossof commanded the station into hibernation mode

"Rossof, that's Hilda's air supply!"

Rossof snickered. "*Da.*"

Torsten grabbed Rossof's arm. Guilt feelings for hitting her riddled him. "You only need her out of the way for a few hours."

Rossof pulled him aside. "We are going to alter the data to make the experiment look like failure. She could catch the phony data and blow whole thing. She probably cannot escape, but dead is safer."

Torsten reached out and touched Rossof. "I say no killing. It would ruin Lars if it got out."

"Calm down. Okay, I disable communications but leave life support system on." Rossof waved Torsten away.

Torsten pulled himself back through the connecting tube and into the runabout. Guilt picked at his mind. He wished for an end to this nightmare.

But it came back with a vengeance.

"Going somewhere, Torsten?"

Torsten turned to see Hilda, smiling as if nothing had happened. His stomach knotted.

"J-just waiting for you."

She laughed. "I see I fooled you! I only need to fool a few others for a few hours." She mimed a kiss towards his cheek just the way Hilda had.

"Anna!" Torsten could not believe her impersonation was so good.

"We're late, let's go," Anna said. "Vitaly will take the other spacecraft."

In Hilda's voice, she told the spacecraft to return. Torsten wondered, uncomfortably, what Lars really would have thought about this. How much had Anna taken on herself? Until now he'd never felt the psychological price of doing favors for his brother so heavily.

Anna seemed tense, too, but it might be more the anticipation of an actor ready to take the stage than worry about what might go wrong with her impersonation.

"Time to see if this works," she said. "Central Control, Central Control, this is Shuttle Two."

"Shuttle Two, Central. Dr. Kremer, has there been a problem? No one has been able to reach you. Dr. Levine is quite concerned. The experiment is on hold."

Torsten stifled a sigh of relief. Rossov must have added Anna's vocal database to Hilda's. The fact that Central Control's computer had accepted Anna as Hilda got them over the first big hurdle.

"Roger, Central," Anna replied. "I misjudged a zero gravity turn and hit my head pretty hard. I haven't been able to access the net; but they say a slight concussion can do that. I've taken some neurogen and it should clear in a few hours. It's a nuisance to be off-line, but I can make do with this." She touched the headset. "And aside from that, I seem to be fine. Tell Dr. Levine not to worry. I assume all the preparations are in order for the experiment? I haven't been able to reach Dr. Rossov."

"There are no problems with experiment preparations. Dr. Rossov is inbound to the MES. He is concentrating on some last-minute equipment items at the vertex and is not available for conversation now. Do you wish to speak with Dr. Levine?" Central continued.

"I'm sure Sarah's very busy, too," Anna answered. "Just tell her not to worry. I've been invited to do commentary on the media ship, so I'll be there if she needs me. Shuttle Two out."

Anna turned to Torsten. Flushed with the success of her impersonation, she grinned like a hungry tigress, floated over to him and ran a fingernail across his lower lip as she purred into his ear. "You don't seem to be in the spirit of things."

Torsten smiled apologetically. "Anna, I can't." He pulled her hand away from his face. "I'm worried about Kremer."

Anna laughed. "No worries there."

A chill went down Torsten's back. Had Rossov broken his promise?

"I'm not sure, Anna. This could all go wrong on us so fast."

She shrugged. "So it goes wrong? Even in the worst-case scenario, if I am discovered, I am on the press ship, vanish, and become Anna again. My skin now has both DNAs, and DNA is so reliable that nobody checks fingerprints anymore. You can deny knowing anything." She laughed. "If the Ten-Ten experiment is successful and the project is authorized anyway, we have a backup. If Lars loses, he can easily find his way back to the top again in twenty years or so. So whatever happens, we can still win. If you want power you have to take chances. Maybe you win, maybe not. But you never get anywhere by not trying. Immortality means never having to give up."

"But Dr. Kremer..."

Anna nibbled on his ear lobe, whispering, "You really don't want to know."

Hilda awoke to a dry sensation in her throat. Then she felt a strong ache in her stomach and remembered the fight. Where was Torsten? She looked around. It was pitch black. Not a glimmer of light. She gingerly moved her arms and legs. Nothing broken. She pushed herself very gently up from the floor—all she had to orient herself was a thousandth of a gravity, and she didn't want to lose it. Where the hell was Torsten? What did they want with him?

Silence answered. Complete dead silence. That was wrong. Creepy.

"Override 10-A-T-7." That was twenty-five years old, but why change it?

Still nothing. Whoever had shut this down had known what they were doing. Damn, she was a physicist, not a tech.

She felt herself gasp for a breath, and then another breath. Life support was down, and she'd probably used up all the oxygen in the immediate area. The silence—no fans, no circulation. Willing herself to be calm, she pushed herself away, down the hall, and was able to breathe more easily. You have to be like a shark, she told herself, and keep moving to breathe. But where? The airlock. She needed to find her helmet and an emergency suit. Back to the airlock. She felt her way along, blind, half afraid to stumble across Torsten's body, but the floor was bare.

She reached the airlock, but couldn't find the emergency suit lock by feel.

How much time was left? She pressed the face of her wrist comp. Less than an hour, the numbers glowed at her. Glowed! She pressed the face again—her eyes were so well night-adapted that she could see the wall clearly.

There! She pressed the emergency equipment panel, got the suit out, and released its tiny life support unit. Fortunately, the fittings were standard. Then she got her helmet from its niche, put it on, asked for max, and breathed deeply, then turned it back to normal as she felt fully recovered.

Now what? Her shuttle was gone, of course; a look through the airlock door window showed both that and the fact that the outer airlock door had been left open. The bastards had been thorough. Maybe, with a clear head, she could get the station powered up again. There was a spare CPU.

Still suited up and clear headed, she went back to the control center.

Working alone, in a spacesuit, the CPU swap took an hour and a half, but the new one knew nothing about any shut down. So it quickly powered the system up. A comm light went on indicating the station's AI was standing by. "Computer, patch me through to operations."

"Visual and audio transmitting capability has been physically disabled. I can only receive visual and audio transmissions," the station's computer announced.

That had seemed too easy, and it was.

"What is the status of Ten-Ten?"

"The experiment has not been conducted, as indicated by the continued presence of the MES. I cannot query for data in a receive-only mode..."

"Computer, what is the status of the transmitter repair?"

"A full repair can be accomplished in two days."

"What's happening?"

"You are giving an interview to InterplaNet News," the AI told her.

"Me?"

## **Chapter 5**

### **BHP Solar System Experimental Station,**

**3 Jun 2257**

The atmosphere on the press ship was tense, with all eyes glued to the data displays and the scene from BHP operations. The latter lacked the drama of bygone eras, Torsten thought. No consoles, no headsets, no big central display; the physicists just stood around in groups of two or three, occasionally saying something to each other. Rossov was back among them now, coolly going from one group to another and patting people on backs as if he'd never been anywhere else. But the relaxed appearance was misleading; voice stress indicators were at 160% and nobody but nobody was sitting down.

The south pole of BHP central faced the experiment and Dr. Sarah Levine was at a south-facing window, hands gripping the rail.

There were consoles aplenty in the nerve center of the media ship, a disk-shaped section of the spherical hull just below the observation dome. A half-dozen had been bolted to the ceiling of the room, creating what was in effect another floor. They'd even, Torsten noted, tacked down a Velcro walkway between the ceiling consoles and all but one of them had people sitting/hanging behind them. In zero gravity, as long as everyone watched their heads, that worked.

Torsten grabbed a towel someone had thoughtfully attached to the console and blotted up his sweat—it didn't run in zero gravity, just accumulated on his skin in great salty drops. Behind him was a chaotic mess of wires, conduits, and bodies careering this way and that; his editors would replace that with a giant version of the magazine logo. In the middle of all the chaos was a central desk, at which sat anchorman Ashira Nagato of InterplaNet News and Dr. Hilda Kremer—at least who they all thought was Dr. Hilda Kremer.

Torsten started his own voice-over. "This is Torsten Ried for *Popular Issues*. We are within minutes of the most breathtaking and potentially the most dangerous physics experiment ever initiated, the precursor of an even bigger experiment that will either, according to some, give humanity the power of gods or, if it goes wrong, destroy the entire universe. Let us leave that aside for the moment; this will be big enough. Not since the days of nuclear weapons has a man-made explosion so huge been attempted. Some think this threatens the very fabric of our existence, but the physicists have constantly assured us they know it will not. We shall have to hope they are right!"

With a glance of his eyes and a mental click, Torsten selected a view of the experiment vertex.

"This is where the collision will take place. The small structure you see will be totally vaporized in the explosion, but its instruments will send their important readings nanoseconds before they vanish. Physicists will use these readings to refine their model, the one that says there is no danger, and ask the Interplanetary Association Senate for final approval to attempt to make a black hole.

"But what Senate? Whose viewpoint will this experiment support, the 'forward forever' liberals of President Owomba or the 'enough already' Consolidationists led by Senator Lars Ried's Conservative Union Party? We should all know in about five minutes. In the meantime, we will join Mr. Ashira Nagato, who is conducting the pool interview of Dr. Hilda Kremer, the chief theorist behind this gargantuan challenge to nature."

A nod to his AI took Torsten out of the flow. He sighed and turned his attention to his monitor. Anna looked very much like Hilda, but had a kind of snooty carriage that he'd never seen the real Hilda affect.

The audio fade-in caught her in mid sentence. "...no problem whatsoever. It's really only a small nuclear explosion; bigger ones were conducted three centuries ago, right in Earth's atmosphere."

Nagato frowned. "Can you explain for new viewers, in words that we all can understand, what aspects of the standard model you hope to verify with this experiment?"

"Certainly. Our model predicts we can do the black hole experiment safely. It also predicts certain readings from this experiment. If they match, we maintain we can do the black hole experiment."

"But the black hole effort will be billions and billions of times bigger."

"You do what you can," Anna/Hilda said with a superior shrug.

Torsten found himself sweating. Anna/Hilda's answers had none of the depth that Hilda's would have had. By now Hilda would have explained what a "quagma" was and talked about compression constants and calibration. The general public might not have detected the difference, but someone like Dr. Levine certainly would. The whole house of cards was starting to fall apart in his mind.

"Mark one," someone said. "The accelerator coil field strengths are nominal."

I'm on, Torsten thought, suddenly too busy to worry about the deception.

"The biggest gun ever built by humankind is about ready to fire. Transient fields a billion times stronger than those that propel our starships will be applied in sequence to send its ten-gram bullets at ten times the speed of... I mean to a gamma of ten, that is to say to a speed so relativistic that they'll hit with ten times the mass they really have. I sincerely hope I am still here to report the results." Torsten took a deep breath. He was definitely rattled. What he had said was pure hype, but if there was even a chance in a billion that Hilda was wrong and the most vociferous of the critics right, they might have been his last words.

There was a momentary silence in the newsroom, as if the same thought had occurred to everyone else.

A million nightmares raced through her mind. A recording? An experiment-induced time warp? A virtual doppel-ganger? "Let's see it."

She'd seen herself before, of course, recorded or through real-time monitors. But here she was, with Ashira Nagato, no less, on InterplaNet News.

He asked, "We have reports about an abnormal amount of gamma rays on the preliminary tests. Can you confirm that?"

"Without using a lot of technical jargon," her double said, "the latest round of tests showed an unnatural, inexplicable, amount of gamma rays escaping the collider collisions. Gamma rays are one of the most lethal forms of energy in the universe."

Hilda winced at how the double played up a danger that was nonexistent to anyone over a few hundred kilometers away from the experiment.

"Your calculations failed to predict this radiation?"

Hilda's image shrugged and gave a distracted look into the camera. "Yes, but it's not enough of a loss to keep us from making a black hole, so we don't consider it important."

"So we are going ahead with the final test anyway?"

"Of course," the double said with a voice that was dripping with contempt.

Hilda stared at the image, stunned and in shock. Not only the public image of the project but her reputation was being trashed by this impersonation. She dug her fingernails into the palm of her open hand. Had Torsten been in on this sabotage all along, she wondered? To set back everyone's work for at least a generation? To destroy her life's work and that of her dearest friends? What kind of monster had she been playing with? How was she ever going to face Brad?

Academics and Earth were another life. She couldn't look to Tse Wen, or Sarah, or

Brad to solve this. She had to do it herself. But how?

If she could only get word to Sarah. Hilda thought furiously. She had a radio, in the suit. It was just a matter of gain. "What's the power of my suit radio transmitter?"

"Three watts."

"Do you have a parabolic dish pointed at the station? How big?"

"I can point the north pole ten-meter radar dish at the station."

Hilda did the calculation herself—the suit antenna was essentially omnidirectional, so its three watts would be spread over...Maybe...

"Get the airlock ready. I'm going outside."

It was hard to make good time over the dusty surface. If she tried to stride or hop too hard, she would put herself on a trajectory taking many minutes to return to the surface. She found the best way was essentially to go hand over hand on the surface, pulling herself along from rock to rock as she emerged from the pitch black shadow in her helmet light. But the surface of the asteroid's polar night was barely the temperature of liquid nitrogen and there was only so much the few nanometers of high tech fabric of her gloves could do about that. Her fingers grew numb with cold. She flexed them furiously between grabs.

It took fifteen minutes to reach the dish. It was on a tower over a hundred meters tall with a de-spin platform on top of that. More hand over hand work. She looked down and shivered at the height—despite the low gravity. She pulled herself over the rim of the dish, launched herself toward the feed horn at the focus of the dish and grabbed hold.

"This is Hilda Kremer calling Dr. Sarah Levine. Emergency."

"Person calling on suit radio for Dr. Levine, your voice does not match Dr. Kremer's."

They'd hacked the data base, Hilda realized. "Your data base has been compromised. Let Dr. Levine make the identification. Tell her...tell her thanks for making me take my helmet with me..."

Torsten stared at the time display; it didn't move. A hold, he guessed. The media deck was silent as if every comment that could be made had been. In the silence Torsten heard Anna/Hilda say, "I'm fine, Sarah, go ahead...let me check...no problem, that should be fine."

He could only hear this side of the headset conversation. Was Levine suspicious of something? Had Anna/Hilda allayed those suspicions?

"Resuming count at ten," someone called out.

Torsten stared at the image of the Ten-Ten's vertex, not trusting his voice.

"Five...four...three...two...one..."

"We have data!" someone shouted

"What the hell?"

"It's all neutral pions!"

"Look at the magnetic transient!"

The silence had turned instantly into a babble.

Torsten stared at the facility.

It was still there. No ten-megaton nuclear explosion. But people all around him were

yelling about data. Something was terribly, terribly wrong. Well, it was supposed to go wrong, to discredit the experiment. Maybe he had misunderstood how wrong. At any rate, he had better start talking.

"Something unexpected has happened," he intoned. "The experiment vertex is still intact, but instruments are reporting the results of a huge explosion, albeit not quite the kind of explosion expected. Perhaps time itself was affected; perhaps we aren't even in the same universe anymore!"

*Steady, Ried, his producer said. Keep your feet on the ground you know.*

Torsten nodded and took a breath. "Or maybe there's some kind of massive instrumental problem." It occurred to him that Anna was prepared for this. "Let's see what Dr. Kremer has to say."

Anna/Hilda looked white-faced. The plan *was* for her to look confused and unconfident, but this looked too real. She talked, at any rate.

"The last round of tests showed an abnormal amount of gamma rays escaping the collider collisions. As I said, gammas are one of the most lethal forms of energy in the universe. They can also carry away the energy of collision before it has a chance to compress the matter enough. The fact that we have so many...uh...gammas..."

"Neutral pions," someone shouted, apparently trying to be helpful.

"They turn into gammas right away," someone else said.

Anna/Hilda looked around. "Gamma, pions, we, uh, don't know what happened. Our models must be wrong. The energy could have gone into small black holes that consume ordinary matter, or produce something, uh, strange. I just hope this is contained."

Nagato jumped on that. "If the models are wrong, it would not be wise to go ahead with the Black Hole Project, would it?"

Anna/Hilda seemed to recover with that cue. "No, in all honesty, I'm forced to say it would not."

He nodded. "The critics in the consolidationist alliance have a point then?"

"Yes, I'm afraid they do."

Anna/Hilda was now having trouble keeping a smile off her face; however unexpected/*this* result was, it played right into their plan. It was time to get back into editorial mode. Torsten checked the setup and nodded to his AI to be ready to break in.

Nagato's frown was deep and angry. "I must then observe that these unexpected events hark back to the cautions that the Conservative Union Party espouses. They say scientists do not really know what they are doing, and this is the apparent proof. We must now all consider our votes very carefully and take into consideration the power of these science experiments and their effect if left unchecked by proper oversight. Meanwhile, everyone here is still trying to figure out what happened."

Daring to hope, Torsten wondered how this was playing with the staff. He paged Rossov. No answer. He called up the monitor showing the scene in the station common area. There seemed to be none of the confusion and chaos there that was in the media center. Rossov was nowhere to be seen. Then he saw Dr. Sarah Levine's face. It was one great big grin.

She knew. They'd been set up. Oh, shit. *Anna, vanish. They're onto it.*

He looked back to the press room pool desk. Ashira Nagato seemed lost in concentration, listening to something. His mouth dropped open and his eyes got very big.



Then his lips closed to a thin line of anger and he whirled around to the seat next to him. It was empty.

Torsten looked around; the room was a sea of floating bodies. Anna had somehow dropped her Hilda persona and vanished among them. He tried to imagine how—switch badges, let her hair out, wipe off some makeup? Anna Messenger would appear again. But there could be no such exit for him, he knew. He was hung out to dry.

Or was he? Was there any way he could backpedal himself out of this? And help Lars as well? Perhaps, he thought, perhaps. The knot grew in his stomach and he turned grimly to his pickup to try to talk his way out of it. He was good at that, he told himself—between Anna and his mother, he'd had to be.

"There have been some new developments," Torsten said. "Often, when nothing else can explain what has happened, the answer turns out to be some form of human manipulation, and that is apparently the case here. What we were told was to be the actual Ten-Ten experiment, was apparently not.

"Which leads to the question of where the data came from."

He sent a query toward Sarah Levine. *What happened?*

To his surprise, she answered. *As if you don't already know, Ried. Saboteurs apparently hoped to substitute false data for real data. We suspected that and did a precursor shot that triggered their mechanism, and revealed it. You can quote me. Levine out.*

He did quote her, and hoped he sounded innocent and confused. He certainly sounded rattled, no doubt about that. Text began scrolling on his monitor. Station security was looking for Rossov.

"What this looks like now is an attempt to sabotage the experiment by very well-prepared opponents or, conceivably, if our imaginations run free, a staged sabotage attempt conducted by equally fanatic proponents seeking to embarrass consolidationist forces." He waved at all the media consoles, all occupied now with earnest people speaking rapidly. He could even smell, despite the best efforts of the *Gulliver's* environmental maintenance systems, the presence of too many excited bodies.

He looked back at the screen showing the common room to locate Sara Levine. It didn't take long; she was facing a video pickup and seemed to be grinning right back at him.

*You haven't seen anything yet, Ried,* she sent.

Then she turned to her window as if to watch something.

What? In the middle of all this confusion? They couldn't...they wouldn't...

The countdown clock had started again, at T-60. The audacity of it took his breath. But what better time? He glanced at some of the other displays; he didn't understand the numbers, but they had all apparently recycled to pre-shot status. Rossov's false data had played itself out of the system and he would not have a chance to plant another set.

Or was he doing that now? If Rossov had slipped out on a small repair bot to the instrument module to cover his tracks or plant another set of spurious data and they made the shot, he'd be vaporized.

Torsten started to call security, to ask them to hold the experiment. Whatever Rossov was guilty of, for whatever reasons, he was still a human being, with a life to lead...Then Torsten stopped. If he called, he'd expose his own role in all this and involve Lars as well. Also, Rossov, if anyone, would know that the real shot was in progress; if he was at the Ten-Ten's vertex, it was by his own choice. So be it.

Torsten realized that he, too, perhaps had a choice. At least for a while, he could be the professional he had always wanted to be, independent of his family, his own person. He was here, with an audience, with what could be the story of the dawn of a new era of history. It was not up to him to make the news. He had only to put everything else aside and report it.

"In the meantime," he began, "the research staff appear to be preparing to do the experiment for real. The data now show the beam lines are fully charged again. I am not getting a count but would guess that it will happen soon."

He had to fill, he realized; there were no more interviews to switch to. "The instrument module still floats suspended at the ends of the largest linear accelerator ever made. In a few moments, despite all the threats, sabotage efforts, and ethical concerns of opponents ranging from the fringe of political activism to sober physicists and interplanetary leaders, those accelerators may fire and lay the groundwork for a technological journey of Promethean significance that, like it or not, we all seem to be on."

He glanced at another monitor. "We have a count now—twenty seconds. The project staff members have crowded around their windows—windows, I should remind you, that are made of glass dense enough to stop ninety percent of cosmic radiation; you would not want to look at this with unprotected eyes...seven seconds...five...four..." He zoomed in on the vertex module. "...two...don't blink...one..." Suddenly, a brilliant white star sprang out of where the spherical instrument module had been. For the tiniest fraction of a second, he thought he saw a beautiful, iridescent hourglass shape expand from the vertex and rush at him, but it blew by almost instantly.

Did he feel a slight acceleration? Hilda had said there was not that much matter involved, even at its huge energies, compared to the mass of the station's asteroid.

"That was it! The instrument module has vanished—where the center of the Ten-Ten experiment was, where all the controversy, plans, and plots were focused, there is now nothing. There is nothing at all in that direction..." and he paused a moment as he realized the poetry of what he was about to say, and said it anyway, "...nothing between us and the distant stars."

"Mr. Ried?" It was a human voice, behind him. The idiot didn't realize he was interrupting a live feed. He held up a hand to indicate he was busy.

A hand touched his shoulder, lightly. "Mr. Ried."

What the hell? Well, it was a good place to break anyway. He faded his channel into the pool feed and turned angrily to confront his interrupter.

The young blond man behind him seemed suitably apologetic. "Please excuse me, Mr. Ried, I'm Simon Kalas, from BHP Central Security. Hilda Kremer, the real Hilda Kremer, said we should talk to you."

Torsten shut his eyes and took a deep breath. *Oh, shit.*

It was Tse Wen and Brad's idea to quietly whisk Hilda and Sarah out to the Marin Headlands for a walk when they landed back on Earth. They wanted to get the group away from protesters and newsmongers who howled for news.

They walked up the dirt road towards a cliff overlooking the Golden Gate. With each step Hilda felt her muscles adjust to her Earth weight once more.

"Why such a windy place?" Sarah asked.

Brad deferred to Tse Wen, who was looking out over the cliff.

"The wind up here is strong because the topography has forced it up and given it a

greater distance to cover. It is also hard on microphones and little things that fly. The wind has much to teach us about the source of strength, don't you think?"

It was coming from the East today, and was warm. Hilda touched Brad's arm. He shrugged. "Like being in our faces. Hilda, your boyfriend's damage control efforts..."

Hilda winced. The history of her misjudgments with Torsten Ried now stood between them.

Brad shook his head. "Sorry Hilda. It's a bloody war of public opinion. Never mind truth."

"It's always been that way, Brad," Hilda said. She'd taken a vacation from physics on the voyage in from the asteroid belt, and had read a compilation of the correspondence between two American philosopher-presidents, Adams and Jefferson, that Tse Wen had given her after the bomb attack. "Six hundred years ago, Thomas Jefferson said that 'the inquisition of public opinion overwhelms in practice the freedoms assured by the laws in theory.'"

"Jefferson had it right," Brad said. "It's impossible to prove that anything is absolutely safe, and you'll never kill off all the wowsers. You just have to out-argue and outlast 'em. Anyway, we've won, mates!"

"We have only won the right to keep trying," Sarah said. "Lars Ried keeps on stumping his platform and in a few years will be after the Presidency again and who knows how far they will try to reach." She looked up.

"You are worried about the other impactor launch sites," Tse Wen said. "We have people of unquestioned loyalty going out to take charge of those operations. Dr. G. P. Weaver, a former student of mine, is going to Epsilon Eridani. Hilda's sister, Elizabeth Avonford, will go to Lacaille 9352, and Hilda herself is going back to Groombridge 34. Beyond that, a wise combatant makes use of his opponents' energy."

Hilda smiled thoughtfully. "Thank you for teaching me that, Tse Wen."

"There is still no public word about the impostor and Rossov."

The mention of Rossov still saddened her. There was no proof, of course, but everyone believed he'd been at the vertex when Sarah had triggered the real event. At least his death there would have been as nearly instantaneous as a death could be.

"Right," Brad added. "One or both of 'em are still out there. Hilda, did you know Rossov was sore at you about one of his papers not being accepted?"

"No, I didn't. All this for a paper?" She had reviewed thousands of papers over the years. She consulted her deep files through the net, "Oh!" A chill went down her.

"Hilda?" Sarah asked

"I trashed a paper. 'Quagma Energy Loss by Advanced Wave Emission,' submitted to Physika by V. I. Rossov, 2220. But that was thirty years ago!"

Sarah laughed. "Advanced emission! Then he had a secondary agenda. He was still trying to get people to take his work seriously.?"

Tse Wen sighed. "When we made people immortal, we also made grudges immortal. Well, in the end, it would give me peace to think that Dr. Rossov may have killed his grudge the only way possible. I shall consider it a sufficient act of apology."

Hilda nodded; Rossov had achieved a sort of closure, though she regretted the death greatly.

A warm gust of wind hit the group as they reached the apex of the hill. They turned their backs to it and looked out towards the Pacific Ocean and the Farallon Islands on the

horizon.

"What do you think you'll miss the most about Earth?" Sarah asked as they got high enough to see most of San Francisco across the water.

"Besides us mates, o' course," Brad said, jokingly.

"Oh, I'll miss you all! Chaos help me, I will."

But instead of sadness, Hilda felt a rise of excitement. It was hard to contain. After all these years on Earth, she was finally going home to New Antarctica, to return to where she had been born, home to work with her father. Perhaps Kate Avonford's starship would stop there, too, some day. Too bad she would miss seeing her younger sister, Liz, who was shipping out to manage the impactor launch from Lacaille 9352.

Hilda picked up a sun-bleached Dun-geeness crab claw from the roadside where a seagull had dropped it. Playing with it absently, she looked first at Tse Wen, then at Brad. "And the wind," she said at last.

Sarah looked at her oddly. "The what?"

"The wind. New Antarctica is not misnamed. You have to think first about everything you do outside, there." Particularly with the project on her shoulders, she realized. She would have to *make* it happen. After Duluth Station, she thought she had that in her, but... "I'll miss this wonderful warm *free* wind in my face."

Torsten Ried glanced at the time display on his work screen. It was 13:24, 7 August 2258. He wished he did not know what he knew would happen in three minutes.

Out in the asteroid belt, the inexorable laws of celestial mechanics would work their will, and one small asteroid would come between the Black Hole Project's main xray communications laser and Groombridge 34. The occultation would only be for a few minutes, and the AI had long ago predicted and allowed for it; for an hour or so, it would not transmit, lest its power slice a deep cut in the traversing asteroid's regolith and fog the entire area with droplets of frozen lava. His stomach tightened.

What the AI running the project's link to Groombridge 34 did not know, and what Torsten did know, was that there was another laser, hidden down that data stream on the occulting rock, that would transmit for about a millisecond on top of the main carrier between the last data and the interruption code. The AI that ran the bogus link knew all the right codes and modulations. It would also have a message, backed by terabytes of bogus experimental data and theoretical calculations, which would direct a delay in launching the Groombridge 34 impactor.

So Rossov's dark, ironic sense of humor would reach beyond his death. Did Hilda deserve this cruel revenge? Probably not, he thought, tightening his fingers into a grip.

But if Torsten were to admit knowledge of it now, he would have to admit complicity in the kidnapping and he would betray his family in a way that they might correct very rapidly. He would also, once again, get involved in making news instead of reporting it. He thought of Hilda, Sarah, Lars, Anna, and their Promethean agenda. Were they too big to stop?

To make the call or not? He opened his mouth to send a warning...then cleared his throat. Then he looked back at his time display and shook his head. Too late now.

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