

SPECIAL DOUBLE ISSUE!

ANALOG

SCIENCE FICTION AND FACT

JULY/AUGUST 2015

**Night Ride
and Sunrise**
Stanley
Schmidt

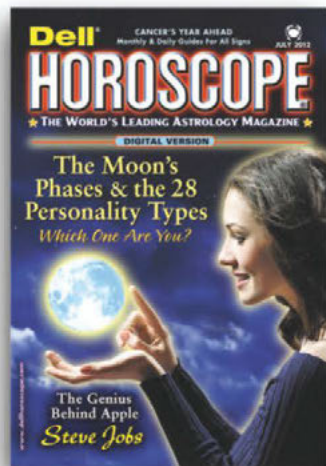
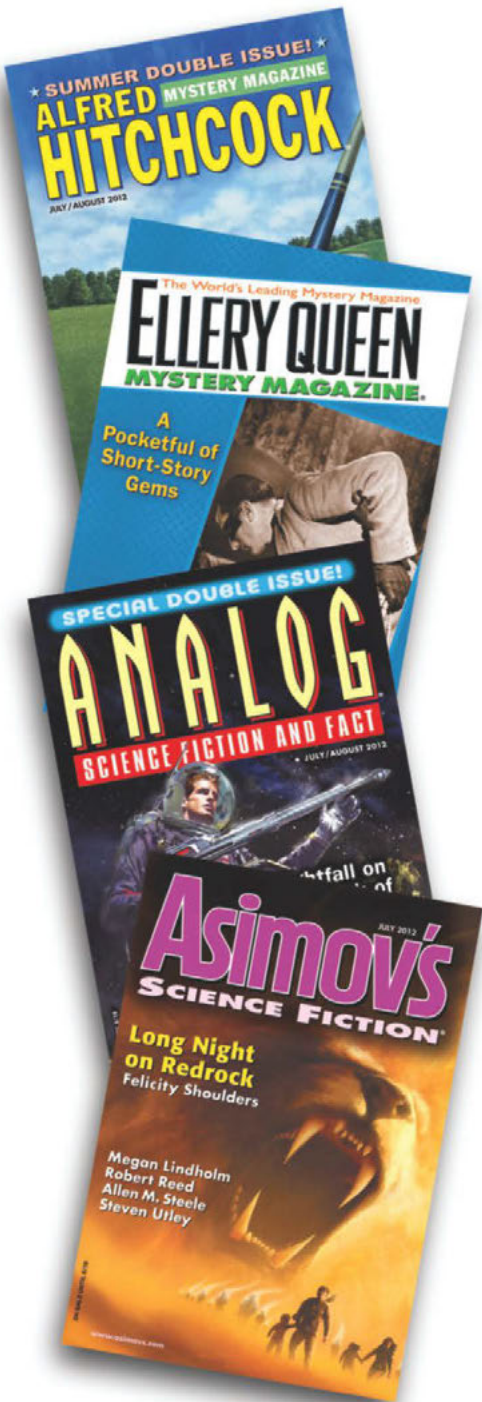
Edward M. Lerner
Marissa Lingen
& Alec Austin
Robert Zubrin
Adam-Troy Castro

ON SALE UNTIL 7/7

www.analogsf.com

Advertise in our digital magazines on iPad!

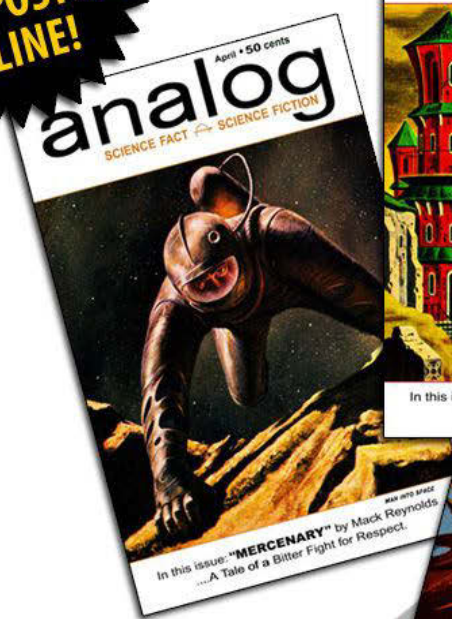
Penny Publications, LLC, the parent company of Dell Magazines, offers digital advertisers a desirable, highly-responsive audience. We publish 5 nationally recognized, digital magazines.



For more information on advertising with us, contact:
Advertising Sales Manager via email at advertising@pennypublications.com,
or call 203.866.6688 x204.

NOW AVAILABLE!

**BUY
ANALOG
COVER POSTERS
ONLINE!**



VINYLZ ART

 **Canvas Posters**
SHOP NOW!

ANALOG

SCIENCE FICTION AND FACT

Vol. CXXXV No. 7 & 8
July/August 2015

Next Issue on Sale
July 7, 2015

SERIAL

NIGHT RIDE AND SUNRISE, Part I of IV, Stanley Schmidt _____ 10

NOVELLA

SLEEPING DOGS, Adam-Troy Castro _____ 156

NOVELETTES

THE SMELL OF BLOOD AND THUNDER, Liz J. Andersen _____ 56

THE TARN, Rob Chilson _____ 101

SHORT STORIES

BREAKFAST IN BED, Ian Watson _____ 70

POTENTIAL SIDE EFFECTS

MAY INCLUDE, Marissa Lingen & Alec Austin _____ 75

IN THE MIX, Arlan Andrews, Sr. _____ 81

GUNS DON'T KILL PEOPLE, Jacob A. Boyd _____ 90

PINCUSHION PETE, Ian Creasey _____ 95

TUMBLING DICE, Ron Collins _____ 121

DREAMS OF SPANISH GOLD, Bond Elam _____ 130

ASHFALL, Edd Vick & Manny Frishberg _____ 134

DELIVERY, Bud Sparhawk _____ 142

THE NARRATIVE OF MORE, Tom Greene _____ 146



56



121

SCIENCE FACT

ALIEN ALTERCATIONS: STAR (SPANNING) WARS, Edward M. Lerner	44
MOVING THE EARTH, Robert Zubrin	139

SPECIAL FEATURE

PLOTTING: HOW TO MAKE THE UNEXPECTED INTO THE INEVITABLE, Richard A. Lovett	83
--	----

PROBABILITY ZERO

CEASE AND DESIST, Jay Werkheiser	144
----------------------------------	-----

POETRY

67P/CHURYUMOV-GERASIMENKO, G.O. Clark	43
---------------------------------------	----

READER'S DEPARTMENTS

GUEST EDITORIAL: CONSPIRACY THEORIES	
FOR EVERYBODY, Rosemary Claire Smith	4
ANALYTICAL LABORATORY RESULTS	8
BIOLOG: LIZ J. ANDERSEN, Richard A. Lovett	69
THE ALTERNATE VIEW, John G. Cramer	118
IN TIMES TO COME	141
THE REFERENCE LIBRARY, Don Sakers	181
BRASS TACKS	186
UPCOMING EVENTS, Anthony Lewis	188

Trevor Quachri Editor

Cover design by Victoria Green
Indicia on Page 5

Emily Hockaday Assistant Editor

Cover Art by Tomislav Tikulin
for *Night Ride and Sunrise*

CONSPIRACY THEORIES FOR EVERYBODY

On October 28, 2014, the uncrewed *Antares* resupply ship to the International Space Station exploded within seconds after liftoff. NASA and Orbital Sciences Corporation had no immediate public statement as to the cause, as they were understandably focused first on ascertaining that everyone was accounted for and uninjured, then securing the area, fighting the fire, evaluating the damage, and gathering debris. With reams of data yet to be examined, those in charge did not engage in unfounded speculation.

No matter. Courtesy of social media, conspiracy theorists rushed to fill the vacuum of hard evidence, supplying their own untethered notions. They began with the reasonable observation that the rocket engine was a decades-old repurposed Russian model. (In fact, Orbital Sciences Corporation did subsequently identify the cause of the catastrophic event as a turbo-pump failure in one of two main engines in the first-stage rocket.) Next, the conspiracy theorists seized upon recent tensions between Russia and the United States, stemming from Russia's actions in the Ukraine, as well as concerns that Russia could bar American astronauts from hitching rides to the International Space Station. To the proponents of conspiracies, nothing can ever be an accident or simple happenstance; the timing is always suspicious, if only in retrospect.

Three days later, Virgin Galactic's *SpaceShipTwo* crashed in the Mojave Desert, killing one test pilot and severely injuring a second. That event boosted the just-launched conspiracy theory into a higher orbit. For conspiracy theorists, a second disaster in less than a week meant the hunt was on to identify those who shot down both space vehicles. It was time to round up the usual suspects, i.e. foreigners with unfamiliar customs and beliefs, our own

government, other powerful institutions, and anyone else deemed untrustworthy. In this case, the suspects were NASA, other United States governmental agencies, scientists, including journalists, and the Russians. You know how this goes. The next step was a remarkably inventive, too-clever-by-half pronouncement as to what "really happened." The conspirators were supposedly desperate to prevent Orbital Sciences Corporation, Virgin Galactic, or other private companies from venturing into space where they'd see firsthand that the Moon landings were faked. Or else it was because word would get out that NASA and the Pentagon have been hiding the fact that aliens in UFOs are up there and up to no good.

Thankfully, *Analog* readers are more likely to disparage this outlandish stuff than to embrace it. And yet, how many of us have at least flirted with some other conspiracy theory at one time or another? I'll admit to the occasional temptation. What's more, I think it's only natural to be drawn to them when seeking to understand a sudden, calamitous event.

In my defense, and possibly yours too, let me point out that there are times when conspiracy theories do prove to be correct. Take for example that day when the President of the United States ignored warnings and participated in a widely attended event in a public location, where he tragically became a sitting duck for a gunman who shot him in the head. We know now that the assassination of President Abraham Lincoln (who did you think I was talking about?), as well as the attempted assassinations of other government leaders, was secretly planned by John Wilkes Booth, the ringleader of a group of conspirators.

Hence, it would be a mistake to suppose that conspiracies, as such, don't exist. Of course they do. After all, a *conspiracy* is

nothing more than an agreement between two or more persons to act secretly and illegally to injure others. In contrast, a *conspiracy theory* is something rather different. For one thing, the word “theory” lends the term the veneer of scientific rigor, though all too many conspiracy theories are not only untested but also not amenable to testing. Born of unsubstantiated assumptions and beliefs, they are fueled by tendencies to see connections where none exist, and can be impervious to counter-argument and the weight of evidence.

Getting back to my own brief flirtation with a conspiracy theory . . . I remember well my immediate reactions upon hearing of the bombing of the Alfred P. Murrah Federal Building in Oklahoma City several years before 9/11. Tragically, 168 people lost their lives, including children and infants in the building’s day-care center, while hundreds more were injured or left homeless, and many nearby buildings damaged. In the immediate aftermath of the bombing, no person or entity stepped forward to claim responsibility. Into the void rushed the baseless speculation, masquerading as “conventional wisdom,” that the Oklahoma City bombing must have been the handiwork of a well-known group of international terrorists. As I struggled to come to grips with this profoundly shocking attack, I can attest to the seductive nature of that conspiracy theory. It amassed many adherents before it proved to be flat wrong. Instead, the conspirators were American citizens, several of whom were convicted for their roles in the bombing.

There was a certain irony to my evidence-free provisional adoption of a false conspiracy theory. As an attorney, I’ve worked with people who were occasionally accused of participating in vast conspiracies to do . . . well all

manner of reprehensible acts. My reaction to these assertions typically began with incredulity that anyone believed this nonsense. That usually gave way to other reactions, such as amazement at the level of paranoia and naïveté exhibited by the proponents of the conspiracy theories. Even so, it can be oddly flattering to be associated with scores of cunning people—who seldom pulled off the surprise element of a surprise party for a coworker, family member, or friend—but who nevertheless possessed breathtaking secretiveness and skill when implementing their sinister designs with precise timing and nary a leak to any outsider.

I began to wonder why many people disregard more likely explanations and embrace conspiracy theories. This led me to pose two related questions: 1) Why do we sometimes leap to conspiracies when seeking to understand how and why a disaster has come to pass? 2) Why is it so difficult for us to reserve judgment while those who possess the data and/or are charged with conducting an investigation and determining what happened perform their duties?

My formal training as an archaeologist made me a practitioner of the scientific method. As such, I had to consider the limits of the data at hand—what it demonstrates, what it doesn’t demonstrate, where the gaps are, how to go about formulating and attempting to disprove hypotheses, and most importantly, how to reserve judgment until such time as the evidence justifies a well-founded conclusion. Even then, as every scientist knows, new data may very well necessitate revisions, even wholesale revisions, to a dearly held hypothesis. My archaeological training stood me in good stead when I completed law school and became an attorney.

Analog Science Fiction and Fact (Astonishing), Vol. CXXXV, Nos. 7 & 8, July/August 2015. ISSN 1059-2113, USPS 488-910, GST#123054108. Published monthly except for combined January/February and July/August double issues by Dell Magazines, a division of Crosstown Publications. One-year subscription \$55.90 in the United States and possessions, in all other countries \$65.90 (GST included in Canada), payable in advance in U.S. funds. First copy of new subscription will be mailed within eight weeks of receipt of order. When reporting change of address allow 6 to 8 weeks and give new address as well as the old address as it appears on the last label. Periodical postage paid at Norwalk, CT and additional mailing offices. Canadian postage paid at Montreal, Quebec, Canada Post International Publications Mail, Product Sales Agreement No. 40012460. (c) 2015 by Dell Magazines, a division of Crosstown Publications, all rights reserved. Dell is a trademark registered in the U.S. Patent Office. Protection secured under the Universal Copyright Convention. Reproduction or use of editorial or pictorial content in any manner without express permission is prohibited. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. All submissions must be accompanied by a stamped self-addressed envelope, the publisher assumes no responsibility for unsolicited manuscripts or artwork.

POSTMASTER: Send change of address to: ANALOG SCIENCE FICTION AND FACT
6 Prowitt Street, Norwalk, CT 06855.

IN CANADA RETURN TO: Quad/Graphics Joncas, 4380 Garand, Saint-Laurent, Quebec H4R 2A3
Executive Office: Penny Press, 6 Prowitt St., Norwalk, CT 06855

Editorial: Analog Science Fiction and Fact, 44 Wall Street, Suite 904, New York, N.Y. 10005
Advertising and Subscriptions: Analog Science Fiction and Fact, 6 Prowitt Street, Norwalk, CT 06855.

Printed by Quad/Graphics, Taunton, MA U.S.A. (5/4/15)

ANALOG

To my surprise, the fields of law and archaeology share one notable feature: They both focus on determining what happened and why, albeit on altogether different time scales and using very different types of evidence. Just as it's a bad idea for a scientist to leap to conclusions before collecting and systematically examining the data, it's an equally bad idea for an attorney to rely upon a theory of the case without giving full consideration to all the arguments and carefully scrutinizing all the evidence, not just what ever happens to favor the client. In law school, students are trained to set aside preconceived ideas and to explore every aspect of a case. That's an invaluable skill for us all, and one requiring practice.

Which brings me back to our modern-day tendency to rush to adopt conspiracy theories based on nothing, save a poor-resolution video and an inventive imagination. Why wait weeks, months, or longer for an analysis of reams of data from numerous sources, given that investigations don't always provide definitive answers? This way of thinking isn't confined to those who've decided in advance that the official explanation will be a deliberate falsification.

Is our rush to judgment simply an instance of our own impatience getting the better of us? After years of consuming fictional accounts of heroes foiling diabolical villains and their schemes, are we conditioned to see the same things in real life? Or could conspiracy theorizing be an

innately human response when something unexpected and threatening rears up before us? To cobble together an analogy from the computer programming and medical fields: Does the pattern-recognition software in our brains jump into overdrive, registering false positives? To be sure, when something dreadful happens, fear can push us to make an immediate assessment of imminent threats, to pick out anyone and anything about to attack us.

Perhaps there is no penalty, or not much of one, for false positives. Being hard wired to assign blame based on an immediate best guess could have advantages. It would allow us to act quickly in our own defense, and to act against those who, in fact, have tried to do us harm previously. Hence, the propensity to take action based on a false positive may not be self correcting.

Of course, we do possess a corrective mechanism—an adaptive and powerful mechanism: the power of human thought and reason. Yet it is far from assured that rationality will kick in right at the moment we could really use it. For one thing, all those scheming fictional characters are running around in our heads, offering cognitive shortcuts. Then, too, we hear other people proclaiming that they don't trust those charged with conducting the investigation, just as they don't trust their government, private industry, or other institutions to do the right thing most of the time.

<p>TREVOR QUACHRIEditor</p> <p>EMILY HOCKADAYAssistant Editor</p> <p>DEANNA MCLAFFERTYEditorial Assistant</p> <p>JAYNE KEISERTypesetting Director</p> <p>SUZANNE LEMKEAssistant Typesetting Manager</p> <p>KEVIN DORISSenior Typesetting Coordinator</p> <p>VICTORIA GREENSenior Art Director</p> <p>CINDY TIBERIProduction Artist</p> <p>JENNIFER RUTHProduction Manager</p> <p>ABIGAIL BROWNINGManager,</p> <p>Subsidiary Rights and Marketing</p> <p>SANDY MARLOWECirculation Services</p>	<p>PETER KANTER Publisher</p> <p>BRUCE SHERBOW Senior Vice President Sales, Marketing, and IT</p> <p>CHRISTINE BEGLEY Vice President, Editorial and Product Development</p> <p>SUSAN MANGAN Vice President, Design and Production</p>
<p>ADVERTISING SALES DEPARTMENT</p> <p>Tel: (203) 866-6688 ext.442 ■ Fax: (203) 854-5962 ■ printadvertising@dellmagazines.com</p> <p>Subscriber Services: 203-866-6688 Option #2</p>	
<p>EDITORIAL CORRESPONDENCE ONLY analog@dellmagazines.com</p>	

If that weren't enough, there is something almost reassuring in believing that a horrific event was caused by a conspiracy of wrongdoers, a reassurance that we lack when the cause is a natural disaster that we are powerless to prevent, or a combination of complicated factors whose interactions nobody anticipated, or basic incompetence and human error. In contrast, the existence of a conspiracy gives us hope that we can prevail against it, just like our fictional heroes. It's considerably more challenging, and perhaps less satisfying, to square off against forces of nature or our own lack of understanding or forethought.

Yet, we would reap greater payoffs if we could reserve judgment. For one thing, the actual causes of horrific events might be ascertained more quickly if time and resources need not be devoted to disputing the conspiracy theorists. Moreover, demonizing the alleged perpetrators, in the absence of any hard evidence of wrongdoing, does damage to more than just the purported conspirators. In a just and free society, the rush to adopt an unproven conspiracy theory inevitably tramples upon the principle of innocent-until-proven-

guilty. We can better uphold that principle by letting the appropriate investigations proceed. Besides, despite what intuition says must be "the real cause," intelligent, thinking people can still be prone to false positives from time to time. Let's refrain from taking a cognitive shortcut to "the answer." Let's withhold judgment until the evidence has been sifted and the facts are known. In other words, let's apply the same rational, analytical skills that serve us well in other aspects of our lives. This will, however, require us to do something difficult, namely, to say, "I don't know. The investigators need time to follow leads, to do their jobs. I'm willing to wait and see what they determine."

Though I do not have definitive answers as to who, if anyone, conspired to assassinate another president, here are two things I am quite sure about: 1) Getting payloads and people launched into space isn't something to be taken for granted. It's still hard. That was one reason President Kennedy urged Americans to support the Moon missions more than a half century ago. 2) No conspiracy theory has or will help us explore our Solar System and beyond. ■

THE ANALYTICAL LABORATORY



Once more we'd like to thank everyone who voted in our annual poll on the previous year's issues. Your votes help your favorite writers and artists by rewarding them directly and concretely for outstanding work. They help you by giving us a better feel for what you like and don't like—which helps us know what to give you in the future.

We have five categories: novellas, novelettes, short stories, fact articles, and covers. In each category, we asked you to list your three favorite items, in descending order of preference. Each first place vote counts as three points, second place two, and third place one. The total number of points for each item is divided by the maximum it could have received (if everyone had ranked it 1) and multiplied by 10. The result is the score listed below, on a scale of 0 (nobody voted for it) to 10 (everybody ranked it first). In practice, scores run lower in categories with many entries than in those with only a few. For comparison, the number in parentheses at the head of each category is the average for that category.

NOVELLAS (3.74)

1. "Music to Me," Richard A. Lovett (5.23)
2. "Flow," Arlan Andrews, Sr. (3.59)
3. "Journeyman: Against the Green," Michael F. Flynn (3.23)
4. "The Jenregar and the Light," Dave Creek (2.92)

NOVELETTES (0.73)

1. "Life Flight," Brad R. Torgersen (3.59)
2. "Persephone Descending," Derek Künsken (1.85)
3. "Journeyman: In the Stone House," Michael F. Flynn (1.69)
4. "Mind Locker," Juliette Wade (1.18)
5. "Plastic Thingy," Mark Niemann-Ross (.97)

SHORT STORIES (0.30)

- 1 (tie). "Another Man's Treasure," Tom Greene (.87)
"Snapshots," Kristine Kathryn Rusch (.87)
2. "Cryptids," Alec Nevala-Lee (.82)
3. "A Star to Steer By," Jennifer R. Povey (.77)
- 4 (tie). "Mousunderstanding," Carl Frederick (.67)
"Opportunity Knocks," Joyce & Stanley Schmidt (.67)
"The Region of Jennifer," Tony Ballantyne (.67)

FACT ARTICLES (1.58)

1. "Lockstep: A *Possible* Galactic Empire," Karl Schroeder (2.26)
- 2 (tie). "Saturn's 'Jet-Propelled' Moon and the Search for Extraterrestrial Life," Richard A. Lovett (2.10)
"Spanking Bad Data Won't Make Them Behave," Michael F. Flynn (2.10)
- 3 (tie). "Alien AWOLs: The Great Silence," Edward M. Lerner (2.05)
"Probability and Nature of an Interstellar Information-Trading Community," Mark H. Shellans (2.05)

COVER (1.32)

1. January/February, by David A. Hardy (3.64)
2. March, by Patrick Jones (2.56)
3. May, by Vincent DiFate (1.95)
4. June, by Dominic Harman (1.59)
5. October, by Alan Gutierrez (1.74)

As ever, you, the readers, have shown impeccable taste in selecting the winners of this year's Analytical Laboratory.

Richard A. Lovett's conclusion to his "Floyd and Brittney" series, "Music to Me," took a commanding First Place in the Novella category, and understandably so: the series has always been popular, and based on your comments, many of you feel like he knocked it out of the park with the finale.

Last year's Novella winner, Brad R. Torgersen, surfaces again with "Life Flight," taking First Place in the Novelette category this time. Derek Künsken's "Persephone Descending" took second place, which is especially impressive for his first story in *Analog*. (It's also worth noting that Michael F. Flynn placed Top Three in both Novella and Novelette with "Journeyman" stories.)

Short Story is always a hotly contested award, but this one is especially so, due to the larger number of pieces in the category. Still, both newcomers and familiar faces are well represented, with Tom Greene's "Another Man's Treasure" (this being especially notable, as it's his first story with us) sharing First with Kristine Kathryn Rusch's "Snapshots."

For Fact Articles, Karl Schroeder's science-behind-the-story piece for his serial, *Lockstep*, takes the lead, no doubt in part thanks to the tremendous popularity of that serial.

The always-excellent David A. Hardy took First Place as Best Cover once again. Who doesn't love a good crashed spaceship on an alien planet?

It's also worth noting that thanks to the hard work of Assistant Editor (as well as Poetry Editor!) Emily Hockaday, we feel confident that we'll be providing enough poems throughout the year that you'll be able to vote on your favorites in next year's AnLab. So start keeping track!

Since AnLab votes are so important to encouraging authors and artists to do their best work, and to giving you the kind of magazine you most like to read, we hope to get even more next time. Use our online ballot, e-mail, or "snail mail," whichever you prefer, but please vote! (Please be careful to vote in the right category, as listed in the annual Index. Sometimes a few votes are wasted by being cast in the wrong category, and those simply can't be counted. Using our online ballot makes this much less likely.) ■

Night Ride and Sunrise

Part I of IV

Stanley Schmidt

"Don't go out at night," they'd told him, which was undoubtedly good advice—but impossible to follow. How, Phil Bertrand wondered wryly as his teeth clashed together and his body jerked wildly from side to side in the darkness, was he supposed to solve a problem that only happened at night without going out at night?

But the first time he'd tried, it had only taken a couple of hours to find himself in this situation: snatched by unseen—hands?—and stuffed roughly into some cramped, smelly, open vehicle never designed for someone of his size and shape, which immediately lurched into bone-rattling motion. He couldn't see who his captors were; it was a very dark night, not stormy, but heavily overcast, with only fitful glimmers of faint light from Selena making it through transient thin spots in the scudding clouds and the forest canopy. He had a powerful flashlight and a dazer, but was trying hard to save both as last resorts.

That took a mighty effort, for the rickety wagon's headlong plunge through pitch blackness was the most terrifying experi-

ence he could remember. The thing careened through forest at breakneck speed, seemingly finding every rock and root under its wheels and leaving Phil to puzzle over how its unseen drivers could manage with no running lights and only the faintest hints of moonlight. But he had come here to get information, and this was the first thing to happen that showed any promise of providing some. He was determined to see how it played out, observing before acting on his own. It wasn't clear what a flashlight, or even a handgun, could accomplish at this point, and he didn't want to reveal any more than necessary about what meager resources he had until he had a better idea what they might be good for. That idea, he hoped, might come a little later—if he survived that long.

Just when he thought the ride couldn't get any scarier, the sound made by the wagon changed abruptly. At that same moment another thin spot crossed Selena, letting through just enough light to show that they were emerging from the forest, a whiplike branch stinging his face as if to say, "And let that be a lesson to you!"

Then, just before Selena disappeared completely into blackness, he had a momentary glance proving that things could get worse. Straight ahead loomed a cliff rising sheer to a height so great he couldn't pick out its top from the black clouds beyond—and his ride was plunging straight toward it without the slightest hint of slowing down.

At such moments, he'd read, a man's life tends to pass before his eyes. Phil's mind was evidently more practical. As if realizing that there wasn't going to be time to replay his whole life, it started much more recently and a mere ocean away, concentrating on the events that had gotten him into this fix, bopping they would suggest a way out of it...

I.

The knock on Phil's door caught him by surprise. His latest encounter with his neighbors, like so many before, had not been a happy or satisfying one, and he couldn't think of anyone he was in a mood to welcome. Nonetheless, an ingrained sense of duty led him to get up and walk to the door, though he took his time about it.

"Looksee," he said softly, and the door vanished—or, more accurately, became one-way transparent. Beyond it he had a full view of Newtown, the oldest (and until recently the only) town on New Horizons. The Adopted Sun hung low in the northern sky, presaging autumn, glinting on the sea and in blinding highlights on the gracefully grown houses dotting the gentle slope from here down to the shore. Children played in the streets, as always, and a couple of adults made their purposeful ways between points known only to them. None of that registered consciously; it had become too familiar and too ordinary. What made his eyes grow wide with astonishment, and then narrow with a more complicated stew of emotions, was the lone person standing outside the door—a slightly stocky strawberry-blond woman with turquoise eyes and dimples whose age he once would have guessed at twenty-five.

"Hazel?" he breathed as if he couldn't believe it. Then he remembered she couldn't hear him and opened the door warily. He winced involuntarily at the cacophony from beyond the low wall of Mrs. Cripps' Baby

Farm, then repeated, "Hazel Castagna? What brings you here? I thought . . . I thought . . ."

"That you'd never see me again? That would have been simpler, wouldn't it? But you can't get rid of me that easily, you old coot. Are you going to invite me in?"

"Of course. Please do come in." He stood aside, welcoming her with a halfhearted attempt at gallantry and resisting the temptation to point out that she was a couple of years—Earth years, no less—farther into old-cootdom than he was. She knew it, and neither of them showed it now, for reasons they both knew well. They hadn't had many secrets, back in the old days, and they'd shared some exhilarating times. . . .

What had gone wrong? And what did her coming back mean?

On guard, he showed her to a longcouch, got each of them a drink, and seated himself at the far end, not quite facing her. "It's good to see you," he said, while wondering whether it was. "So . . . how's the Zo colony doing?"

"Breakaway," she said. "That's what we call it, and we think it's best if everybody thinks of it that way. And it's doing . . . well. But not perfect." She leaned forward, trying a little too hard to radiate enthusiasm. "It's a beautiful place, Phil. You'd really like it. It's just enough different from here to rekindle that old thrill of exploration and discovery. You can tell it's part of New Horizons, but you can also tell it's a very different part—a part that's been separated from the rest for a long time." She paused a moment as if unsure whether she could continue. Then she looked right into his eyes, and for a moment, he saw some of the old glow that had so drawn him the first time he saw her face-to-face. "You should come and join us," she said.

He stiffened. "I thought we settled that quite some time ago."

"More or less," she said. "But if you'll remember, we weren't that far apart. Neither of us was happy with the way things were going here. We never counted on *them*. And we didn't like what they were doing to our dream. Yours and mine, Phil. Remember? That's how this all started out."

"Yes," he said with a bittersweet smile. "All too well. It was quite a dream, wasn't it? On that we can agree. That, and not liking what the Fruitful were doing to it. What we

couldn't agree on was what to do about it. Your idea was to run away. Mine was to stay and try to fix it."

"And how much luck have you had with that?"

He cringed. "Not much," he admitted. "Once they discovered the Gate, and the colony we'd started, they just kept coming. They outnumbered us so quickly they took our own rules and turned them against us. And now . . . I realize there won't be any more coming in from outside, but the ones already here are multiplying at a rate that makes a travesty of what we originally planned. It also makes it impossible for the few of *us* left to change what they're doing. Sometimes I feel like an ant trying to stop a steamroller."

Hazel nodded. "I knew it would be like that. I just saw it sooner than you, and I'm sorry for the frustration you must be feeling." She leaned toward him. "Sometimes, Phil, knowing when to quit is the better part of wisdom. It always hurts to see something you love being ruined. It's hard to decide whether to stay and try to make it better or go somewhere else and start over. Staying is noble, but it only makes sense if you have a reasonable chance of success. I think you're beginning to see that you don't." She paused, and then spoke even more softly. "Decisions aren't etched in stone, Phil. You can change your mind. I've come to ask you to join us in Breakaway. We could really use you—"

"No!" It came out even more harshly than he intended. "You wouldn't stay and help me. Why should I pull up my roots to come and help you?"

"I think you know," she said quietly. "Because we can give you a chance to get what we thought we were going to get here. Zo is a whole new continent."

"Just like New Horizons was a whole new world," he said bitterly. "You and I thought we could move here and build our kind of civilization, free of all the stifling influences that had made the Solar System feel so cramped. Maybe we could have, if we'd actually limited it to the people we so carefully chose together. But you see what we've got instead. Why should Zo be any different?"

"Because," Hazel explained patiently, "the Fruitful have all the room they could want right here. And the Gate doesn't work any more,

so—" She stopped abruptly, her jaw dropping slightly as if she'd just realized something astonishing. "You think I tipped them off, don't you? Told them about New Horizons and the Gate?"

"Well . . ." Phil said uncomfortably. "I know I didn't. So what am I supposed to think?"

She stared at him incredulously for several seconds, then burst out laughing. "Oh, come off it, Phil! Do you really think I was the only one who could have spilled the beans? Sure, it would have been nice to have our own private little paradise. Just us and a hundred and eighty of our closest friends. But do you really think we had any realistic hope of telling that many people about something this big without at least one of them spreading it farther? We'll never know where the leak was, Phil. My guess is that there were several, but it doesn't matter now. The damage is done. Midlands is going to develop in a very different direction from what we planned, and we don't have a realistic hope of changing that. But we do still have a chance to try something at least a little like our original vision—on Zo."

She frowned sternly. "Mind you, I'm hurt that you would think that of me. But I can forgive and forget. And I'd still like you to join us. *I'm* going to give it a try, with or without you. I'd prefer with, but it's your choice."

She stopped and waited. Phil stared, trying to digest what she'd said. It had been years since he'd really thought about his assumption that she'd sold them out. The grudge was just there, firmly rooted and festering without conscious attention. But now that he thought about it, with the new perspective those years allowed, her denial made sense. It had been silly to imagine they could keep a secret with that many people in on it, and quite likely he had done her an injustice by blaming her.

Could it be that the Hazel with whom he'd once hoped to build a new world still existed?

"I'm . . . sorry," he said finally. "I know that's not enough, if you're telling the truth, and I think you are. But . . ." He trailed off, feeling awkward and ashamed. "That's the third time you've said you wanted me to come to Zo," he said suddenly. "Once you even said that was why you'd come back. And once, before I so rudely interrupted, you said you needed my . . . something. What do you need from me?"

"Your help," she said simply. "Breakaway has a problem, Phil. A problem that, if we

can't solve it, may force us to give up. We think you can help us avoid that."

He waited, but she said no more, leaving the statement hanging like bait. "What kind of problem?" he said eventually. "Why do you think I can help?"

She smiled cryptically. "You grew up on Luna, didn't you? So you're used to long, dark nights."

"Not really," he said. "We lived underground, in artificial habitats. We knew intellectually that the long, dark nights were out there, but we seldom actually experienced them." He frowned, trying to make sense of what Hazel said. "You expect me to camp out on Selena?"

She chuckled at the image. "Oh, no. Nothing like that. Our problem is right here on New Horizons—more specifically, on Zo. But it does happen at night."

"Well, you grew up on Earth, so you've probably had more actual experience with nighttime than I have. And days and nights on New Horizons are only a little longer than on Earth." He let his frown deepen a little, but also leaned toward her. "Tell me the truth, Hazel. Why do you *really* want me to come?"

She hesitated before answering, and then didn't quite meet his eyes. "I miss you," she said quietly. "I'd like to see if we can at least be friends again." She did look into his eyes as she hurried on: "You have a broad background in science. And this was all your idea in the first place—"

"And yours."

"—and I always admired the way you tackled problems. We've got a doozy for you, and I think your insight might break it. Call it just a hunch, but who else knows you well enough to have a hunch about you that might be meaningful?" She paused and added, "And it's not just me. A lot of the others still look up to you, as the founder."

"Hm-m-m." Phil leaned back thoughtfully, trying to resist being drawn in too easily to something he might regret. And yet . . . "Just what is this mysterious problem?"

"I'd rather not tell you too much here. I think you'll have a better chance of breaking it if you go back with me and spend a few days looking around at where we are and what we've done. If you see the problem in context, it may help you get a handle on it."

"Even though none of you have been able to."

"Yes. I told you I have a lot of confidence in you. And you'll bring a fresh perspective. We've spent the better part of a year getting to where we are—including becoming aware of the problem—in small steps. The sheer gradualness may keep us from seeing things that would be obvious to you if you come in and get a quick introduction to the status quo." A surprising note of pleading had crept into her voice. "Please, Phil. We really need you to try. If you don't like it or you can't see any more than we have, you've got a free ride back here whenever you say the word. Won't you at least come and look around for a few days?"

She went silent, but her eyes never left his. She waited with a palpable mix of patience and intensity for the goodly time that he mulled. He had several levels of misgivings about her plea, about which she would say so little. But he also felt several levels of temptation. It really had been too long since he'd wrestled with a frontier or the kind of problem he could get his teeth into. Lately, here in Newtown, he'd found too little but frustration.

"Okay," he said finally. "I could use a change. I'll go and look around. But no promises beyond that. Fair enough?"

She grinned in a way that brought back memories. "Fair enough. Thanks a lot, Phil. This means a lot to me."

II.

It took Phil three days to get ready, and he spent much of that time grumbling to himself. Was he seizing an opportunity or wasting his time? Should he be trying once more to talk Hazel into staying to help with the problem *here*, or was that too far gone to be salvageable? If he went with her, should he be preparing for a brief visit or an indefinite stay?

In the end, he made the best compromise he could. He prepared his house to take care of itself indefinitely, and he took copies of most of his library on a handful of chips. But he also carried a remote control for the house, and enough emergency contact information to insure (he hoped) a ride home if Hazel betrayed him and refused to bring him back when he wanted to come.

On the appointed morning, Hazel showed up bright and early in a public bug; a simple,

compact, two-seated car that she parked at the end of the fifty-meter walkway. He saw her arrive but waited for her to walk to the door instead of rushing out to meet her. If he was going to give up days—or more—of his life to help her with something she wouldn't even explain, she could at least help him carry his few bags.

When they walked out to the car, he set the pace—slow and easy as if he wanted to drink in what might be his last memories of this place for which he had once held such high hopes. It was a cool, clear morning, the vegetation bejeweled with drops left over from a predawn sprinkle. Chipskunks scurried about under the edges of shrubbery, lapping up the droplets, and two snickerthrushes were calling to each other from opposite directions. A few human neighbors, not just children but even a couple of adults, watched curiously from their yards, and one or two waved.

It seemed, on the face of it, just the sort of thing he and Hazel had been hoping would develop here in the first place.

She accepted his slow pace without comment, and when she finally spoke, her voice startled him with the realization that they had so far said nothing except the most automatic greetings. "You know what's funny about this?" she asked.

"Uh . . . what?"

"It's so easy."

"What's so easy?" They stopped at the bug and began loading Phil's few belongings into it.

"Everything. In the old stories, a new colony on an alien world would be struggling to survive and doing everything it could to hold onto every bit of help it could. If somebody broke away to strike out on their own, the original colony would try anything to stop them. If they broke away anyhow they wouldn't dare show their face back 'home' again. If they did, they might be shanghaied into staying. But everybody here knows who I am and what I've done. They know I'm back, but nobody's shown the slightest sign of caring—except maybe you."

"I care," Phil said guardedly, checking his house control to make sure everything was secured and then sliding into the bug's passenger seat. "At least, I'm glad to see you again. Whether I'll be glad I listened to you remains

to be seen." Uncomfortable with what he'd said, he shifted tack as Hazel settled in next to him. "I suppose you're right, though I haven't read nearly as many of those stories as you have. It *has* all been too easy. These people hardly know the meaning of struggle, and this place has grown beyond anybody's wildest imaginings."

Neither of them spoke for the rest of the short drive. It would be stretching the point to call their destination an airport; a new world with less than twenty-nine years (twenty-two Earth years) of history, only two settlements, and fewer than five thousand inhabitants simply didn't need them. Runways could have been built easily enough by nanoseeding; but why bother when perfectly good VTOL planes were just as easy and much more versatile?

But even modern VTOLs made some noise, and there were dangers in being too close to them when they took off or landed, so Newtown had, from the start, without formal planning, come to regard one open field as the *de facto* airport. A handful of minicopters and a few long-range VTOLS of various sizes stood around it as if scattered haphazardly and abandoned, each ready to take off when needed from right where it stood.

No one was around to watch (unless you counted one robin redbreast who favored them with a curious glance from the edge of the field) as they stopped to transfer his bags to her craft. Then she left him standing by its base as she went off to park the bug in a drop stall. *This is it*, Phil thought as he waited for her to walk back. *My last chance to back out.*

But then, what better do I have to do here?

He followed her listlessly up the boarding steps into the small cabin and strapped himself into a gimbaled seat. *Could be worse*, he told himself. *At least we're going through the motions of doing something real. Back home—back on Earth and Luna—a "scientist" like me did little more than study and re-analyze what real scientists did before. And Hazel . . . well, Hazel studied real writers' stories about things that didn't even happen.*

Including, sometimes, things like this.

With so little traffic, there was no formality about takeoff. The press of acceleration perked him up a little, even though the unprepossessing engine, powered by a tiny grain of antimatter handled by fields of which his

ancestors had had the merest inklings, made little noise. Straight up they went, pressed hard into their seatbacks, and for the first moments there was no direct view except the cloud islands dotting the sky above. A bank of viewscreens showed the colony falling away below them, and mere seconds after takeoff Hazel touched a couple of control points on the nearly blank screen in front of her, and the craft swiveled around them. As it became horizontal, still accelerating fast forward, the ground came into view through big side windows, and Phil felt, for the first time in years, the thrill of seeing it rush past. In spite of himself, he burst out laughing with sheer delight.

Hazel glanced sideways at him and laughed, too. "It's always fun, isn't it? I'll bet you haven't seen it this way for a long time. Here, let me give you a look before we head out. Let you see how it's changed."

As she started a tight circle a few hundred meters above the ground, Phil's surge of pleasure momentarily gave way to grim annoyance. *I know all too well how it's changed*, he thought. But then, looking out and back as a lowered wing seemed to point like a lecturer at Newtown, he gasped aloud as he realized, *No, I don't. I didn't.*

From the ground, where he'd spent far too much time lately, all he saw was more people—especially kids—and houses sprouting ever closer together, most of them quite similar because they were grown from the same few templates. It looked pretty much the same wherever in town he stood, and when you were down in it, there was no way to tell how far it extended. Sometimes, even though he knew better intellectually, it seemed as if the whole planet were like that.

Up here it was different. As Hazel circled the town, Phil was initially shocked that it now seemed to fill the whole valley bottom that once had dwarfed it; buildings crowding almost down to the Midland Sea and out to the foothills of the interior mountains to the south. Under the original growth plan, the population now should have been less than a tenth of what it was. He'd known intellectually that it had grown much faster and much larger, but this was the first time he *realized* how much.

After one circle at fixed altitude, Hazel nudged the plane's nose up, spiraling them

upward and outward away from the town. Newtown again dwindled to a dot. Its own little piece of coastal plain, defined by the delta of one river that flowed down out of the mountains, no longer dwarfed it, but there was lots more coastal plain and plenty more rivers along the coast that stretched as far as he could see to the east and west.

All of it was empty and most of it unexplored, except by the scouting-and-navigation satellites installed on the way in. No human settlements, and no native counterparts. They'd worried about that, at first. With the Gate coming out so close to such a hospitable world, it seemed there ought to be a native civilization, or at least natives on the brink of developing one. But in all those years, there'd been no sign, and surely there would have been if there were anything here. The worry had faded into the background of human culture, where it had been buried for so many years after decades of fruitless searches for extraterrestrial civilization or places where it might reside.

Mankind really was alone in the cosmos, just as everyone Phil and Hazel had grown up among assumed.

That meant all this was theirs for the taking. The trick was to use it without screwing it up, and that was what the First Wave had set out to do. But the Second Wave . . .

Well, Phil had seen just moments ago dramatic proof of where *they* were headed. But watching Newtown fade to a dot, and then to invisibility against a backdrop of lush wilderness, gave him a sliver of hope that things might yet work out even here in New Gondwana, even though he'd seen the current numbers.

By the time they were out over the Midland Sea, and Equatoria was coming into view, Newtown had receded to the back of his mind. For the first time in years, he was more conscious of the fact that this was a whole new world where humans had immense opportunities and immense responsibilities.

And Zo was a whole new continent, far away in the northern hemisphere. . . .

Hazel's plane flew high and fast, so even though Equatoria was the northernmost continent of the New Gondwana cluster, and also the largest, it took them less than an hour to

cross it, and they didn't see much detail. Then they were out over the Global Ocean for a couple of hours. They didn't talk much, and Phil found himself thinking about all the little things that had changed. Occasionally he glanced at the altimeter, and that made him think about the trouble they'd had back in the beginning reprogramming such things to deal with a denser and "softer" atmosphere than the one where they'd been built.

After years in high-tech academia, he'd been amazed at how much the effects of such tiny changes pervaded unexpected details of life. Cooking, for instance. Whether you did it yourself or let an autochef do it for you, you had to reckon with the fact that recipes don't work the same when things boil at higher temperatures. It was like living, literally, in a pressure cooker, though not a very good one. Hazel, who had lived in both Tampa and Boulder on Earth and liked to bake, had told him she was used to something similar (but in reverse) in "high-altitude cooking directions." For Phil, born and raised in the tightly controlled environment of Luna, the whole concept still seemed strange.

They were flying east as well as north, so by the time Zo came into view it was late afternoon. A storm system was just breaking up, and they descended through luminous cloud canyons toward a distant shore that at first barely distinguished itself from the surrounding ocean and clouds. But as they got closer and began to descend, the air grew clearer and the shadows sharper. The vague land mass resolved into mountains sloping down to a ragged edge. Then colors appeared. Pinks and yellows and browns, coupled with sculpted shapes thrown into sharp relief by the late afternoon sunlight, suggested aridity in the mountains. The coastal strip, in contrast, glowed in a rich patchwork of vibrant colors including the greens and purples that here meant lush native vegetation. Not everywhere; parts of it were as rugged and, in some places, dry as anything in the mountains. Sheer cliffs alternated with stretches of sprawling marshland around the mouths of rivers, and here and there verdant fields crept up the lower slopes.

Soon they were quite low and paralleling the rocky-marshy south coast, flying east. Phil found himself watching for Breakaway and feeling an odd mix of excitement and anxiety

at not finding it among all this intriguing terrain. Irrational, he knew; Zo was big, and he knew only its general shape from satellite pictures. There was no reason to assume they were close to it yet. But still . . .

Suddenly, he noticed that the plane had veered slightly to the left, then right. Hazel seemed to be turning inland and starting a broad circle clockwise. As they crossed the jagged coastline and continued over beaches and fields toward the coastal range, he blurted out, "What are you doing? I thought Breakaway was on the coast."

She flashed him a grin. "It is. But I want you to have a good view on your first approach." She chuckled in a way that brought back memories. "I always was a bit of a ham, I guess."

"That's true," he said, grinning back, and then he turned his full attention to the passing show outside. Beaches, marshes, and cliffs gave way to fields and forests interspersed with bare, rocky areas slashed apparently at random by deep, narrow crevasses, reminding Phil of pictures he'd seen of old-fashioned jigsaw puzzles. Flying lower and lower, he strained to see what lay within, but the shadows were too deep. And then . . .

He gasped and pointed. "What are those?" Flying above jagged peaks and looking down a gentle slope toward the sea, he had spotted a sizable cluster of odd structures—towers, with curiously blurred tops?—glinting brightly in the sunshine and casting long shadows. "They look . . . artificial."

Hazel laughed, continuing her circle around the out-of-place formations and heading back out toward the sea. "Windmills," she said. "Don't worry, they're ours. One of the Breakaway colonists—you may be surprised at who—brought both templates for growing them and plans for building them, if it should ever come to that. We decided to give it a try. I think all the originals were driven at least partly by a sense of adventure, a desire to see what it was like to get our hands dirty and do things for ourselves that there wasn't room to do back in Solsystem. That desire got stronger when the Second Wave came to New Horizons, as a reaction to what we saw them doing. There wasn't much adventure in letting canned nanosystems do all the work for you, and who knows how long we'll be able to

trust them with so few people and resources to dedicate to maintenance and adjustments? So we decided to see how much we could do without them—within reason, of course—and without committing too much mayhem on our new surroundings. Our windmill man convinced us that was a good way to start: essentially free, nonpolluting power sources. And the siting couldn't have been better. That hanging valley channels good reliable winds right down off the mountains above—”

“Above?” Phil blurted. “We must be really—There it is!” He felt his heart pounding with a strong echo of the excitement they'd all felt when they'd first come down to the surface almost three decades ago. Squinting, he made out the forms of a few dozen human-grown houses on a shelf below the windmill farm and above a natural harbor flanked by cliffs alternating with extensive marshes. “That's Breakaway, isn't it?”

By then they'd swung around over the sea and were flying back along the rugged shore toward the colony. In mere moments they were so close he could see people walking among the buildings and small boats bobbing in the harbor. “Sure is,” Hazel confirmed, with an obvious note of pride in her voice—and a less obvious undertone of concern. “And now it's time to pivot for touchdown, so I hope you're strapped in.”

Landing reminded Phil of sliding down a rope, with somebody else doing all the work. Hardly any time passed before he was following her down the boarding steps, his legs protesting the end of several cramped hours but his senses reveling in a flood of new inputs. The sun tracked higher in the sky here, and the field around him glowed with what he knew were early spring flowers even though he didn't specifically recognize any of them. A couple of ornithoids fluttered swiftly by, and he thought something was distinctly odd about them, but they flew too fast for a good look—and besides he was too busy noticing other things. Unlike the reception Hazel had described getting when she returned to Newtown, several locals were running across the field to greet them, led by a gaggle of small children, laughing excitedly.

Phil was glad to see them. He'd always liked kids, one at a time—in some ways he still felt

like one himself—and in reasonable numbers, they represented hope for the future. This was the first time in a long while that he'd seen them in reasonable numbers. When they gathered around, tugging at the newcomer's clothes, plying him with questions about who he was and where he'd come from and why he was here, he answered as eagerly as they asked. He thought he recognized a few of them, but kids can change so much in even in a New Horizons year that it was hard to be sure. He definitely knew several of the adults who brought up the rear and was surprised at how much he'd missed them. Several minutes became an exhilarating blur of hearty handshakes and hugs and backslapping, marred only occasionally by the hint of a suspicious glance.

Then he heard Hazel saying, “All right, everybody. There'll be plenty of time to catch up later. Right now it's late and we've had a long trip. Let me get Phil settled in and rest up a bit before dinner. Tonight we party.”

Phil was a little surprised—and couldn't quite make up his mind whether he was more relieved or disappointed—that he had his own place rather than sharing Hazel's. He was even more surprised—and pleased, even touched—that it was a remarkably near duplicate of his own place back in Newtown. Evidently Hazel still remembered, and maybe she still cared.

Or maybe she just wanted to butter him up so he'd want to give that mysterious “help” she wanted.

He squelched that thought and concentrated on settling in, with plenty of help from Hazel. It was easy enough; everything looked and felt familiar and was right where it belonged. The only differences he noticed were outside. The plants along the path outside the door were decidedly unfamiliar and presumably native. Tomorrow he would have to start learning what things lived around here, just like when they'd first landed on New Horizons, and what the locals called them.

Hazel left him alone, and he lay down for a catnap, which (with a little chemical help) was surprisingly effective against both travel fatigue and a shift of many time zones. But she was back an hour later, as promised, to escort him to a communal dinner.

When they went back outside, the light had become even crisper and clearer, but a bit fainter. The sun had not quite set, but the sky flamed around it and was beginning to darken toward a deep blue overhead. No stars yet, but a thin crescent Selena hung in the west. After all these years that was still one of his favorite sights. Selena never looked as big and bright and colorful as Earth seen from Luna, of course, but he'd spent enough of his last years before migration on Earth to get used to Luna as seen from Colorado—and Selena looked like that writ very large.

He started at a sudden scurrying sound almost underfoot as they started up the path, and looked down to catch a glimpse of a small fleeing creature that reminded him of a chipskunk. But . . . did it really have six legs instead of four, or was that the "jet lag"? He almost asked Hazel, but decided to wait till he'd adjusted and had some time to observe for himself. This was a new place, he reminded himself, and he was still at the stage where a lot of looking and listening were called for before he did much talking.

Besides, it had been the merest glimpse. . . .

They walked side by side past domes and other shapes dotted here and there with glowing windows, headed for the biggest one and talking little. Just as on rural Earth, animals here got more vocal at dusk. The antiphonal chorus sounded very different from the one he'd gotten used to in Newtown, but included some deliciously musical voices.

"This is our gathering hall," Hazel told him as they got close to the biggest structure. It looked a little like an old-fashioned quonset hut, but with its edges smoothed off. "I don't know who all will be here. There's a good deal of interest in your coming, but I doubt that everybody will show up. Still, I think I can promise you at least a few old friends and maybe some new ones."

Phil didn't say so, but that was a relief. He wasn't really looking forward to facing two hundred people, even if some of them were old friends, right after a long trip and before adjusting to the time change.

The big room inside held a few dozen milling loosely around a few good-sized tables. *I can handle this*, he thought. *Maybe I'll even learn something.*

The buzz of conversation and laughter was just enough to feel inviting, and the smells emanating from bowls and platters of food intrigued. Any native food on New Horizons needed nanoprocessing before people ate it, of course, and even crops imported from Earth needed help to preserve their essence when grown here. But exactly what you got when you nanotreated any food depended on what you started with, and Phil already knew that the feedstocks here were distinctly different from those around Newtown. Some familiar faces drew him into their midst, laughing and thrusting food and drink into his hands. He enjoyed the new tastes and the company of old friends he'd written off, but it was too much for his travel-weary brain to absorb all at once. *It's for them as much as me*, he told himself, *though why they're so glad to see me I can't imagine. But I'll take it all in at my own pace, later, after a good long sleep.* . . .

But there was one human contact that registered more than the others, and he wasn't sure whether it fell into the old or new category. Just as he was beginning to run out of steam and to think about how to make a graceful exit when the sun hadn't even set, Hazel strode purposefully toward him with a skinny, intense-looking young man in tow. At least, he *looked* like a young man, but who didn't these days?

Well . . . this one looked *really* young, younger than most people chose to stabilize at, or have themselves restored to. Seventeen or eighteen, maybe, by Earth reckoning—which suggested that he really was that young.

And he looked vaguely familiar, though Phil couldn't quite place him. Narrow face, thin, light-brown hair combed haphazardly straight back as if he just wanted to get it out of the way . . .

Hazel was beaming. "Phil," she said, touching his arm and practically bubbling, "this is someone you just have to meet: Luk Zakowitz. He's our windmill man."

This . . . *kid* was responsible for the gleaming structures Phil had seen in the hanging valley? Impressive, and surprising. Yet he was looking at Phil with an oddly shy expression. "Mr. Bertrand," he said, barely loud enough to hear over the din. He extended a hand and shook Phil's with what seemed an odd mixture of timidity and enthusiasm. "I'm very pleased to meet you . . . again."

"Again?" Phil echoed. Maybe there was something to that feeling of *déjà vu*.

"Yes. You probably don't realize it, but you had a lot to do with my coming here." He grinned, which apparently took some effort. "My folks aren't very happy with either of us."

Phil frowned, trying to put the pieces together. The name sounded vaguely familiar. . . . "It was years ago," the windmill kid prompted. "I was barely past toddling—maybe seven or eight years old. You were talking to my parents at a party about your different reasons for leaving Solssystem. I didn't understand everything any of you said, mind you. I barely knew what Solssystem was, back then, and I still know only by hearsay—"

Things began to click into place, even through the post-travel haze. "You were born here?"

"Yes. One of the first of the Second Wave born in Newtown. Anyway, it got a bit heated, and you left in a huff. My parents told me I shouldn't pay any attention to you, but it was too late and that was probably the worst thing they could have said, if that was really what they wanted. Like I said, I didn't understand everything, but a lot of what you said fired my imagination. The way you came through because you wanted elbowroom and new experiences, while they just wanted room to have lots of kids and keep them safe inside the perimeter. To each his own, I say, but much as I love my brothers and sisters, growing up with thirteen of them made me think about elbow room, too—and what was outside the perimeter.

"I never forgot that night, and a couple of years ago, when some of you started talking about coming to Zo and trying to explore and tackle it on its own terms . . . well, I had to be part of it. I even thought maybe I could contribute something—"

"And so you have," Hazel broke in, "and I think Phil will be a big help to you." She glanced at her watch. "But now it's almost night. We'd better get back to our quarters."

Phil felt a little dizzy. "Wait a minute," he said. "This is just getting interesting. I'm touched to hear I had such an influence on a child of the Second Wave, though I hope I didn't cause any trouble. But people keep talking about getting me to help, and I still have no idea what I'm supposed to help *with*. How about some—"

"Later," Hazel interrupted gently but firmly. "Like I said before we left, we think it's best if you get the overall picture before you try to understand the fly in the ointment. Luk and I will take you out tomorrow and start showing you around, but for now we just want to get everybody safely back to their beds. And once you're there, don't go out at night."

"No," Luk agreed with a solemn nod. "You really don't want to go out at night." He paused pensively and then added, "I hope you don't have to."

That was all Phil could get out of them. It bothered him, and he wanted to *demand* that they tell him what was going on. But he half-convinced himself that his impatience was just crankiness born of travel fatigue, and he'd be in better shape to understand the answers later.

As Hazel and Luk hustled him toward the door, he realized that everyone else was leaving, too, even though nobody had made any sort of announcement. He couldn't remember ever seeing a party break up so quickly and quietly, as if there were some reason that it had to be that way—a reason that everybody knew and didn't want to talk about.

Everybody except him.

Hazel and Luk stayed with him all the way back to his house but didn't talk much. Both sun and Selena had set, the air had cooled a bit more, and all the sky's colors were fading slowly toward black. A few daring stars poked through the gathering gloom, and a few dark shapes fluttered by, startling Phil but not bothering him in any physical way.

"Good night," Hazel and Luk told him when they reached his door, and then they went their separate ways, leaving him to wonder what kind of night he would really have.

III.

Travel-weariness battling apprehension about the unknown, Phil alternated between deep sleep and lying awake listening, with the outside pickup turned down but not off, for scary sounds that never came. There were plenty of night noises—things he would have attributed to birds and insects and amphibians in the few rural places he'd spent time on Earth—but nothing alarming. He eventually woke somewhat but only partially refreshed, and breakfasted alone on food that came from

a dispenser just like the one back home in Newtown, but tasted subtly different. He turned up the outside sound, and heard an animal chorus distinctly different from either that of last night or that of Newtown at any time.

And then he went out to meet his guides, hoping that today he'd learn why he was here.

"Why a boat?" he asked as he looked down a long, wavy, rickety-looking ramp from the top of high bluffs. Comfortingly close behind him were the nearest houses of the settlement, but to either side the ground fell away abruptly, with no way down except this uninspiring artificial slope. The other end connected to a similar structure that floated on the undulating sea, with half a dozen modest-sized boats tethered to it. The boats bobbed in no particular pattern, and portions of the dock itself rose and fell disconcertingly with the waves, even though they were in a sort of natural harbor sheltered by rocky headlands on both sides. Phil found himself grabbing onto the nearest post to steady himself. Just trying to follow the motions of any boat made him queasy, especially since his peripheral vision inevitably saw other boats doing their own things.

"Some of the best natural feedstocks are aquatic lifeforms," said Hazel. "So some of us have become . . . well, fisherfolk, for lack of a better word. Besides, we find it soothing and invigorating to be out on the water, and out there is where you'll get some of your best views of . . . Are you all right?"

"I will be," he said, wishing he felt as confident as he tried to sound. "I'm just not used to . . . this."

Luk looked at him wide-eyed. "Haven't you ever been on a boat before?"

"No. Obviously we had no place for them on Luna, and when I stayed on Earth for a while it was around Boulder, well inland and at the foot of big mountains."

"There were a few lakes," Hazel said, "but nothing very big. And I guess we never got around to—"

"It's okay," Phil said curtly. "If a boat is what we need, a boat I'll learn to use." He managed a smile. "Actually, part of me is looking forward to it. I'm familiar with the concept, but the practical details are a bit disconcerting."

He sniffed while scanning the wide expanse of bare mud and limp vegetation between the base of the cliffs and the breaking waves. "Maybe it's the smell. Reading about ten-meter tides in the abstract and actually seeing them on a coast this rugged . . . well, there's a difference. This all seems so *wild* compared to Newtown!"

"That's what we wanted, Phil," Hazel said quietly. "Remember?" Then, abruptly, she flashed him one of those infectiously radiant smiles that he remembered from so long ago, and touched him briefly on the hand. "Come on, let's go see it."

Following the brisk pace she set, he found the walk down the ramp less intimidating than he'd feared. Going onto the boat itself took more getting used to. Smaller than the dock complex, and only loosely tethered to it, it bobbed and rocked in ways he initially found disconcerting. *Okay, wise guy*, he told himself sternly as he struggled to stay upright. *You wanted to see what it would be like to get right out on a planet without too many layers of technology between you and it. This is it. Give it a chance.*

Of course, it was reassuring that there was *some* technology between them. Though the shape and feel of the boat were in many ways unfamiliar, its smoothly integrated materials were the accustomed ones of imported nanotech. Nobody had built this boat by hacking trees down, carving them up, and lashing them together. They'd grown it from a template, just like the houses and bugs and all the other machinery the colonists depended on every day. That made it feel familiar and trustworthy, even as Hazel and Luk cast off the tenuous lines that held it to the dock, a throaty hum began somewhere in its innards, and the dock and village began to drift away and shrink in Phil's eyes.

"This'll give you a good overview from a different perspective," Hazel told him, beaming with pride. "Back in Newtown we depended on the nanotech we brought with us for everything: power, food, fabrication. But all the templates we brought with us were developed on Earth and Luna and Mars, and make things designed to work in one of those places. They weren't always such a good fit here."

"So what did you do?" Phil asked, enjoying the salty breeze in his face as the boat picked up speed.

"Well," said Luk, "you *can* modify some of our tools. Some of us can, anyway—given half a chance."

Phil looked into the young man's face, trying to fathom what he saw there. A convert to "our side," or a lurking spy for "theirs"? "It sounds," he said, with a smile to defuse any irritant the words might carry, "like there's a story there."

Luk blushed, just perceptibly. "Well, yes. As I said, I didn't completely fit in with 'my people.' I spent a lot of time digging around in the libraries they brought with them. Hardly anybody else bothered. All that information just sitting there, unused. I found all kinds of things in it—ways to use some of our tools to modify others. It seemed to me that we could make better ones, ones better suited to this world instead of another that I've never seen and they'll never see again." He made a sweeping gesture toward the receding village, his hand rising at the end toward the backdrop of hills beyond.

And the windmills on the hanging plain.

"That's what I've done," he said. "I didn't inherit any windmill seeds that were just right for here, but I did find things that I could tweak into a decent fit. So we're trying to use what's here, without isolating ourselves from it any more than we had to." A look crossed his face, with elements of pain, nostalgia, frustration, and pride. "Back home, everybody just wanted to fence off one little area that the dangerous local wildlife couldn't penetrate and make it as much as possible like the homes they'd left behind. I wanted to find ways to use what we have here without depending too much on what they brought with them." Luk gazed earnestly into Phil's eyes. "We have a whole world to explore here! Why can't they see how wonderful that is?"

Phil gazed back, marveling at how much connection he felt between this young man and his own younger self—and reminding himself it was still too early to let his guard down. Yes, they had some important things in common; but how deep was the gulf he suspected still existed between them? "Most people are afraid of change," he mumbled. "Even

ones who can nerve themselves to take one big leap might still fear little things that they can't control."

For a while, none of them said any more. Phil watched the village recede, admiring the toehold the Breakaway people had built here. Gradually, he found his attention drawn to things closer at hand. The undulating sea all around the boat; the smooth swath behind its stern, neatly framed by the V-shaped wake. Sometimes he glimpsed a streamlined shape rising from the depths, coming just close enough to the surface and into the light to give a tantalizing glimpse of what it was. Living things, Phil knew; but were they more like fish, dolphins, or giant squids?

Or none of the above—perhaps something fundamentally different from any of the Earthly forms he'd read about?

Something whizzed past his head, with such a loud fluttery noise and such a pungent odor that he ducked instinctively. He had time for the briefest close glimpse, then watched the creature fly rapidly off toward the horizon. His first impression was of a gull, a kind of bird he knew only dimly from Earth; but as he kept watching he found himself thinking of bats—*big* bats—perhaps because of the way the wings moved.

When he saw two more go by a little later, not quite so close but with more time to watch, he had a disturbing impression of a couple of stubby projections—vestigial extra limbs?—between their necks and wings. And, again, a strong impression of size. Some of them, he guessed as he watched one dive and catch a "fish," must have two-meter wing-spreads.

He wondered what they ate besides fish.

"You mentioned the way Newtown set up a sense-and-shock barrier around the perimeter to keep critters out," he remarked offhandedly, "and hinted that you've avoided doing that in Breakaway. How's that working out?"

Luk shrugged, but seemed to avoid eye contact. "Nobody's been attacked by anything yet," he said.

"I'm not sure there are any big land predators here that *could* attack us," Hazel volunteered. "The planetologists say Zo has been cut off from the other continents for a long time, sort of like Australia back on Earth. In fact, the name—"

"I know all about the name," Phil interrupted, trying not to sound harsh. "I was in on all that, remember?"

"Um, yes. Of course." Hazel cleared her throat. "Anyway, evolution has found its own way here. Some things have diverged from the way they are in New Gondwana."

Like bat-gulls? Phil thought. "How about herbivores? Are you having trouble with crops?"

"Crops' might be too strong a term," Hazel said. "We're somewhere between farmers and hunter-gatherers. We have nanovats that can make food suitable for us from just about anything organic, but the best ones try to build on the feedstock's intrinsic characteristics without changing them too much. So we have foods here like none you've ever tasted before, made from the 'fish' we catch and wild plants and small animals we gather locally. Some of them are quite good—"

"Yes, I noticed that last night."

"—and some are easy enough to grow that we've started planting and tending patches of them near the village so they're easy to gather."

"Careful," Phil warned with a grin. "That way lies agriculture, sedentary life, and a vicious circle of being able to do things that let you support more people, who then need more of those things, so you need still more people to do them."

"We think of that often," said Hazel. "We're trying to be careful. And it's not as if we're really either farmers or hunter-gatherers in the old sense. The nanos changed all that. We're something new."

"And we don't know yet quite what to do with that."

"Well, it's time to learn." She swept a hand past shore and sea toward a distant horizon. "C'mon, let's see some of the neighborhood."

The engine's purr grew a little louder, and the boat surged faster toward the west, land speeding by to the right and the village falling behind, giving way to wilderness. Just west of the valley that cradled the village, they swung wide around a rocky headland jutting a good kilometer out to sea, bare except for a pair of startling objects rising from the outermost promontory.

"What are those?" Phil asked, pointing. They looked like two big broadleafed Earth trees, densely covered with flame-orange blossoms.

"We don't know," said Hazel, "but they're not what you think—or at least, what they look like. We're not even sure whether they're animal, vegetable, or mineral. Up close, the details don't look anything like leaves or flowers. You may be able to get some idea of that with these." She handed Phil a pair of binoculars. "But they do make that point real easy to spot, at least when there's daylight and no fog."

The binoculars quickly optimized themselves for Phil's eyes and stabilized the image, but Hazel was right. Such texture as he could make out in the "trees" didn't look like anything he knew, either back in Solssystem or elsewhere on New Horizons.

As he was lowering the glasses, a flash of motion caught his eye lower on the headland, down near the water line. He tried to catch it with the binoculars, but all he got was a sleek, pointed tail disappearing into a wave—and a faint hint of motion continuing its path into the water. "Can we go in a little closer?"

Hazel deferred to their young companion, who Phil was beginning to suspect was the sub-colony's main technical expert. "Luk?"

"Probably," said Luk, already fiddling with the remote he wore around his neck. "It's pretty rocky here, even well offshore, but the boat won't let us get too close to anything dangerous."

Slowing slightly, they edged closer in to the bouldered shoreline. Phil managed to keep the glasses on the trace of motion he'd spotted long enough to discern a sinuous shape just under the surface. It reminded him a little of a terrestrial otter, but longer, slinkier, and unmistakably with three pairs of stubby limbs. Its tail also looked longer and thinner than an otter's, and the way it swam reminded him more of a snake. He guessed its length at two-thirds of a meter, but without much confidence since there was nothing near it for comparison. Just as he'd decided he had a pretty good look at it, it seemed to look directly at him, straight back through the binoculars, and then dove out of sight.

"What was that?" he asked.

"We call them otters," said Hazel, "for obvious reasons. Though there are certainly differences."

"Yes. Was that one normal? It seemed to have six legs."

"Yes, and yes. That seems to be one of the differences between here and New Gondwana. Here six limbs are the norm; back there it's four. But we think it's divergence caused by continental drift, not independent origins. Soon after we moved here, one of our biologists asked a colleague who had stayed behind if anybody'd ever noticed evidence of a vestigial third pair back there. Nobody'd ever noticed them before, but once the question was asked, his contact did find a few. Not in everything, and always so small that they could easily be overlooked, but definitely structures that could be explained that way." She paused. "We had situations like that on Earth, too. Snakes evolved from lizards, but only a few species still had even the tiniest internal vestiges of legs."

"I'd like to see another one," said Phil, remembering the stubby "extras" he'd thought he saw on the bat-gulls.

"Easily arranged," said Luk. "Just keep scanning around the water line. They're pretty common both here and in the marshes."

Phil did as Luk suggested and soon found three more "otters," one in the water and two bounding over the rocks with surprising agility despite their stubby little legs—and then still another hanging by its tail from a piece of driftwood, unhurriedly enjoying a brunch buffet from the tide pool below. Between otters, he found himself drawn to the shoreline itself. From the air he'd seen how tortured this rock looked, as if a great hammer blow had fractured it into hundreds of huge pieces, still almost but not quite joined. Down here, at closer range, he found himself thinking of fractals as well as fractures: the pattern was repeated, with patterns of deep cracks and tantalizing caves, on a multitude of scales.

"I can see why you didn't build here," he said. "Was it hard finding as gentle a spot as you did for Breakaway?"

This time Luk answered. "Not too bad. There are several kinds of terrain that more or less alternate along the coast: dry but relatively flat land like ours; dry, forbiddingly rugged headlands like this; and tidal marshes like I want to show you next. Seen enough here?"

"For now," said Phil, and by the time he finished the two words, Luk had the boat speeding out to complete its transit around the point and into the next bay.

"We did shop around a bit," he said, raising his voice just a bit to be heard over the slightly louder engine noise, "and we think we got the best spot in the area. It's not too hard to find a piece of land as flat and dry as that, but this is the only one we found with that plus a good harbor, reliable water sources not too far off, and a good place for windmills to bring the water and electricity where we need them."

By then they were well back into the next bay, which was very different from the one that hosted Breakaway. Here the mountains seemed far inland, and gently waving marsh "grass" stretched level toward them farther than Phil could estimate. Luk slowed the boat and skimmed it along the edge of the grass. "Good place for fish," he remarked, and indeed Phil sometimes glimpsed a shiny shape darting from one place to another under the surface. He also saw lots of small winged things darting about among the tall grass, and occasionally glimpsed bat-gulls of various sizes, and once or twice another otter. "The grass itself makes a pretty good feedstock. So we have plenty of things we can eat, and equipment to make it taste like a good variety. We're doing pretty well."

At that moment, Luk seemed to glow with pure pride in what he and his colleagues had accomplished, momentarily forgetting whatever concerns had led them to send Hazel to fetch Phil here. Phil felt a kindred glow; once he got used to it, he found being out on the water exhilarating, and what he'd seen so far left him impressed with the new colony. Everything seemed gratifyingly under control, and future prospects so bright he found himself thinking for the first time that he might just stay here.

"So," he asked casually that night at dinner, as he enjoyed a wonderful new fish dish that Luk proudly told him the nanos took directly from feedstock to "cooked," "what is this problem you brought me here to look at?"

For an instant Luk's glow seemed to chill completely, but he quickly drew an optimistic look back over his face. "Tomorrow," he said, "I'll take you up for a closer look at the windmills."

And that was all he would say.

IV.

Hazel didn't go along on that trip; it was just Phil and Luk. Their vehicle was the same sort

of bug used back in Newtown, but battered and scuffed from harder use. A road of sorts wound out of the village, making switchbacks up a scrubby hillside. Glances over his shoulder gave Phil ever better panoramas over village and ocean, but what really held his attention was how surprisingly long the climb went up.

He toyed with the idea that this time alone would be a good chance to feel Luk out about the folks he'd left behind, and why he'd really left. But that could backfire; they would be alone together a lot today. Better to wait, listen, and watch for opportune moments to ask questions.

When they finally leveled out on top—really on a shelf, with mountains rising still higher beyond—the village looked remarkably small and vulnerable. Windmills loomed all around them, tall and imposing. “Impressive,” Phil said as Luk parked the bug. “So you use some of them to pump fresh water down to the village and others to generate electricity?”

“That’s right,” said Luk. “And if I do say so myself, they work pretty well, when they . . . They work pretty well. Let’s get out and I’ll show you around.”

It was only as Luk started opening the clear cabin dome that Phil noticed the tiny shapes darting frantically around outside like molecules in a hot gas, moving too fast to see much more than streaks. By then it was too late. As soon as the bubble opened, his ears were assaulted by a cacophony of whines and buzzes, rising, falling, whirling all around him, sometimes almost deafeningly close. And he felt a pummeling of small, stinging blows, as if someone were halfheartedly throwing handfuls of gravel at him.

Reflexively, he ducked and tried to pull the dome back shut over them. “There’s something out there!” he blurted frantically.

“Indeed there is,” Luk agreed with a curt laugh. “But we’ll just have to put up with them. If you think they’re bad now, you should have seen them when we first started growing the windmills.”

Phil watched skeptically as Luk pried the canopy from his grasp and resumed opening it. “Do they . . . are they dangerous?”

“Don’t seem to be, at least directly. Just annoying. *Real* annoying, but just try to ignore them. C’mon, let’s take a walk.”

Nose wrinkling in distaste, Phil climbed out of the bug after Luk. The ground cover was different here, a lush mat of green and purple and orange that seemed woven principally of two kinds of plant. One was as bladelike as grass and sprouted clusters of small leaves and flowers vaguely reminiscent of clover, except that the leaves were smaller and more numerous, and the orange flowers larger but not particularly attractive. The other had clusters of small round leaves, a little like four-leaf clovers, but no flowers, at least now.

And the ground crunched underfoot, in a way that felt and sounded completely inconsistent with the obvious springiness of the plants.

Phil looked down. A lot of the flowers had things crawling on them, things faintly suggestive of both miniature hummingbirds and overgrown bees. They never stayed long in one place, and from their comings and goings, he saw that they were the same pests that filled the air—to a surprisingly high altitude, he noticed by tilting his head back.

The crunchiness was bodies of dead ones, a veritable carpet of them that had fallen among the plants. They seemed uniformly distributed; the crunch didn’t vary much from place to place. Grimacing, Phil tried to step gingerly in places without bodies, but there weren’t many big enough for a foot, and he soon gave up the effort. “So are these the problem?” he asked.

“No,” said Luk. “At least, we don’t think so. At first we thought they were a problem, and to some extent they were. Some of them get smashed up on the windmill blades, and some get ground up in the bearings, which is worse. And we were afraid they would bite, or carry diseases, or both. At first we tried to exterminate them—you can see the odd zapper still working here and there around the field, though we don’t try very hard to maintain them any more. It seemed to help for a while. At least, their numbers fell off noticeably, but then they started creeping back up again. These days we pretty much treat them as a nuisance to live with. Self-cleaning nanocoats on the blades and bearings keep those problems under control, and people just get used to the critters buzzing around. Besides, we don’t spend that much time up here.” He paused and sighed. “Meanwhile, the real problem isn’t getting any better. In fact, it’s—” He broke off

abruptly and started walking rapidly, motioning to Phil to follow him. "Let's have a closer look at one of the windmills."

Phil followed him to the base of one of the structures and tilted his head back to look up at the whirling blades. Both they and the spindly supporting tower gleamed in the sun, but not like metal. He didn't recognize the material, but assumed it was something the assemblers cobbled together from stuff they found in the soil. It hummed softly, providing a soothing counterpoint as Luk droned on about how it worked, pointing out the mechanisms with which this one converted kinetic energy to electricity and explaining how in others they were modified to control the flow of water from reservoirs up in the mountains down to the village of Breakaway. Phil tried to follow it, but a good many of the details were beyond him. Besides, he found more and more of his consciousness drawn to the smells.

He wasn't surprised by the faint bite of ozone; he'd been around enough electrical works to know that was often a byproduct. A soft sweet odor he assumed was lubricant of some sort, and some of the others, not obviously wood, plastic, metal, or biological, he guessed were the synthetic materials of the windmill itself. The one that increasingly gnawed at his consciousness was one that part of him wanted to identify as death.

He tried to resist that morbid thought, but could only resist so long. It *was* death, he finally admitted, though not quite the death-smell he knew from infrequent experiences on Luna and Earth. Maybe, he told himself, it was the collective smell of all those tiny dead bodies of flying pests. To take his mind off it, he asked Luk, "Mind if I feel what the tower's made of?" He took a step toward it, hand outstretched—and almost stumbled with an involuntary gasp.

His toe had struck something large and soft, which for some reason conjured up an instant image of a dead human body. Reflexively, he looked down and saw that it was a dead body, but not human. It reminded him of the bat-gulls he'd seen from the boat, but even bigger. Broken wings sprawled around it, and odd but unmistakably complex paws, almost like hands without arms, protruded slightly from the chest. "What's that?" he asked Luk, surprised at how much he was shaking from the sudden but apparently unwarranted fright.

"We just call them bats," said Luk. "We assume they're related to the ones you saw yesterday, though we don't know just how. But they're more of a problem for me than the little buzzers because they're so much more massive and they do frequent this area—though we didn't realize that until the windmills were up and running. When one of these puppies flies into a blade, it isn't good for either one of them. And it happens quite a bit."

"So are they," Phil asked, growing weary of asking this question and hearing it evaded, "*the* problem?"

Luk seemed to hesitate before answering, which Phil suspected was telling. "They may have something to do with it, but it's hard to see how." He chewed his lip and then said, "I guess I've put this off long enough. Come here." Again following the younger man across the field, Phil noticed a couple more of the big dead bats on the ground, but Luk didn't mention them.

They passed two or three more windmills before it dawned on Phil that there was something seriously wrong with the one they were approaching. Its bottom seemed crumpled, in an asymmetric way, and the whole structure leaned far to one side, looking as if the merest puff of breeze could topple it. Close up it looked even worse, with bottom struts so deeply pitted that in places daylight shone through, and the ground around them was torn up as if some deranged farmer had used a giant plow to demonstrate a random walk problem.

Luk looked as deeply disturbed as the soil when he stopped at its edge. "*That's* the problem," he said as if spilling some long-suppressed and profoundly disgusting secret. "This has been happening more and more, and we don't know what's causing it. But as you can see, this mill is useless now, and there's no easy way to fix it."

Phil stared, hardly sure where to begin asking questions. But he could see the potential seriousness of the situation. "How long has this been going on?"

"Almost from the start, last summer. At first we thought it was just a fluke and maybe it wouldn't happen again. Some kind of animals, we thought, though we never saw anything that looked like it could do this."

"And nobody's seen it happening?"

"No. We've tried camera traps, but didn't get anything worth mentioning. And it

doesn't happen all the time; it has ups and downs. Last summer it was just a few isolated instances, and this spring, until recently, it hasn't been too bad. Our water and power needs are relatively light at this season, and enough mills are still working to meet them without too much trouble. But last winter, when we needed heat and had to worry about just keeping water liquid . . . it got scary. And just recently it's been ramping up again. Close to a third of our mills are out of commission now, and they're going down faster than we can grow new ones."

Phil's mental wheels were spinning now. He could see that there was a real problem here, on several levels. And it bothered him, because he'd begun to think that Breakaway actually had a chance of doing what he and Hazel and their carefully selected cohorts had set out so long ago to do in Newtown. "So that," he said carefully, "is why you called me?"

"Yes. Part of it, anyway." Another long pause. "There's more."

"More?"

"Yes. Let's go back down to the village."

Driving back down the same road was a whole different experience than driving up it. Even though switchbacks sometimes had them running roughly along contour lines, on average they now had the mountains behind them and the sea—and the tiny, vulnerable-looking village—spread out before them. This time Phil didn't wait so long to try to engage Luk in conversation. "So why," he asked once they'd left the windmills behind, "did you wait so long to tell me?"

"Denial," Luk said bitterly. "And shame. The windmills are my baby; I feel responsible for them and for everything that depends on them. It was hard to admit that there was a big problem. Even after Hazel got you here, I didn't want to just dump it on you. I hoped that if you saw the overall picture of what we have here, and how it's supposed to work, you'd see something obvious that I was overlooking. Something that would make it so I wouldn't have to admit to you how badly things were going."

"Why should you care what I think?" Phil asked. "And why would you think I could help with this problem? You're the expert on windmills."

Luk winced. "This isn't a windmill technology problem. It's something bigger. We don't know what, but it affects the whole colony. And . . . I looked up to you. I've read enough history to know that none of us would even be on this planet if it weren't for you. Is it so unreasonable to hope that you might still be the best person to look to for a problem this basic?" He looked determinedly straight ahead at the rough road. "Though I must confess I've never understood why you stayed behind when the others came here. You obviously didn't like what . . . my people were doing. And Breakaway seemed to offer you a second chance at your original goals."

"I wasn't ready to give up on the first one," Phil said wryly. "I'm not saying I was right. I'm beginning to think 'just stubborn' is more like it. Hazel likes to say knowing when to quit is often the best kind of wisdom. But I never claimed to be wise." He was silent past a couple more switchbacks, trying to pin down something that was gnawing at the back of his mind about the ruined windmills. Eventually he gave up and said, "And yet you did come, and that surprises me. Why did each of us do the opposite of what the other would have expected?"

Luk gave a short laugh. "Well, you may have a pretty good handle on yourself. Me? Well, I've already hinted at some of it. But I guess what finally drove me to it was that I just got tired of the pressure and jumped at the chance to get away from it."

"Pressure?"

"To marry and have a family."

"But . . . you're only . . . What? Eighteen standard?"

"Sorry, I don't think in terms of your 'standard.' I'm almost twenty-four of the only kind of year I've ever known. But yes, you've guessed me right, and I gather you think that's young to be under that kind of pressure. But you don't know my people."

"I think I—" Phil began, and then stopped with a sigh. "No, I don't. Not as well as I should. Maybe I should try harder to see things from their point of view."

"Not a bad idea," said Luk, "if only to know your enemy. For one thing, they're a lot less monolithic than you might think. I know some of you stereotype them as religious fanatics, but they come from several different backgrounds, and some of them aren't religious at

all. True, the movement did start with Brother Magnus harping on how Earth and its colonies in Solssystem had got so crowded and regimented that nobody could 'be fruitful and multiply' any more—"

"Because," said Phil, "they'd done way too much of it up to then."

"That may be," said Luk. "I wouldn't know; I can barely imagine the kind of world you folks had back there. Anyway, nobody paid much attention to Magnus until word got out about the Gate you'd found in space."

"I don't suppose you know how that happened?"

"Nope. Anyway, after you and Hazel and your friends did the hard work of figuring out how to get there and what might be on the other side, people who agreed with Magnus came crawling out of the woodwork. They didn't agree with him on everything, mind you. Some believed this world was made for us and we had a divine mandate to fill it; some were fertility cultists of one sort or another. Some just liked the idea of big families. And some were cantankerous individualists and libertarians who just didn't like being told what they could and couldn't do. Some *are* devoutly religious but see Magnus as a kook; they just followed him here because he was going somewhere they wanted to go.

"They all had their own reasons, but they all saw Magnus's plan to come here as a way to get away from all that—just as you folks did. Magnus was eloquent enough to appeal to a wide range of people, and smart enough not to insist that everybody agree with him on every philosophical detail. He'd take anybody who could help with the effort. As you well know, lots of them wanted to come with him and make up for lost time by being *real* fruitful and multiplying as fast as they could. If the Gate hadn't quit working, there'd be even more of us."

"I'm thankful for small favors," Phil muttered bitterly. "No offense, Luk. Nothing against you personally."

"None taken," Luk assured him. "You've probably noticed that sometimes I say 'us' and sometimes 'them.' I still haven't sorted out which way I really feel. Anyway, the Gate and this place gave them an opportunity they'd long felt deprived of. So they got here and right away started using every means they could think of, natural or technological, to populate

it as fast as possible. Encouraging big families; neural imprinting to accelerate education so people could start those families at early ages; even cloning and baby farms to supplement 'doing what comes naturally.'"

"That much I knew," said Phil. "And if they keep it up, they'll fill this planet and be back where they started in no time. Especially since they also freely use medical nanotech to prolong lives. Right?"

Luk shrugged. "Yes, they do use it. As for whether that's a big problem . . . maybe someday, a long time from now. Hardly a concern now. We've got a whole planet here and we humans are barely a speck on it. I was more concerned with my personal problem. My folks were at the divine-mandate end of the spectrum, and that idea just didn't feel right to me. Neither did reproducing for the sake of reproducing, as the be-all and end-all of life."

"It made sense back on Earth, when the human population was as small as it is here now. But things were very different then. They had plenty of room and food, lots of enemies and other dangers, and none of our technological shortcuts."

"Exactly. So when they practically pushed me into an arranged marriage before I was eighteen—I guess that's about fourteen, your way—I started thinking more and more about getting out. The harder they tried to get me to live their way, the more I wanted to live mine—but there was no place to go. Until the Breakaway group came along."

He drove silently for a couple of minutes, and Phil sensed that he should just wait. Finally Luk, struggling audibly to control his voice, said, "So I came. But my folks considered me a failure by their lights, and now, here, I'm beginning to feel like one by my own."

Phil pondered how to react before he said anything. "You're no failure," he said at last. "You just have a problem that you haven't finished solving yet. Let's go see if I can help."

They rode the remaining few minutes into the village in silence, Phil trying to pin down the thing that was gnawing at him about the windmill damage. He hadn't got very far when Luk pulled the bug up alongside a house near the periphery of the village and got out.

Phil followed, frowning as he noticed that something was wrong with the house, too. It

looked abandoned—why would any house be abandoned in a colony so young?—and lopsided. Only as he walked around to the far side did he see the reason for the lopsidedness: The bottom half-meter of the outside wall had crumbled around a third of its circumference, its shards and dust spilling into and mingling with the surrounding soil.

Which was chewed up, as if by that same misused plow or a rooting pig.

Just like the windmill Luk had shown him up in the hanging valley.

Phil still hadn't pinned down what was nagging him about that, but he felt sure the same thing bothered him about this ruined house. The agent of destruction, whatever it might be, was the same in both cases. It had to be.

"This is new," Luk was saying. "It looks like the same kind of thing we've been seeing in the windmill field, which had a certain comforting remoteness about it, but lately it's been happening right in the village. As you can imagine, that's more personal and threatening—for everybody who lives here."

As Breakaway's newest resident, however temporary, Phil could appreciate that. He had the feeling he wouldn't sleep quite so well tonight as he'd been doing so far. "Nobody's seen it happening?"

Luk shook his head. "It only happens at night."

"So? Couldn't people set alarms to alert them when something's happening outside, so they can look outside and see what it is?"

"Sure. Tried it. Didn't work."

Phil frowned. "Didn't work how?"

"The alarms didn't go off, even when there was plenty of damage to be seen in the morning. So a few brave souls tried staying out at night to watch. The things they were watching for never happened where anybody was watching. But some of the watchers were attacked by . . . things."

"Things?"

"Nobody ever got a good look. And since then it's been harder to find brave souls."

Phil deliberated for a second or two and decided not to pursue that just now. "Automatic cameras?"

"I already told you we've tried those. But we can't put them everywhere. Most of them haven't seen anything. A couple of the earliest ones caught fleeting glimpses of motion, but

too indistinct to give any idea of what was moving."

"But *something* was moving," said Phil.

Luk's laugh was more like a snort. "Sure. Obviously something had to be. We still have no idea what."

Phil's eyes kept sweeping around the scene, trying to come up with something more substantial to say. All he came up with was, "Let me sleep on this. Sometimes that helps. Meanwhile . . . you've got a good meaty problem here. Just think how good it's going to feel when you do solve it."

"I wish I believed that," said Luk.

So did Phil, but he didn't say so.

V.

At least Phil now understood, albeit dimly, why people warned him against going out at night—but he began to wonder whether the problem could be solved without it. And the night after Luk showed him the damage, though he slept better than he'd feared he might, did not bring the subconscious inspiration he'd hoped for.

In the morning he asked Hazel to join him for breakfast. She was there in fifteen minutes. "Very interesting tour with Luk yesterday," he said over a local version of coffee and low-fat pastries derived from indigenous plants. "He told me." He waited to see how she'd react to that rather cryptic pronouncement. When she didn't, he proceeded as if she knew exactly what he was talking about. "There were a couple of things that bothered me, and I didn't want to embarrass him with excessive cross-examination. He's feeling kind of insecure, you know."

"Yes, I know."

"So I thought I'd kick things around with you for a while. See if you might have a fresh perspective."

"Surely not as fresh as yours," she said, "but I'll be glad to try."

"I gather that what bothers him most, aside from the obvious dangers, is that nobody understands how the damage to houses and windmills is happening. I'm not convinced that anybody has done as much as they might to investigate."

"I can see how an outsider might think that," she said. "And you're still an outsider, though we're hoping to change that. I assume

Luk told you that whatever is happening didn't set off alarms?"

"Yes."

"Okay. Wouldn't you find that a bit spooky, in our situation?"

"Maybe. 'Spooky' isn't a word I'm in the habit of using, though."

"We aren't either," she said, a bit frostily.

"But things pile up. Combine that with the lack of any tracks leading to or from the damage sites—"

"That's it!" Phil exclaimed, feeling a sudden chill.

"That's what?"

"Ever since he showed me those patches of torn-up ground around the messed-up structures, something has been bothering my subconscious about them, but I haven't been able to put a finger on it. You've done it for me. Somebody or something, some animal or machine, must have done that stuff. But how did it get there—and away?" He stared into space, frowning, pleased to have gotten past one stumbling block but frustrated to see no way to go further beyond it.

When the silence had stretched on too long, Hazel said, "And, of course, then there are the deaths."

Phil looked up sharply. "Deaths?"

Hazel cocked an eyebrow. "Luk didn't mention them? No, I guess he wouldn't. He really is touchy about all this. He feels responsible for everything that's gone wrong, though of course he isn't. His windmills work fine. What's happening to them isn't his fault."

"That's what I told him."

"Good. Let's keep ganging up on him. And of course his connection to the damaged houses is even less."

"Still, you mentioned deaths. . . . You know, I just realized there's a contradiction there. That day on the boat, when I brought up the question of predators, Luk said nobody had been attacked by anything yet. Then yesterday, when he was showing me the damaged houses, he said some people who stayed out at night to see what was going on were attacked by . . . his word, and he hesitated before he said it . . . 'things.' Why would he say they weren't one time and they were another?"

"Well, we're not sure. These . . . incidents . . . were quite recent. We don't really know that they were literally attacks by anything. They

looked like they were, and I think part of Luk is resigned to that. But another part is still hoping to prove that they were something else." She was silent for a while before adding, "A lot of us feel that way."

Phil was silent even longer before asking, "So how many were there? And who were they?"

"Just two," Hazel said. "But there isn't really any 'just' in a situation like this, is there?"

"Who?" he repeated, not mentioning that two deaths were a full percent of their population.

"Gerhard Santos and Giselle Muhindi."

Phil winced. "Just two deaths" doesn't have a face; Gerhard and Giselle each did. He hadn't known Gerhard well; he had a vague mental picture of a colleague of Hazel's in Boulder, a soft-spoken, amiable geologist with an ironically devilish goatee. Giselle was another matter: a protégée of Phil's, a young linguist who'd been born in Tanzania but raised almost her entire life on Luna. Phil remembered warning her there wouldn't be much for a linguist to do on the new world, and her cheerful smile as she answered, "Well, then I'll become something else. If I can't find something to keep me occupied on a whole new planet, I'm a lot farther over the hill than I thought."

Now she was gone, and he'd had no chance to say good-bye. He didn't ask for details, but he suddenly felt a much more personal determination to get to the bottom of whatever was out there.

"I'm sorry to break it to you this way," Hazel was saying. "I should have thought more about how . . ." She touched his hand sympathetically. "Anyway, I suspect you now have a better idea of how all this has been affecting the rest of us. But take it a little further. Our way of life is threatened; people we cared deeply about have lost their lives. Couple that with the mysteries of what's causing it, the lack of tracks, the silence of the alarms . . . well, after a while it begins to look almost supernatural."

"Supernatural?" Phil tried to sound incredulous but didn't convince even himself. "Come on, Hazel. Most of these people are former academics. Many of them are scientists—"

"And we're all human," she interrupted. "I think we all have a hardwired susceptibility to superstitious tendencies. This is starting to reawaken them, even in professional skeptics."

They haven't gone so far as to actually admit that, yet, but they're scared. They've tried a lot of ways to figure out what's happening, and come up dry. Meanwhile it goes on, and there's nobody else out here to ask for help." She took both his hands in hers and looked straight into his eyes. There was a hint of pleading in her gaze that made him uncomfortable. "That's why I wanted to get you here, let you see what our 'normal' life is like with no preconceived notions, before we hit you with this. Intellectually, most of us still believe there has to be a rational explanation. But events have crept on us so gradually it's become hard for us to think about them that way. Help us find that rational explanation, Phil. And a solution."

The quest had turned personal. Phil thought hard about it the rest of the day, and he left the outside sound turned all the way up that night. In the morning he asked Luk to show him the automatic cameras they'd tried before. He reset as many of them as he could get his hands on, in new places all around the village and also near undamaged windmills. He added more sensitive sound sensors and waited for the next morning. Luk drove him up to the windmill field to inspect the results.

Two more windmills and two more houses wrecked, the occupants of the latter staring fearfully at the remains.

But absolutely nothing on cameras or playbacks. As Luk had said, they couldn't put them everywhere—and the vandalism, or whatever it was, only happened where they weren't.

Phil tried that for two more nights, with similar results. He noticed that new houses were being grown, presumably as spares to replace damage that had come to be expected but couldn't be predicted.

On the third morning of coming up dry, he came to the grim conclusion that the only way to see what was going on was to go out and watch, despite the apparently sound advice he'd been given.

Nobody offered to go out with him, though plenty offered gratitude, wishes for good luck, and admiration of his courage. He didn't press the point, though he was disappointed and annoyed that not one of his old colleagues would share his risk. Once he felt close to just saying

to hell with them and flying back to Newtown, leaving them to fend for themselves, but the problem nagged.

He felt edgy when he set out alone to patrol the village two nights later. He waited until it was quite dark and dressed as invisibly as he could, with flat black clothing from head to toe and soft-soled shoes that could grip almost anything and made appreciable sound on almost nothing. He carried a powerful flashlight and a single weapon—a dazer—but resolved to use either only as an extreme last resort. Lacking any idea of what he might meet out here, he wanted to be able to defend himself, but he didn't want to scare anything off before he got a look at it.

Which meant relying on the fitful light from Selena, which was close to full but usually hidden by thick clouds, churning in several layers streaming restlessly in different directions at different altitudes. Only rarely did the currents allow a clear view of the satellite, and in those fleeting instants the landscape brightened to a ghostly composition of soft glows and skeletal blackness. Then it faded again, leaving him to try to interpret things of which he'd caught only tantalizing glimpses. Nightglasses helped, but not enough to give any illusion of daylight.

For two hours and more, he paced among the domelike houses of the village, wincing when he came upon one that had been damaged, but never finding one currently under attack. Nothing stood between him and the eerie chorus of unfamiliar animal sounds from the surrounding forest and plain, and he had to work at reining in his imagination's efforts to read dark significance into every chirp and warble.

Eventually, it almost became boring.

It was after midnight, out on the west edge of the village, when things changed. His first hint was a faint sound that hit him immediately as different enough to stop him in his tracks—the merest suggestion of a combination of a scuffling and a sort of whispered chittering.

He listened for several seconds, then moved on warily, planting each step with the greatest of care.

After four such steps, one of those clear patches brushed across the face of Selena, and for half a second he saw the ground churning at his feet next to a house.

With great difficulty he suppressed the urge to cry out a warning to the house's occupants. Then he realized that there weren't any. This house was one of the new ones being grown as spares, and it stood more than the average distance from any of its neighbors. But the ground was indeed . . . well, seething. There was no big animal or machine here, but rather, apparently, a great many little ones. He stood watching for some time, alternating fruitless glances at the restless ground with wary glimpses at his surroundings to see if something else was sneaking up on him while his attention was riveted there. He became aware of an unfamiliar smell, and then another; but smells being smells, he couldn't tell where they were coming from.

He did cry out, though he managed to stifle it to some extent, when he heard a sudden crescendo of what sounded like leathery wings, then felt pulses of wind as they flapped by within a meter of his face, then heard the sound recede. It had passed behind him, and when he tried to follow it with his limited eyes, he caught the merest glimpse of something receding into the darkness.

One of the bat-gulls? he thought. *Or the things we saw dead among the windmills?*

Or . . . something else?

His nerves truly on edge now, he tried to formulate a plan but came up with nothing more coherent than continuing to watch, both the ground in front of him and the suddenly sinister night around him. A couple of minutes later, another flyer buzzed him, this time right in front of his face, and this time he felt sure it was one of the kind he'd seen dead on the hanging plain.

And he couldn't shake the feeling that it had turned its head to look right into his eyes as it passed, though he could remember nothing about its eyes.

If it had any.

Trembling, he forced his mind to focus. The number one thing he was out here to investigate was happening right at his feet, and he had to get a better look at that, if nothing else. Carefully he lowered himself to hands and knees, near the moving ground but careful not to touch it, and strained to see what was causing the motion. The light was too dim to see much more than vague shapes at that scale, and he finally decided to allow himself one quick look with his flashlight.

But as he reached to retrieve it from his pocket, the act threw him a little off balance, and quite suddenly he was hit from several sides at once by what felt like hard, squirming bodies, smaller than an adult human but still frighteningly powerful. Something pinched him and tugged at his clothing in numerous places, but before he could turn to look, something knocked the nightglasses off his face. The loud "Oof!" that escaped his lips was initially more surprise than anything else, but fear was not long in following.

Things happened fast then, and he strained futilely to see what they were. The clouds were particularly thick at that moment, completely hiding Selena, and with the glasses gone his eyes struggled with minimal success to adapt to deep darkness. As whatever had hold of him dragged him roughly across the ground, he groped wildly in front of and around him, hoping to retrieve the glasses. All he found was what felt like small, wiry arms and furry, ever-moving bodies. He started to yell in earnest, but was cut off by something mushy and foul-tasting stuffed suddenly into his mouth. About then he had second thoughts about yelling, anyway. Frightened as he was, and as great a relief as it would have been to have half a dozen armed villagers come running to his rescue, some part of him sensed that what was happening here was more than a mere nighttime nuisance, and he'd learn more by simply watching as long as he safely could. After all, he *was* armed.

Wasn't he?

With a sudden surge of alarm, he abandoned his groping for his glasses, and instead grabbed for the pockets containing his flashlight and dazer. He fought down the temptation to use them, trying instead just to make sure they were still in place. They were, but finding out wasn't easy. His captor—captors?—had hold of every part of him and made it hard to move his arms in any controlled way. Once he found his precious cargo, he stopped resisting their efforts to restrain his arms, not wanting to call their attention to the bulges in his clothing by letting his hands linger there.

Their smell—he was thinking "their" now; there *had* to be more than one—was overpowering at this distance, and he hurt all over from pummels and pulls and pinches. The ground changed underfoot, becoming less

grassy and more rocky. Then he was flung against something hard and held there while the forms squirmed and chittered around him. He had dark-adapted enough now to make out vague shapes, but no detail. Whatever they were, they were wrapping him with something that felt like a hybrid of rope, rubber band, and reptile—and that put a much more effective end to his struggles. Panic felt perilously close as they manhandled him along the side of the hard thing he'd been pushed against, clumsily upended him—apparently they couldn't quite lift him—and shoved him into a cramped space like a box open at the top. Something slammed noisily shut behind him, and in the same instant he became aware of the feel of splinters, at least two strong new smells, and a jerky rocking motion of the box he was in.

And then a sudden lunge as the whole thing started to move away from the village. The jerky rocking didn't stop; the feel of the motion quickly told him this thing was on wheels, but not on pavement. It picked up speed quickly, seemingly hitting every rock and root in the area. Irregular grunts and rhythmic percussive sounds suggested some sort of draft animal up front, but the impression was vague at best.

And, just as Phil began to feel that he was getting enough night vision to have some hope of seeing what his conveyance was and what was powering it, it plunged into forest and everything went pitch-black again.

The noise of its reckless plunge changed character, shattering into millions of tiny reflections off branches and rocks and foliage. His teeth jarred achingly together, branches slapped and cracked against the outside walls of the box, yet somehow the thing kept going without crashing to a bone-breaking halt or inflicting serious damage on his exposed head. Nerve-racking as it all was, some small inner part of Phil (was that something Hazel had known he had, the reason she had brought him here?) began to relax just enough to look for clues in his predicament.

Whatever had captured him was clearly not human, and neither ground-based observers nor surveillance satellites had noticed any new spacecraft coming in. So his captors were almost certainly natives who had somehow,

impossible as it seemed, escaped prior notice by the colonists. Evidently they were nocturnal. A large part of the terror of his ride stemmed from the fact that it was done in rough, crowded terrain, with no semblance of artificial running lights and no Selenalight worth mentioning, especially here in the forest. So whoever was driving it—and whatever was pulling it—must have *extremely* sensitive vision, or infrared vision, or ultrasonar, or . . .

But Phil didn't, and he could hardly have imagined how much terror utter darkness could add to a fast, rough ride that would have been scary enough in broad daylight. Seized by a desperate desire to learn more as quickly as possible, he wiggled his hands and found that his bindings weren't as secure as he'd feared. He couldn't swing an arm, but he could squirm one hand into a position where he could operate either the dazer or the flashlight if he chose to. Either beam would have to come through fabric, of course; that wouldn't matter to the dazer, and even the filtered flashlight might be enough to be useful.

But it would also give him away, and possibly throw away any slight advantage he might have. So he forced himself to refrain.

Then, abruptly, the sound changed again, and one of those fleeting thin patches in the clouds let through enough Selenalight to show him that they were emerging from the forest, a whiplike branch stinging his face. Straight ahead loomed a cliff rising sheer to a height so great he couldn't pick out its top from the black clouds beyond—and his ride was plunging straight toward it without the slightest hint of slowing down. In an astonishing kaleidoscopic flash his mind fast-forwarded through the events since Hazel had walked back into his life and enticed him into this mess.

Then the sound changed yet again, and though Selena and her light had again vanished, he knew from the deafening din that his carriage, such as it was, had plunged into a narrow slot canyon and was continuing its headlong advance. Faster, in fact, even though an occasional turn jerked him from side to side, and smoother, even though the echoes between two sheer cliffs close at hand made the sound much louder.

Smoother? He was reminded of a time back in the hills of southwestern Colorado when Hazel had taken him on an off-road adventure,

and the luxuriously silky feeling when her four-wheel-drive vehicle finally returned to maintained highway.

Was this twisting passage through the canyon a road?

Why not? Phil thought, finally admitting the obvious to himself. *Whoever has me is obviously intelligent and at least a little bit technological.*

But what do they want with me?

Whatever it was, it was quite clear that everything humanity had “known” about its place in the Universe for the last century had just changed radically.

These creatures shouldn’t have existed, anywhere—and especially here.

VI.

The ride continued in the same vein for several minutes: fast, dark, loud, relatively smooth but with frequent lurches from side to side, all intensifying the feeling of careening through a narrow, sheer-walled, winding canyon. Toward the end—Phil sensed that from a new gradual change in sound quality—another light patch in the clouds let him vaguely see the canyon’s rims, high above and frighteningly close together.

This time the brightening lasted a little longer, and grew. The wagon emerged from the slot canyon as abruptly as it had entered, and for part of a minute Phil could, at last, see some of his surroundings. Selena shone down like a spotlight through a hole in the restless clouds, twice as bright as full Luna on a good night on Earth. Looking up from where he sat in the wagon, he could see that they had emerged into a bowl-like valley, still tight and steep-walled on all sides—indeed, there seemed to be overhangs like craggy eyebrows all around—but much more open than the canyon they had just traversed. Still, there were cliffs everywhere, including straight ahead, so he felt a certain relief when he slid suddenly forward across the floor of his box as the vehicle screeched to a halt. He even found himself relieved that there was a solid wall there, and it held as he bumped painfully but not destructively against it.

As the last motion ceased, he noticed one more thing about the surrounding cliffs. Back under the rim of the one catching the most moonlight, the rock of the cliff itself had been

carved into huge, high-relief sculptures—some of them distantly resembling the “otters” he’d seen, and others just as distantly resembling the “bats.”

He’d barely had time to recognize that there were more sculptures on some of the less well-lit cliff faces when the clouds again drew a curtain over Selena. It wasn’t quite so sudden this time, so first the darker sculptures disappeared, and then the brighter ones faded slowly. At the same time scurrying sounds came from outside, then the sound of something mechanical like a latch being unfastened, and the wagon’s tailgate fell open. He smelled nonhuman bodies, felt warm breath, and for the first time saw, however poorly, some of his captors as they wrestled him out of the wagon and half-laid, half-dropped him on the ground. They looked vaguely like those six-legged “otters,” but bigger, and with huge eyes. Some walked on four legs with their forequarters upright like the centaurs of human mythology; others balanced even more upright on hindlegs and tails. Most of them seemed to be struggling to lift him, but jabbering wildly as if they couldn’t agree on how to do it. Others were attending a much larger beast of vaguely similar body plan, hitched to the front of the wagon.

As he helplessly endured the otters’ unskilled efforts, he noticed sculptures and other obviously artificial works, including what looked like doorways, all around them, seemingly carved out of the rock. Other otters were running out, some of them using all six extremities as legs until they got close, as if to see what their fellows had brought home and how they might help.

This is a city! he thought. *How could we have missed this for all this time?* Even as he asked the question, he saw at least part of the answer. He remembered trying to peer into the deep rock crevices as Hazel had flown into Breakaway that first afternoon and finding them too narrow and dark. If these “otters” were nocturnal and their sculptures were hidden back under overhangs . . .

It wasn’t a full explanation, but it was a start.

After too much rough jostling, they evidently decided he was too heavy to carry, and it would be easier to make him walk—their way. They shifted abruptly from trying to lift him as he was, to propping him up on his feet and

trying to steady him there. He was willing enough to help with that. Once he was reasonably stable, several of them pressed hard to immobilize his arms while they loosened his vinelike binding, one of them jabbering near his face as if to tell him, "Don't get any ideas." That was an interesting development, but he resisted the urge to try to throw his restraints off entirely.

Until they started shoving him, still holding his arms against his sides, toward one of the dark doorways in the cliff face. By now clouds again covered Selena so thickly that he could recognize the door only as a slightly deeper blackness, but as they got very close he could see that it was smoothly worked and ornamented and had some sort of hinged closure currently propped open toward the inside. New smells and a disturbing warmth issued from within, and when they tried to push him through into that unseen but surely more confining space, Phil reached a breaking point.

Tensing all relevant muscles and then releasing all the tension in one swift, explosive effort, he knocked a couple of his captors aside, took his dazer in hand, and pointed it out between two coils of his wrapping. For a moment he held it there, trembling slightly, debating whether he dared fire it when he couldn't see where it was aimed. With all the restraint he could muster, he held off, hoping that if he really needed to use it, there'd be a better time later.

But already it was too late. As soon as he got the muzzle out, one of the otters noticed and batted it out of his hand. He cried out involuntarily as it left his grasp and clattered across the rock, vanishing completely.

And at the same instant, they pushed him through the door into complete darkness, bumping his head on the way, and he heard the door slam shut and latch.

Trapped, in the dark both literally and figuratively, and defenseless, Phil numbly let himself be pushed ahead. To his surprise, they didn't go very far before they stopped, slinky bodies pressing in around him from all sides to keep him upright and motionless.

And somebody turned on a light.

It wasn't much of a light, but under the circumstances, it was very welcome indeed. It came up gradually, rising only to a level well

short of Earthly full moonlight; but the dim black-and-white view at least told him something about his surroundings. It was a single large room, and from his feel for the distance they'd traveled, he was pretty sure they hadn't gone through any corridors. Looking as close to over his shoulder as he could manage, he saw the corner of the door through which they'd come in from the outside. It was only twenty meters or so back, he guessed—but there was no way he could get there now. He was still surrounded by a squirming horde of otters, pressing in to make sure he couldn't go anywhere.

The light came from several sources, glowing disks that cast eerily writhing shadows of otters all over the walls. He towered over them, but they were still in control.

A black shadow passed swiftly over him with a leathery sound of flapping wings, and he looked up, startled. There were glowing disks in the ceiling, too—a *high* ceiling, at least fifteen meters in the middle of its domed expanse. Two or three of the big bats, or something much like them, were looping around the room, sometimes swooping through the center as if to scrutinize him. A few more sat awkwardly on high ledges or hung upside down from projecting rods. Dark patches high in the walls looked like the ends of passages from—somewhere.

More doors, high above the floor. As the sculptures outside had suggested, there was some connection between the otters and the bats. But what was it?

One otter's chittering rose loudly above the others, and the hall grew chillingly quiet. The flying bats found ledges or perches of their own and settled quietly onto them. And Phil saw both otters and bats—yes, both had hands—putting on what looked like dark glasses. Made sense, Analytical-Phil reflected; he'd already realized from his hair-raising ride through the darkness that they didn't need much light, and that might imply that they couldn't tolerate much, either.

But why were they putting on glasses now? They'd just come from outside, where the rare moments of full Selenalight were distinctly brighter than what now filled the hall. So if they didn't need them out there . . .

The answer came even as he formed the question. One glowdisk in the middle of the

ceiling grew still brighter, casting what looked like a celestial spotlight on the otters in the middle of the floor. As the light grew to a level that Phil judged just a bit brighter than full Selena on a clear night, the otters moved outward, forming a rough circle around the bright area, fading into the relative darkness.

The ones between Phil and the center parted, giving him an unobstructed view of the spotlight central area. He stared wide-eyed at what the spotlight showed, barely noticing as the otters holding him relaxed their grip somewhat.

He didn't even think about trying to escape; the only thing he felt now was intense curiosity about what came next. Rising from the floor, dead center in the bright circle, stood a startlingly accurate model of one of the Break-away colonists' windmills, whirling rotor and all. For a minute or so, he watched it, and then something changed. Somewhere across the room he heard a vaguely familiar whining and buzzing, like a thin, pale imitation of something he'd heard before.

He couldn't quite place it until he saw the little flying things enter the column of light, darting about in apparently random patterns that reminded him of moths around a light at Hazel's place in Boulder. Then he realized they were the same buglike critters he'd found so pesky when Luk took him up to see the real windmills. They weren't as loud here, despite the wall reflections, because there weren't as many. But they were clearly the same thing, swirling around the windmill model—though they didn't seem to care about light or dark, individuals dipping freely in and out of the luminous pillar.

Occasionally, one crashed into the whirling blades and fell staggeringly to the floor, twitching but unable to take back off.

After a minute or so of that, one of the bats dropped from its dimly lit perch, spread big wings, and flapped right past Phil, flying into the light. It did a graceful U-turn on the far side and flew straight toward Phil, mouth gaping as it flew through the light.

And the flying bugs.

It was eating them.

Two other bats joined in that performance, and then one of them suddenly sprouted a small but unmistakable arm just in front of its wing and launched what appeared to be a toy glider—or a miniature of the bat that released it.

The model bat/glider flew into the windmill blades, just like several "bugs" that had preceded it—and went into a fatal spin, falling motionless to the floor. All the bats in the air repeated that, too, showing clearly that they were catching the small flyers on the wing and eating them, and launching small replicas of themselves into the whirling blades, which put an abrupt end to their graceful flight.

Then they stopped. No more gliders, except the few broken ones in the pool of light around the base of the windmill. The little food-flyers gradually dissipated into the darkness, fewer and fewer of them flickering briefly in the brightness. The aerial-balletic bats returned to their perches and settled down as if waiting for something.

They all seemed to be looking at Phil, who was still staring at the windmill and the gliders around its base, his throat dry.

Utter silence, except for the scattered whines of the few remaining food-bugs and an almost imperceptible hum that might have been a motor driving the windmill blades, dragged on for at least a minute. It gradually dawned on Phil that all the otters were watching him, too.

Then, abruptly, a half dozen or so of them rushed into the light, extended their forelimbs, and began tearing the windmill apart.

Or, more precisely, dismantling it. Though they worked fast, Phil felt eerily certain that there was no violent rage in their action, but simply the efficiency of workers doing something that had to be done. In moments, the whole thing lay in pieces at their feet, and they stood pointing at it with outstretched arms and staring at Phil.

As if they expected him to do something.

Heart pounding, he pieced together some of what they were trying to say, though a key piece of it still eluded him. And, he cautioned himself, these were aliens—an extraterrestrial, nonhuman intelligence that shouldn't even exist. Their minds might work very differently from his.

But he felt oddly certain that they knew that and had already learned enough about humans to put together an elaborate message for them. And Phil, for whatever reason, was the one chosen to receive it.

He understood that they wanted the windmills destroyed, and even a little bit about why. But what could he do about it?

What *should* he do about it?

Shaking his head, he said, "I'll talk to them," and experimentally started to back slowly away. Somewhat to his surprise, they didn't try to stop him. Emboldened, he swiveled his head very slowly to look back toward the door. The light was poor back there, but there weren't many otters that way. Evidently they had been as intent on the show in the center of the hall as he was—or maybe just on his reaction to it. "I'll talk to them," he repeated, softly but clearly. "I'll see what I can do." If they let him keep inching backward, maybe he could get close enough to the door to make a dash for it and try to open it.

Suddenly, as if reading his mind, a multitude of otters swarmed forward, converging on him as if to attack. He'd seen no evidence that they were armed, but he didn't want to take chances. Succumbing to panic, he wheeled and ran full out for the door. He was greatly outnumbered, but his much longer legs gave him an advantage in speed. He got there in time to see that a simple bar held it in place. Squirming sinuous bodies pressed against him and tugged at him, but couldn't stop him from lifting the bar, opening the door, and squeezing out into the open "square."

Enough Selenalight squeezed through the clouds to let him see the narrow mouth of the canyon through which they'd arrived. A few otters, alone or in pairs, strolled about their business in distant parts of the square, but seemed not to notice him.

He was running across the stone-floored courtyard and had made it halfway to the canyon mouth when he heard otters burst out of the door behind him, chattering loudly. A couple of their "voices" rang out as if they were shouting through megaphones. Some of the "civilians" stopped and turned this way.

Then they broke into their short-legged runs, and suddenly they were converging on him from all sides. New ones streamed out of doorways to join the flood. He stopped, frantically trying to calculate the best way to get to the canyon before them, and saw no way of beating all of them there.

But he did see the boxlike wagon that had carried him here, with the draft beast, obviously a large, heavy, shaggy relative of the otters, still hitched to it—and approximately

facing the canyon. Its shape, size, and sturdiness reminded him vaguely of a mythical dragon, and he found himself thinking of it as a "dragonhorse."

After a short moment of serious hesitation, he leaped into the cart, snatching up a rock as he did so. He bounced the rock off the beast's back and let out the most blood-curdling yell he'd ever managed.

It worked. The beast took off with a lurch, the wagon jerking violently to catch up and throwing Phil to its floor. It felt like it was going in the right direction, but Selena had disappeared again so he couldn't see and he had no idea how much—or what—the critter would do with no otter directing it.

It didn't matter. Phil had no idea to drive one of these things, and it would either happen or not. It was out of his hands.

A few seconds later, he let out a whoop of mixed relief. If they'd been going to run into a wall, it would have happened by now. The sound, and a couple of fleeting flashes of Selenalight, told him they were in the canyon again. All he wanted was to get as far out through it as he could, to gain a head start. Surely the otters couldn't run as fast as the dragonhorse. . . .

But if the ride had been terrifying when he didn't understand how the driver could see where they were going, it was doubly so when he knew there was no driver.

Time to begin thinking about an exit strategy. Eventually, he assumed, the beast would tire, but it might first run even faster if they got out in the open. If he could judge when they were almost to the end of the canyon, maybe he could jump out when the animal had to slow for a turn. . . .

They never got that far. He began hearing otter voices far behind him, and then a different kind of chatter coming rapidly closer—and seemingly above. A couple of bats flew straight over the open top of the wagon, just a couple of meters above, in seeming slow motion. One of them swooped close to the draft animal, made hurried noises—

And the wagon stopped abruptly, slamming him once more against the front of the box. Ignoring his aches and bruises, he stood up and looked around. The bats had continued ahead when wagon and beast halted, but he suspected they'd be looping back at any moment. And

he could hear otters gaining rapidly from behind. He was surprised they'd made it this far already, till he reflected that they might have used another vehicle.

Going ahead or back on foot was not an option. Casting his muted gaze wildly about his immediate surroundings, he found a nearby crack in the wall that he might be able to climb out of sight—particularly since there was a good deal of fallen rock lodged in it. They'd have him cornered, but . . .

Seconds later he was huddled at the back of the crack, perched atop a pile of small talus, his head almost bumping solid rock at the top. At least he had a high ground of sorts for defense—but what might they have for offense? He could only guess what weapons of their own they might have, but one chilling possibility was that one of them might have picked up his dazer. True, they wouldn't know what to do with it, at first. But it might not take much trial and error to learn. . . .

Before he could think about it too long, one of the bats flew past the crevice, and chattering otters gathered at its foot, looking up at him. Then one of them started to climb toward him, with impressive agility.

There wasn't time for conscious thought. When Phil tried to reconstruct the experience later, he couldn't say whether he had actually thought about the evidence of the otters' and bats' sensitivity to bright light. All he knew was that suddenly the flashlight was in his hand, shining at maximum setting down the crevice, straight into the desperate face of the otter climbing up toward him. It cried out, slammed its eyes shut, and lost control, tumbling down the rocks and landing in a heap. Others gathered anxiously around it, and in a few seconds they seemed to have forgotten all about Phil. One of the bats flew by and peered in, but another quick flash of the light sent that one away. In the ensuing minutes, Phil saw no more bats but caught glimpses whenever Selena permitted of otters fussing over their fallen comrade, then lifting and carrying him—her? it?—back toward the wagon. There was a slow scurrying, then sounds of the wagon and its entourage starting back toward the city in the bowl.

Phil waited many minutes before he dared radio back to Hazel, asking her to home in on his beacon and pick him up in the morning—

carefully. "You were right about having a problem," he concluded. "But it's a lot bigger than you thought."

A little later, when no more sounds had come from the otter town, he ventured back out into the canyon and began to pick his way farther out toward a reasonable pick-up point. He looked back often, but neither saw nor heard any sign of more danger coming this way. When he could see that he was almost at the exit of the canyon, he holed up in another side crack and risked getting a little sleep.

But it was never very restful. Shortly before the beginnings of dawn, he thought he heard a distant sound that reminded him of some kind of engine, but no kind that he knew the colonists to be using. But he found that so hard to believe that by morning he had convinced himself, at least partly, that it was only a dream.

VII.

He woke to bright but still ruddy daylight and the sound of another engine, this one definitely real and reassuringly familiar. It took a moment to gather his wits and remember where he was, but then he took only a quick glance around before scampering down out of his shelter-crack and up the remaining few meters to the end of the slot canyon. He stepped out into a broad band of open, oddly bare rock, walled by forest on the other side, and ran back and forth, scanning the sky and waving wildly (and feeling the effort in every battered muscle and joint).

He spotted the minicopter right away, following the coastline half a kilometer or so away but then veering straight toward him and descending smoothly. All his frenetic motion was unnecessary, of course, if his beacon and their pickups were working right, but he didn't want to leave anything to chance.

The soft, smooth purr of the copter's engine grew louder but never unpleasant, and faded back as the machine settled in next to him, a foot above the ground with nose slightly raised. Hazel was at the helm with Luk in the copilot's seat. Luk flung the nearest door open and Phil yelled, "Don't land! Don't stop the engine!" He grabbed the doorframe and hauled himself up into the cramped rear seat. "Let's get out of here!" He pulled the door shut behind him and stole one last glance down the slot canyon.

Hazel started taking them up, but Luk couldn't help staring over his shoulder. "What happened to you? You look like hell."

"Thanks. It's good to see you, too." But he couldn't deny Luk's observation. His clothes were in tatters, and he sported a wide assortment of scrapes and bruises. "I'll tell you on the way."

Hazel stole a glance over her shoulder, and he was surprised to see genuine concern there. "I missed you, Phil," she said. "I . . . I was worried about you."

"So was I," he said with a wry grimace. Then the bitterness that had been building up came spilling out. "If you were really worried about me, why didn't you come out with me last night? Or at least monitor me from inside, ready to help if I got in trouble?"

Hazel looked startled. "What? I—"

"—didn't give it a thought," he finished for her. "Looks to me like you didn't care at all. You just hoped I'd do it all for you, while you sat inside and waited. Or maybe you just didn't have the guts—"

"Now just a minute!" she interrupted hotly. "That's not fair and you know it. I—"

Phil cut her off with a wave of his hand, trying at the same time to clamp a lid back on his own outburst. "Never mind," he said roughly. "What's done is done, and we don't have time to argue. We've got a real problem here and we're going to all have to keep our heads on to figure out what to do about it." He paused before dropping the bombshell. "I was kidnapped."

Two incredulous frowns across the seat back. Phil divided his attention between them and studying the ground they'd just left, looking in vain for any trace of what he'd seen during the night. "Kidnapped?" Hazel repeated, her anger seemingly forgotten. "How can that be? We're all accounted for, and—"

"Not us," he said. "There was somebody here before us. Natives, I suspect. And they're not happy with us."

A long silence, except for the whirring engine, accompanied by blank stares. "At least one species," he added after a while. "Probably two." He watched the ground below them. They must have been following something at least approximating the route of last night's wild ride, but he could see no evidence of it.

"How could we have missed them?" Hazel asked finally, frowning deeply. "We did careful scans when we arrived, and we've had satellites watching the surface ever since . . ."

"But we couldn't look for everything," Phil said. "Only what we thought of. And while the satellites have collected lots of data, we haven't had anybody scrutinizing most of it. I think it's going to turn out that a lot of what they do doesn't look much like the way we'd do it. I've only begun to see hints of the infrastructure, but you'd be surprised at what's down in the cracks in those fracture zones. I think most of what they do is hidden from the surface, and they only do it at night."

"I have to have another look," Hazel said suddenly, swinging the copter around to swerve back the way they'd come.

"Good," said Phil. He'd been concerned about the fact that they'd already been on a landing approach to Breakaway; he'd never been more than a few miles away, which was hardly surprising, and a copter covered such distances fast. "Take your time; look around. Breakaway is going to have to make some hard decisions fast, and it might be best if the three of us compared notes before we go home and open the floor."

They kept talking as Hazel doubled back and kept circling, looking at the general vicinity of the town where Phil had been taken and still seeing no obvious sign of such a thing. "Two species, you said," said Luk. "And those are . . .?"

"Otters and bats," Phil said. "Big ones, in both cases. The 'bats' may be the same kind you showed me dead in the windmill field. The 'otters' are bigger than the ones we saw along the coast, but smaller than us. And they seem to have some kind of symbiotic relationship. The town where they took me seemed to belong mainly to otters, but there were bats there too. And sculptures of both—"

"Town?" Hazel and Luk gasped in unison. Hazel added, "Maybe you'd better start at the beginning."

Phil tried, doing his best to condense the frightening ride and the show in the underground hall into a short, coherent, easy-to-follow narrative. He feared he wasn't too successful, and he kept reminding himself *not* to mention the "engine" he'd thought he'd

heard during the night. He needed all the credibility he could get.

"Something about our windmills bothers them," he said, trying to wrap things up. "I wasn't completely clear on what, but I think I got part of it. Our annoying little flyers are a food source for the big bats, and it seems the windmills kill bats both directly and indirectly by killing their food."

"It's not just the windmills," said Luk, looking pale. "Remember I told you how for a while we tried to exterminate the little flyers? Maybe we shouldn't . . . But why don't they just eat somewhere else? It's not as if we're doing that *everywhere*..."

"I don't know," said Phil. "But I think both bats and otters are a lot smarter than we'd like to believe. Maybe they think about the future. Maybe they think you grew your windmills on sacred ground." He frowned. "I don't even know which 'they' I'm talking about when I say that. And I don't understand why the *otters* care so much about a disruption of the *bats'* food supply, if that's their grievance." He made a frustrated shrug. "Anyway, they pantomimed destruction of our windmills." Analytical-Phil noted in passing that he'd said "our" instead of "your," something he might not have done yesterday. "I think they want us to do it—and if we won't, they're prepared to do it for us."

Luk looked aghast at the thought. Hazel just said grimly, "It's not that simple."

"Indeed it isn't," Phil agreed. "I tried to tell them I couldn't do anything but would talk to the rest of you, see what could be done—and they attacked me. I escaped well enough to call you and wait for you to come and get me, but I'm afraid I've created a seriously unstable situation. In my getaway, I hurt at least one otter, maybe seriously." He paused. "I suspect I'm about as welcome as a defendant who ran out of his own trial and slugged a cop to do it—except I'm an alien too, which probably makes it even worse. If they think anything like humans, their grudge may well extend to all humans."

"Oh, my," Hazel said softly. "That was a classic theme in the old science fiction I used to study: what to do about colonizing a planet with native intelligence. The classic options were to wipe them out, which the more civilized writers tended to regard as a highly distasteful last resort—"

"Of course," Phil muttered. "That's genocide. I'd want no part of it."

"—or to leave the planet as expeditiously as possible, to minimize contaminating the native culture. Sounds noble, but we don't have that option. The Gate doesn't work any more, and we never could use it in the other direction. That's what we get for using found technology that's past its prime, with no manual and nobody to tell us—"

"Could the otters be the Builders?" Luk asked suddenly. "Or the bats? Or their ancestors?"

"I suppose it's conceivable," said Phil, "but I doubt we'll ever know. Maybe someday things will settle down enough that we can look into it; I know I'd like to. But for now we have a much more immediate problem and we're going to have to do something about it fast."

"Yes," Hazel said with a wry hint of a grin. "And, dearly as I love them all, these are the kind of people who hold faculty meetings."

"This is going to take a lot of getting used to," said Phil. "We've been convinced we were unique for so long that we're out of practice at thinking about how we might deal with a non-human intelligence."

Hazel circled for a while without saying anything except, "I still don't see how a town can be hidden down there."

"We can't leave the planet," Luk said, "but we *could* leave the continent. Fold up Break-away and go back to Newtown—"

"That's a last resort, too," Hazel said firmly. "We still want to build a better human way here, and we have two incompatible ideas about how to do it. We need space. Besides, it wouldn't accomplish anything in the long run. Humans will multiply—especially your folks, Luk—and so will the natives. Even if there aren't any in New Gondwana, water crossing is bound to happen sooner or later. Contact is inevitable."

"But not in our lifetimes," Luk insisted. "If we all went back to Newtown, we could buy some time."

"Not as much as you think," said Phil. "Have you run the numbers? Besides, leaving problems for future generations to solve was a large part of how Solssystem got itself in such trouble. Our idea here was to lay good foundations from the start. I still think we should try hard to do that."

"Which means," said Hazel, still circling pensively, "we have to try to get to know the natives now, before the trouble gets out of hand. Contact has already happened; the only question now is what we can do about it. We need to talk. And that means we need a linguist—fast, before this becomes a clash of numbers."

Phil thought of Giselle and felt an ache. "Are there . . . others?"

"Not really," said Hazel. "A few amateur dabblers, but we need somebody with as much expertise as we can find."

The longest silence yet, since their take-off. Then Luk said, "I know one, back in Newtown. She's really good, but she's also really . . . zealous. Used to be a missionary. Would you guys want to bring her here?"

"We may not have a choice," Hazel hesitated a few more seconds, then turned the copter back onto a beeline for Breakaway. "We'd better get back and call a town meeting, pronto. Those guys Phil ticked off could be back as soon as tonight, and who knows what they'll do?"

VIII.

They started spreading the word as soon as they got back, and by lunchtime the gathering hall was buzzing. People drifted in at various times, saw the posted notice (if they hadn't already heard the rumor) of an urgent post-lunch meeting, and nobody left. Tables hummed with speculation, and people crowded around Phil and Hazel to ask what they'd found out. Well before the scheduled end of the normal lunch hour, everyone was finished eating and leaning forward in their chairs. Somebody started rapping on the table, and Hazel stood up and waved them to silence.

"Our visitor has news," she began, an inconspicuous mike picking up her voice and stretching it to fill the hall and the electronic minutes. "This affects all of us, and we're going to have hard choices. So listen up—and consider this an official gathering, with everything on record. Phil?"

She turned the floor over with a gesture, and he stood up and nodded to the assemblage. He'd washed up and changed clothes, but there was no hiding his battle scars. "As you can all see, it was a rough night." A scattering of uneasy laughter. "The good news is

that I've learned something we didn't know before, and it's definitely relevant to your problems. The bad news is that what I've brought back is mostly questions, and we don't have long to find the answers." He paused. "The central fact is this: you've got neighbors."

He'd never realized a crowd could gasp as one, but this one did. Then the gasp dissolved into a general agitated hubbub, from which shouted questions began to emerge. Phil held up his hands for quiet. "Please, friends. Let me give you some background before you try to ask questions. Last night, as some of you know, I did what you all warned me not to do, because I'd decided nothing else was going to work: I stayed out at night to see what happened. Well, plenty did. . . ."

He recapped the story of his adventure, much as he'd done for Hazel and Luk in the copter, finding a few new ways to smooth the telling. Nonetheless, just as with them, he had to fend off interruptions but tried to hold them to a minimum by promising to cover everything he could and take questions when he'd finished. "The decisions we have to make," he concluded a few minutes later, "sound simple enough, but making them won't be easy. Do we do what the natives want, and stop using the windmills? If we do, can we keep living here? Or should we close up shop, leave this place to the ones who were already here, and head back to Newtown?"

"Hell, no!" a harsh male voice yelled from the back of the hall. "We've put a lot of work into this place, and what's happening in Newtown is completely unacceptable. We're not giving up our hard-earned gains for some primitive creatures—and we're not hurting them anyway!"

"Actually," Phil said carefully, "they made a pretty good case that we are." This time he was careful to use "we" rather than "you." "And they may not be nearly as primitive as you think."

"And if that's the case," a woman near the left wall said in a more thoughtful tone than the first speaker, "we'll have to be careful how we treat them. But this is so confusing—we didn't think there *was* anybody else. How could we have known?"

"Can't we set things up so that they just won't run into the windmills?" a younger man asked.

"Maybe we *will* have to leave," said another woman, near the opposite wall. "If these are intelligent beings like us—"

The younger man spoke again. "What if we shut the windmills down just for a while, as a gesture of good will, while we try to learn more about who these beings are and what they—"

"They're *aliens!*" the "Hell, no!" guy interrupted. "And they're a threat to us. What do you think we're going to do? Sit down to tea with them and have a bit of a chat? I say—"

Hazel rapped sharply. "One at a time!" she shouted, sharply enough to command silence. "You, Corcovan, can say your say after Smanik has finished his. And don't any of you forget that this is an official gathering and I called it—so I'll moderate it." She turned back to the young man he'd interrupted, who Phil now noticed had an improbable combination of red hair, freckles, and a deep tan. "You were saying, Mr. Smanik?"

"Thank you, Madame Chairman. I was only saying that maybe we *should* try to talk them, and I don't think dismissing the idea with gratuitous sarcasm will accomplish anything. I think we should be considering *how* we might talk to them. Phil, you were among them. You heard them talking among themselves, and they got at least some information across to you. Any idea where we might go from here?"

"They didn't get much across," said Phil, "but we didn't spend much time at it, either. I don't expect it to be easy. I don't think either the 'otters' or the 'bats'—and we'd better come up with better names for them soon—can make our speech sounds, and we can't make theirs. But linguists have ways around that these days—"

"Which have never been tried on nonhumans, for obvious reasons—" Corcovan broke in.

Hazel cut him off. "*Mr. Corcovan, you will wait your turn.*" She turned back to Phil. "You were saying?"

"I was saying," Phil said levelly, "that linguists now have analyzers and synthesizers that can process and make any kind of sound you want. And neural-net systems that can watch and listen to interacting beings and learn rather quickly to correlate meanings and utterances."

"Rather quickly," Hazel agreed, "though nowhere near as quickly as in most of the old stories. If we go that route, it will take time. We'll need patience."

Corcovan, a big, burly fellow with shaggy salt-and-pepper sideburns, was making a great show of asking to be recognized in strict accordance with the rules of order. Hazel noted that, but before doing so, asked, "Mr. Smanik, do you have anything to add?"

"Not at the moment," said Smanik, looking satisfied.

Hazel nodded toward Corcovan. "Mr. Corcovan?"

Corcovan stood up and bowed all around. Then he said, "Do we *have* time? Will these so-called otters and bats have the patience you say *we* must have?" He paused. When nobody answered, he added, "I hardly need to point out that we've lost our only linguist. Even if we hadn't, I'd say, why bother? These beings you've inconveniently found are a clear and present danger to us, and our own survival and welfare have to be our top priority. What we need to do is a preemptive strike—wipe them out before they cause us real trouble."

"There's a very ugly word for what you're suggesting," Phil said in an almost threatening tone, aimed unmistakably at Corcovan personally. "Even if most of us were willing to consider it—which I sincerely hope we're not—what makes you think we could pull it off without knowing a lot more than we do?"

He addressed the entire assemblage. "Look, people, you brought me here from the other side of the world because you wanted my opinion as an objective outsider. So I'm going to give it to you. Neither preemptive genocide nor just giving in and leaving, or even abandoning the windmills, is a good idea. Let's take a look at each of them.

"If we tried Corcovan's 'get-them-before-they-get-us,' we have very little idea what we'd be up against. We don't know how big this town they took me to is, or how it works, or whether it's in communication with others. We have no idea what would be the best way for us to strike, or how they might retaliate.

"On the other hand, if we just capitulate and do what we think they want right away, with no discussion—without even being sure we

understand the request—that could show weakness and invite *them* to make a preemptive strike, if they think that way and have the strength. We can't afford to do that—and it may not be necessary.

"Moreover, the technology we depend on to live in this alien place is fragile. You've already recognized that; it's why you've encouraged Luk to develop his windmills. But we can't count on either the windmills or our other tech to keep going forever. Someday we may have to do without any or all of it—"

"That's one way the Second Wavers have an advantage," Luk added. "More people to do more jobs."

"Right," Phil nodded. "A trade-off we knowingly made and accepted. But if we're determined to stay here, in our smaller numbers, and make it without them, we may someday have to depend on native help, if it's available."

He let that sink in for a few seconds, then gestured for quiet again. "So I think you can see what our immediate course has to be. We can't make the 'preemptive strike' Mr. Corcovan would like, not only because most of us would find it morally unacceptable, but because we don't know what we'd be up against. We can't just shut down the windmills because it would be seen as a show of weakness. We have to keep them running, at least for now—and we have to stop being afraid of the dark, and get out there and guard them."

"Last but far from least, we have to learn more about them—as fast as we can. And that means, as Mr. Smanik said, we need a linguist."

He stopped and waited. The hall grew very hushed, and the hush stretched on. Finally somebody, perhaps the woman who had first lamented that the situation should be so confusing, said, just loud enough to be heard, "But we've lost Giselle. She's the only one we had."

Phil and Hazel let the silence stretch a little longer. Then Luk said, "I think most of us know another. Not here, not in Breakaway, not now. But she could be." He paused to let them figure it out for themselves.

Finally the woman near the left wall spoke again—quietly, tentatively, as if she couldn't quite believe that the only thing she could think of to say was what she should say. "Calantha McQuade?"

Luk nodded. "Yes. She knows her stuff. Maybe we can persuade her to come to Zo for a visit."

An agitated murmur swept the room, above which Corcovan bellowed, "Why would we want *her* here? She'll be nothing but trouble!"

"Because we need her," Hazel said quietly but clearly. "Because she has knowledge and skills that may mean survival for us."

"But we moved across the ocean to get away from her kind," Corcovan persisted.

"Times change," Smanik called out. "She may not be our first choice, but she's our only choice. And we need her soon. We can't waste a lot of time arguing about it."

They argued anyway, of course; but Hazel, Phil, and Luk managed to keep the bulk of the debate under an hour. In the end, the conclusion was inevitable. Only details were still in doubt. "This isn't over yet," Phil cautioned when things seemed to be winding down. "We still have to make her want to come, and we have to make her want to stay. It may not be easy, in more than one way. But we all have to remember that we need her."

"And even if she agrees to come," Luk added, "she won't be able to get here right away. I'll call her as soon as we're through here, if we have a consensus. But we're going to have to get through at least one night without her—and with angry neighbors. And it may be more than one night."

"Which means," said Hazel, "some of us are going to have to spend tonight outside, on guard duty. Those who do, are going to have to resist the temptation to fire on any visitors unless there's absolutely no alternative. Anybody want to challenge me on that?" Her gaze swept over the assemblage, beginning and ending with Corcovan as if daring him to defy her. "Okay, then, let's get this show on the road. Luk, I believe you have a call to make. The rest of you, stay put. We have to draft some soldiers and some ground rules."

Luk made something that might have been viewed as a salute. "I'll get right on it," he said, and slipped out of the room.

And everybody else, with a new kind of grimness, got down to business. ■

To be continued . . .



67P/Churyumov-Gerasimenko

Reflected in Rosetta's eye,
the shiny tailfin of a distant traveler,
jutting from the smooth base region
of the comet, its fuselage buried,
its alien captain and crew preserved
like ants in a snowball, waiting for
for an atmospheric thaw.

—G. O. Clark

Alien Altercations: Star (Spanning) Wars

Edward M. Lerner

Science fiction is replete with tales of human/alien conflict. Such stories go back at least to 1898 and *The War of the Worlds*, H. G. Wells's novel of Martians invading Earth. The inter-species aggression ran both ways, of course. In Olaf Stapledon's 1930 epic *Last and First Men*, far-future humans, in the process of terraforming Venus, obliterate a species of intelligent aliens.

Both novels were written when intra-Solar System neighbors seemed a credible possibility. Leading astronomers of the 1890s, employing the finest telescopes of the era, reported evidence of "canals" and seasonal—dare they to believe, agricultural?—changes on the Martian surface. Until the 1962 Mariner mission flyby, hope remained that the bright clouds shrouding Venus were water vapor, and that

the unseen surface of Earth's so-called sister planet hosted a life-rich environment.

And now? Spacecraft and improved astronomical instruments tell a quite different story. Any intelligent beings with whom we may share the cosmos most likely reside *far* away. Interspecies contact, if it happens, will be interstellar contact.

Science fiction has adapted. On screen, popular SF franchises rife with interstellar, inter-species conflicts include *Star Trek*, *Star Wars*, and *Stargate*. War involving extra-solar aliens figures prominently in the novels *The Forever War* (Joe Haldeman), *Bill, the Galactic Hero* (Harry Harrison), *Ender's Game* (Orson Scott Card), and the long-running Man-Kzin War series (Larry Niven, et. al.). Interstellar, inter-species war has become such a genre

commonplace it sometimes serves as mere set-up for the *real* story, as in the novelette “All the Things You Are” (Mike Resnick).

As discussed earlier in this science-behind-the-fiction essay series, to travel between stars is tough.¹ Suppose, nonetheless, that ways exist to overcome the challenges (and the cited article suggests possibilities). Is interstellar warfare possible?

If (or, being an optimist, when) humanity masters the technology to reach and settle other solar systems, the potential would surely exist for human/human interstellar conflict. Any technology that transports explorers, colonists, and diplomats to the stars can as readily convey weapons and warriors.

Given warfare’s ubiquity across recorded human history—and in our daily news—the burden of proof would seem to rest with anyone predicting different behavior. Why wouldn’t interstellar-capable humans sometimes use violence to seize an advantage or to resolve disputes? Our technology ever changes faster than our basic nature.

This essay, as its title suggests, poses a narrower—and more speculative—question. Might humans and aliens (or two groups of aliens) engage in warfare? The question presupposes that (a) interstellar travel is practical and (b) intelligent aliens exist.

In addressing our topic, we’ll draw upon terrestrial biology, social sciences, and human history. And so, this essay will be less definitive—certainly, less mathematical—than many articles in *Analog*. We won’t, alas, have the benefit of psychohistory: the fictional predictive science, a synthesis of the social sciences, statistics, and historical analysis, that underpins Isaac Asimov’s epic Foundation series (the earliest episodes of which first appeared in the pages of *Astounding*).²

As our purpose is to establish the feasibility, not the certainty, of an alien behavior, qualitative analysis—and insights from SF—will suffice.

Definitions

The nature of warfare has varied over recorded history (during most of which the annals of warfare *were* recorded history). We can scarcely preclude the possibility warfare will assume new forms on distant worlds, in the depths of space, or as practiced by alien intelligences. How, then, shall we define and constrain our topic?

The first meaning of *warfare* (from *Dictionary.com*) is, “the process of military struggle between two nations or groups of nations.” In an era of unrelenting, violent conflict with non-state actors like al Qaeda, that definition seems almost quaint. The second, more general, meaning offers, “armed conflict between two massed enemies, armies, or the like.” The latter definition also seems too restrictive.

Consider, for example, *guerilla warfare*: violent resistance against conventional (massed) armies via unconventional, hit-and-run tactics.³ The modern generalization is *asymmetrical warfare*, in which dissimilar opponents leverage their strengths and exploit each other’s unique weaknesses. Suicide bombers, hijacked jetliners, and roadside improvised explosive devices are too familiar instruments of asymmetrical warfare. During the (first) Cold War, chemical, biological, nuclear, and electromagnetic-pulse weapons were seen, by one side or the other, at one time or another, as asymmetric counters to imbalances with the military capabilities of the opposing side.

More recently, consider the targeting of military satellites.

¹ “Faster than a Speeding Photon: The Why, Where, and (Perhaps the) How of Faster-Than-Light Technology,” January/February 2012 *Analog*.

² *Analog* regular and professional statistician Michael F. Flynn took a crack at characterizing such a science in the two-part “An Introduction to Psychohistory.” Although his April and May 1988 articles offered tantalizing glimpses of ways to forecast selected incidents of organized violence (e.g., the predictability of African *coup d’état* attempts, a cyclic pattern of wars gleaned from the annals of Imperial China), even a mature psychohistory would not—pre-First Contact, anyway—be calibrated to illuminate the behaviors of aliens.

³ Notable examples of guerilla warfare include partisans resisting Napoleon’s armies in occupied Spain and, a century and a half later, Viet Cong battling American and South Vietnamese armies.

“Aware of the US dependence on space and satellite communications to conduct even the most basic military operations, the PLA (People’s Liberation Army) has for the past decade invested significant amounts to develop anti-satellite weapons. In January 2007 China fired its first anti-satellite missile destroying one of its own aging satellites in outer space. In May 2013 China fired a rocket carrying no payload over ten thousand kilometers into outer space, the highest launch since the mid-1970s. The absence of a payload such as a satellite could suggest the rocket is designed as an anti-satellite weapon.”⁴

From recent headlines, consider *cyberwar*. The preemption or the denial of computer-reliant critical infrastructure is an emerging tactic of asymmetrical warfare.⁵

Just as cyberwarfare need not lead directly to deaths, physical combat may avoid lethal force. The U.S. military briefly deployed to Afghanistan a heat-ray-based, nonlethal, area denial system; development of the technology continues.⁶

It’s a safe bet we haven’t seen every mode of conflict that human societies or alien intelligences might ever imagine.

For the remainder of this article our working definitions are:

Warfare: the large-scale application of violence, or the coercive threat of such application, by one organized group against another.

Violence: inflicting material harm, whether directly (e.g., through impact trauma, directed energy, or biological agent) or indirectly (e.g., by denial of critical infrastructure).

* * *

Nowhere in these definitions: constraints on how a conflict is waged or any requirement for parity between sides. Nor need we address specific weapons that might be used or the tactics that might be employed (which is fortunate, given how expansive those speculations could get).

That’s the *what*. Next up: *why* are there wars?

Biology

Natural selection. The survival of the fittest. “Nature, red in tooth and claw,” as Alfred Lord Tennyson put it, several years *before* Charles Darwin published his theories.

Evolution and its processes are the unifying theme of modern biology. Competition as the driver of evolution is so deeply rooted that biologists continue struggling to explain altruism.⁷

Evolution has produced predators up and down the tree of life, from viral bacteriophages that replicate within and destroy individual bacteria to carnivorous sponges (family Cladorhizidae) that dine on crustaceans to the T. rex (dining on anything it wanted) to the sperm whales that prey on giant squids. Nor is hunting limited to the animal kingdom, as carnivorous plants such as the Venus flytrap attest.

Rustling up dinner, even a dinner that fights back, isn’t warfare—although it’s a step in that direction. Many predators, from wolves to dolphins to butcherbirds to (speculatively) velociraptors evolved to hunt in packs. Many prey species band together for protection—and some aggressively defend themselves (e.g., the mobbing behavior of red colobus monkeys and many bird species).

Many animal species, including those that form cooperating groups, are territorial; they will battle their own kind—and related

⁴ “The Dragon’s Spear: China’s Asymmetric Strategy,” *Yale Global Online*, October 174, 2013, <http://yaleglobal.yale.edu/content/dragon%E2%80%99s-spear-china%E2%80%99s-asymmetric-strategy>.

⁵ “‘Asymmetric Warfare’: Pentagon Accuses China of Cyber Attacks and Espionage,” *Global Research*, May 9, 2014, <http://www.globalresearch.ca/asymmetric-warfare-pentagon-accuses-china-of-cyber-attacks-and-espionage/5334452>.

⁶ http://en.wikipedia.org/wiki/Active_Denial_System.

⁷ As suggested by the forthcoming (as I type) *Does Altruism Exist?: Culture, Genes, and the Welfare of Others (Foundational Questions in Science)*, by evolutionary biologist David Sloan Wilson.

species—over turf. Or in the case of dolphins, over surf.⁸

Some of our simian relatives wage such battles, although anthropologists argue whether these conflicts reflect territoriality, competition for mates, or innate aggression.⁹ (That's like scholars debating the causes of the Trojan War, come to think of it.) Nor is human aggression necessarily recent: that Cro-Magnons killed off our Neanderthal cousins is at least one plausible extinction hypothesis.¹⁰

But wide-ranging, cast-of-thousands, no-holds-barred combat? That's a human invention, surely. Consider this account:

"The raging combatants form a blur on all sides. The scale of the violence is almost incomprehensible, the battle stretching beyond my field of view. Tens of thousands sweep ahead with a suicidal single-mindedness. Utterly devoted to duty, the fighters never retreat from a confrontation—even in the face of certain death. The engagements are brief and brutal. Suddenly, three foot soldiers grab an enemy and hold it in place until one of the bigger warriors advances and cleaves the captive's body, leaving it smashed and oozing."

That's the description of a war among ants.¹¹

It's difficult to imagine that the evolutionary processes that repeatedly led to predation, intergroup aggression, and warfare on Earth won't ever produce those traits in extraterrestrials.

Even where nature is green of tooth and claw.

Social Sciences

Biology isn't (entirely) destiny. We *homo sapiens sapiens* (twice wise, or so we flatter ourselves) learn and adapt—if not yet sufficiently to have stopped slaughtering one another.

What have social scientists told us about the origins of war? Psychologist Steve Taylor of Leeds Metropolitan University offers us a run-down, synopsized in this section.¹²

William James, the first psychologist to publish on the topic, identified societal incentives, like the sense of coming together before a common threat, and personal benefits (if you survived!) like the sense of heightened alertness and the opportunity to exhibit discipline and self-sacrifice.

Some evolutionary psychologists infer that a propensity toward violence, including war, is inherent among humans. Steven Pinker, for example, in *The Better Angels of Our Nature*, points to statistical declines in the frequencies and types of violent incidents (which isn't the same as reduced fatalities per war!). Pinker asserts the progress in recent centuries is too rapid to be rooted in a change in human nature. If the antidotes to violence are cultural, then the propensity to violence must be innate.

Some sociobiologists—founder of the field E.O. Wilson prominently among them—like-wise consider warfare innate.

Some biologists, noting a correlation between levels of testosterone and aggression, blame men. Thomas Hayden and Malcolm Potts (the latter an evolutionary biologist) suggest "that the male sex hormone,

⁸ "Dolphins are 'so hungry they're turning on each other': Surf war breaks out in British seas," *Daily Mail Online*, 3 September 2008, <http://www.dailymail.co.uk/sciencetech/article-1051936/Surf-wars-Dolphins-hungry-theyre-turning-British-seas.html>.

⁹ "What Is War Good for? Ask a Chimpanzee. What apes and monkeys can teach us about the roots of human aggression," *Slate*, 19 October 2012, http://www.slate.com/articles/health_and_science/human_evolution/2012/10/chimpanzee_wars_can_primate_aggression_teach_us_about_human_aggression.html.

¹⁰ http://en.wikipedia.org/wiki/Neanderthal_extinction

¹¹ Battles among Ants Resemble Human Warfare: Battles among ants can be startlingly similar to human military operations," *Scientific American*, December 2011, <http://www.scientificamerican.com/article/ants-and-the-art-of-war/>.

¹² "The Psychology of War: Why do human beings find it so difficult to live in peace?," *Psychology Today*, 5 March 2014, <http://www.psychologytoday.com/blog/out-the-darkness/201403/the-psychology-war>.

testosterone, is in some ways the ultimate weapon of mass destruction.”¹³

Psychologists and economists alike note that war offers an opportunity to accrue wealth (perhaps as territory or resources), prestige, and power.

Then there is the matter of group identities—and exclusions. You can doubtless recall a war or three initiated in defense of, or against, a particular nation, race, tribe, ethnicity, or religious denomination. Many such conflicts are underway as I type, and, I venture to predict, many will be ongoing as you read this.

Perhaps our compulsion to war is something cultural. (Some) anthropological studies suggest that primitive hunter-gather societies are less prone to murder and violence than are their “civilized” counterparts. Maybe isolated groups haven’t yet *invented* war.

In short: the social sciences offer no single, conclusive answer. That’s all the more reason to speculate similar factors might stimulate aliens, too, to wage war.

History

So much for theory. What does practice—history—teach about the origins of wars? That centuries, and even millennia after particular events, scholars seldom agree.

Let’s examine some commonly ascribed origins for a few well-known wars. (I will almost certainly omit an example you would have chosen, or the cause you find compelling. That’s okay—and in a way, my point.)

Two recent blockbuster movies (*300*, about Spartans fighting to the death at Thermopylae to delay a Persian land invasion, and *300: Rise of an Empire*, about the Athenian-led Hellenic navy routing the Persian navy at the Battle of Salamis) popularized, with considerable artistic license, the main bouts of the Second Persian War. Did Persians armies cross the Hellespont into Europe in 480 BCE to gain territory, subjects, and tribute? Or was the invasion about securing an unruly border? Did Xerxes, the Persian emperor, set out personally to destroy Athens in retribution for its

humiliation of his father, the emperor Darius, ten years earlier in the *first* invasion? Or did Xerxes strive to keep busy—and remote from his capital city—the military resources of his many subject peoples?

You’ll find historians to support any and all those possibilities.

Did Aegean city-states opposing Xerxes view the Persian onslaught as a clash of civilizations? Yes. To the early Greek mindset, the world consisted of Hellenes and barbarians. But *other* Hellenic city-states (and not merely Persian tributary states) sent warriors and warships to fight for Xerxes. Personal advisers to Darius included politicians exiled from Athens and Sparta, expecting to reclaim power at home as tributary rulers following a Persian victory.

Was the American War of Independence about self-governance (“No taxation without representation”)? Or was the conflict about the taxes themselves, following the recently concluded, world-spanning, very expensive, Seven Years’ War between France and Great Britain? Did France support rebellious Americans with arms and armies out of sympathy some aristocrats felt for the colonists’ cause? Or did Louis XVI seek revenge against Great Britain over his recent surrender of New France (aka, Canada)?

Likely all of the above.

The (first) Cold War—with its hot proxy conflicts and regional wars—was a clash of governance and economic ideologies. It *also* involved longstanding historical grudges, territorial ambitions, aspirations of self-determination, and religious rivalries.

We’ve not exhausted the list. Wars have been attributed to: maintaining the balance of power, protecting the free flow of trade, honoring treaty obligations, obtaining resources, denying a rival resources, inter-ethnic antipathies, and humanitarian interventions. Stirring up trouble with an external enemy is a time-honored way to drum up domestic support or justify domestic suppression (check out the spike in Vladimir Putin’s popularity among Russians once his intervention in the Crimea began).¹⁴

¹³ “Make Birth Control, Not War,” Thomas Hayden and Malcolm Potts, *Pacific Standard: The Science of Society*, April 12, 2010, <http://www.psmag.com/magazines/pacific-standard-cover-story/make-birth-control-not-war-11399/>.

¹⁴ “Putin’s move on Crimea bolsters popularity back home,” *USA Today*, March 19, 2014, <http://www.usatoday.com/story/news/world/2014/03/18/crimea-ukraine-putin-russia/6564263/>.

And what is the role of the occasional charismatic (or crazy?) figure able to bend others to his will (or, in a competing interpretation, to provide the nucleus around which the popular will coalesces)? How might history have differed absent Alexander the Great, Joan of Arc, El Cid, George Washington, Napoleon, Hitler, Mahatma Gandhi, or Saddam Hussein?^{15, 16}

Finally, no matter what one side of a conflict may claim, the opposing side will claim self-defense. Even (especially?) when that second side strikes preemptively.

Bad habits outgrown?

Still, depending on how you count conflicts, we humans are becoming less warlike. And the nations of western Europe, bitter enemies for centuries, have been at peace since the end of World War II.

Are we outgrowing belligerence? Might aliens, too?

Well: the same post-WW II era witnessed the Cold War. Ethnic or tribal wars raged in Nigeria and Rwanda, Lebanon and Syria. Yugoslavia shattered bloodily apart into, so far, seven nations. Turkey invaded and partitioned Cyprus. War has been common across the Middle East. France waged colonial wars in Algeria and Indochina. Post-Soviet Russia has invaded Georgia, Moldova, and Ukraine. Great Britain and Argentina fought over the Falklands. And on, and on.

Suppose that, however you count and give weight to particular conflicts, you conclude the trend *is* toward fewer wars. To what can one attribute the decline, and can we extrapolate anything about the peace- or war-loving nature of intelligent aliens?

Some assert that democracies are less likely to fight than other forms of government, that the will of empowered citizens suffices to resist unpopular wars. Others would claim

only that democracies don't fight one another. Suppose either theory is valid (conflicting evidence to the contrary).¹⁷ Democracy is no more inevitable and no less reversible than Marxist predictions of a dictatorship of the proletariat followed by an egalitarian, classless, socialist state.

If democracy—or another sociopolitical organization, yet unimagined by we mere humans—is an antidote to war, nothing says aliens will adopt or retain that form of government.

It's a mad, mad, . . . MAD world

Soon after the August 1914 outbreak of hostilities in Europe, H. G. Wells (in this context, an essayist) labeled that conflict, "The War That Will End War." Woodrow Wilson adopted the sentiment, declaring, "I promise you that this will be the final war—the war to end all wars."

The mass slaughter of trench warfare turned out not to make war unthinkable. Neither did the earliest weapon of mass destruction: mustard gas. Nor did the death toll, in the tens of millions (estimates vary).

Hence, we came to know that conflict as the *First* World War. The second produced even higher body counts.

Has nuclear deterrence—enshrined in the strategy of Mutual Assured Destruction, enforced by dread of life-obliterating nuclear winter—deterred war? The argument for: humanity hasn't (as yet) blown ourselves away. The argument against: we've expressed our rivalries in other, still lethal forms of warfare. The MAD doctrine that deters a first use of nukes may enhance the ability of nuclear powers to deploy other, perhaps only slightly less destructive, weaponry.

Trust the process

Aliens are, well, *alien*.¹⁸ Who are we to predict their motivations?

¹⁵ In *War and Peace*, Tolstoy offers (depending on the edition) several embedded essays/digressions or one *long* appendix about the Great Man theory of history. On the same topic but much lighter reading, consider H. Beam Piper's *Lord Kalvan of Otherwhen* (the novelization of two *Analog* stories: *The Gunpowder God* and *Down Styphon*).

¹⁶ Not even far-future psychohistory could anticipate the ripple effects of the one-of-a-kind, psychically gifted mutant, the Mule. See Asimov's *Foundation and Empire*.

¹⁷ On the one hand, see http://en.wikipedia.org/wiki/Democratic_peace_theory. On the other hand, see http://en.wikipedia.org/wiki/List_of_wars_between_democracies.

¹⁸ As I discussed at considerable length in "Alien Aliens: Beyond Rubber Suits," in the April, 2013 *Analog*.

Long-time students of the forces of nature, that's who.

First, the trivial case: Aliens could be just like us. After all, *we* turned out to be possible.

However.

It was a long, twisty road from the primordial ooze to us, a road randomly—and repeatedly—rerouted. By asteroid impacts. Volcanic super eruptions. Ecological crises.¹⁹ The drift (and, on occasion, collision) of continents. Perhaps, from across light-years, the sterilizing zap of a gamma ray burst.²⁰ So: without doubting that the fittest survive, who *is* the fittest at any given moment depends upon circumstances that can change without warning.

Hence, the far more likely case: they *aren't* like us. And yet, there's much we can say about life and intelligences that might emerge elsewhere.

The vast preponderance of evidence suggests that physical processes—the chemical properties of the elements, say, and the gravitational attraction between a planet and its sun—are universal. Physics and chemistry everywhere follow the rules seen on Earth and throughout the Solar System.

What about biology do we infer will be universal? The *process*.

Imagine a world of methane seas, its natives resembling the love child of a parrot and squid. What can we predict?

That their world is subject to the implacable and capricious forces of nature. That useful minerals, energy sources, and nutrients are in

short supply—because plant and animal (and whatever else they have) populations will expand until shortages are a certainty. That life on that world—including the presumed intelligences atop the food chain—was sculpted by these impersonal and patient processes of evolution. That the aliens' social groupings and institutions survive because they successfully handled competitive pressures, both inter- and intra-species, resource scarcities, and a changing climate.

Sounds like our roots, doesn't it?

Why wouldn't we expect the parrot/squids to have evolved many of the same *behaviors* as humans? Seizing what one can from those unable to keep it for themselves. Dominating rivals. Eliminating rivals.

Perhaps, even, a propensity to war.

To bee (or not to bee)

Might not aliens emerge so different from us that they exhibit quite nonhuman behaviors? It's hard to preclude that possibility, on some world Out There.

Such behaviors aren't necessarily without earthly precedent.

Consider intelligence evolved from some alien analogue to terrestrial social insects.

Humans exhibit—and have exponentially extended—the aggressive behaviors of some primate relatives. It's no big stretch, therefore, to imagine alien hive intelligences that extend warlike behaviors like those of terrestrial ant colonies.

¹⁹ Here's an eco-crisis for you: the Great Oxygenation Extinction.

The foundations were laid, about 2.5 billion years ago, with the emergence of photosynthesizing life. For the next 200 million or so years, dead organic matter and the ocean's dissolved minerals chemically captured oxygen exuded by the newfangled cyanobacteria. Finally, the ocean reached its oxygen-absorbing capacity. And then, in a geological eye blink, oxygen toxicity extinguished most oldfangled, anaerobic life.

That's also when free oxygen began accumulating in Earth's atmosphere. Earth's primordial atmosphere was rich in methane: far more potent as a greenhouse gas than carbon dioxide. But methane oxidizes into carbon dioxide and water. . . .

And thus, patient cyanobacterial hordes *also* triggered a snowball-Earth era, possibly the longest ever, lasting 400 million years.

²⁰ *Something* caused the Ordovician Extinction Event, about 450 million years ago, in which an estimated sixty percent of marine invertebrates—life hadn't yet made the jump to land—went extinct.

One theorized cause of the OEE is the intense blast of a gamma ray burst. GRBs are among the brightest events (if you could see gamma rays) in the Universe. Some supernovae produce GRBs, as can the catastrophic collision of binary neutron stars.

Or alien hive minds might mimic the wily tactic of some bees. Small groups of Africanized bees (aka, “killer bees”) are known to subvert European honey bees. Their technique: invade the competitor’s hive, kill the queen, and replace her with their own.²¹ Call it the apian version of a decapitation strike.²²

Even less like us

What of beings entirely unlike any terrestrial species? Extrapolation from terrestrial behaviors may become untenable if extended to, for example, a planetary consciousness, creatures of pure energy, or aliens native to Oort Cloud objects. Once we concede that life might take such exotic forms, surely humility requires admitting that we cannot hope to predict how they behave.

Or not.

Anywhere random processes—cosmic rays, solar flares, choose your poison—may regularly intrude (which is everywhere), even the most exotic life forms must experience their disruptive influence. Anywhere the resources critical to life—energy? nutrients? solvents? catalysts?—are limited (again, that’s everywhere), logic further suggests that even the most exotic life forms will compete. On what basis would one preclude the emergence of such familiar competitive stratagems as hiding, hunting—and war?

Would these exotic creatures and humans, if we should stumble upon one another, find reasons to battle? Our needs and interests might be so dissimilar—despite independently evolved abilities to fight—that we’d have nothing to fight about. It’s a pleasant thought. It might even be so—if, on one side or the other, extreme differences don’t *trigger* conflict. Among humans, a xenophobic reflex has often sufficed to cause conflict or justify exploitation.

But maybe we and the exotic aliens differ so extremely that we don’t recognize one another.

If you’ll pardon the ironic choice of metaphor, do we then dodge the bullet?

Maybe not. In Card’s *Ender’s Game*, humanity and aliens fall into conflict *precisely* because the telepathic, hive-like Buggers don’t recognize nontelepathic humans as an intelligent life form.

What if the exotic aliens were made, not evolved? Suppose the aliens were uplifted from some pre-sentient form, bypassing blind evolution on a shortcut to intelligence. Might *those* aliens sidestep warlike attitudes?

Perhaps. If the creators (note the lower case) edit aggression from their creations. If deselected traits don’t lurk in the gene pool to reemerge later. If natural forces—random variation; scarce resources—don’t reverse engineered changes. If none among the creator species ever exploits, suppresses, or otherwise abuses their docile creations—and so teaches them undesired behaviors. If the created species, applying its newfound intelligence, doesn’t invent resistance and rebellion.

Children *don’t* always do as their parents wish.

And if the created “species” are robotic, not life in the conventional sense? *Battlestar Galactica*’s Cylons (“Death to humans”) and Fred Saberhagen’s Berserkers (“Death to life”) rush to mind.

A sense of honor?

Some science fiction reads like Horatio Hornblower²³ in space: navies of similar capabilities slugging it out. Although David Weber’s “Honorverse” is home to its share of alien races, they’re low-tech non-antagonists, leaving Honor Harrington (notice her initials) of the Royal Manticoran Navy to duke it out against human navies of similar capabilities.

If humans encounter intelligent aliens, it might happen that we and they deploy very similar technologies. But even neighboring stars may differ in age by billions of years.

²¹ “Seasonal nest usurpation of European colonies by African swarms in Arizona, USA,” *Insectes Sociaux*, November 2004, <http://link.springer.com/article/10.1007%2Fs00040-004-0753-1>.

²² Decapitation strike: the (as yet untried) strategy of a no-warning nuclear attack against an opponent’s command-and-control centers, with intent to severely degrade the opponent’s ability to counter-attack.

²³ Hornblower is the protagonist in many of C. S. Forester’s historical novels, the Royal Navy officer through whose eyes readers experience the Napoleonic Wars. Great stuff.

What are the odds (*Star Trek* notwithstanding) that we and those aliens will have very similar technologies?

If we and they have a conflict (more reasons for that coming up), might a technology mismatch prevent conflict? Will some honor code among intelligent species—we only pick on our technological peers—dissuade the stronger from dominating the weaker?

Perhaps, but we'd be foolish to expect it. Predators pick off the weakest of the herd. Cortes used his technological superiority (firearms, horses, and personal armor) to conquer the Aztecs. Across Africa, Asia, and the Pacific, nineteenth-century Atlantic powers grabbed territory and trading concessions from lower-tech indigenous powers. Mussolini turned tanks and airpower against Ethiopian troops armed largely with spears.

Perhaps advanced civilizations follow some *Star Trek*-like Prime Directive, not disclosing themselves to, much less dominating, species whose abilities have yet to reach a suitably high standard.

Could be. It's also conceivable that, seeking advantage, some spacefaring civilizations will *force* contact. Just as, not two centuries ago, elements of the U.S. Navy forced the long-isolationist Japan to reengage with the world.

Limited war

Do the physics/math, and any entity that controls the energies required to travel among stars has the capability to destroy worlds. In a no-holds-barred, existential face-off, worlds may *be* destroyed. In any lesser dispute—a mercantile disagreement perhaps, or an armed contest to dominate the population of a world—cooler heads (or whatever) may prevail. Human experience in the Cold War is that Mutual Assured Destruction discourages the use of nuclear weapons; MAD may similarly discourage the blowing up of planets.

If so, battles for control of planetary resources and populations (in some instances, at least) will become—however unequal—battles *on* the planets.

Allies and sepoys and cannon fodder, oh my

Science fiction often pictures armies transported across interstellar space to wage war upon another species (just as, in human wars,

the principals may cross oceans to slug it out head-to-head). Examples include *Starship Troopers* (Robert Heinlein), the aforementioned *Forever War*, and *Footfall* (Larry Niven and Jerry Pournelle).

But human conflicts, especially lower-intensity ones, often draw in other combatants. The Romans used units of native auxiliaries, though wisely (until late in the Empire, anyway) auxiliaries were never as well armed and trained as citizen legionnaires. The Ottoman Empire enslaved and indoctrinated non-Muslim boys to produce its corps of Janissaries. Amid the world-spanning Seven Years' War, both the British and the French had Native American tribal allies (hence the North American aspects of the conflict are known in the United States as the French and Indian War). The British East India Company recruited local forces, too: the sepoys. (A nasty bit of business, the Sepoy Rebellion. Eh, wot?)

Mercenaries are another time-honored human military tradition. Greek mercenaries fought for Xerxes at Thermopylae. Not many years later (as survivor Xenophon famously recounted in *The Persian Expedition*), a Greek mercenary army in the hire of an ambitious Persian satrap invaded Persia. Many a medieval feudal lord hired Free Companies of mercenaries as needed, avoiding the expense of a standing army. George III of Great Britain employed German mercenaries (the Hessians) in his vain effort to suppress the American rebellion. During the last/pre-ISIS Iraq War, American private military contractors like Blackwater USA (as that company was known before name and ownership changes) provided extensive security and troop-training services—that on several occasions devolved into combat and controversy. As I type, mercenaries help to fill the regime's ranks in the Syrian civil war.

SF likewise envisions future wars prosecuted—in whole or in part, willingly or unwillingly—by third-party troops. In *Ranks of Bronze* (David Drake), a coerced Roman legion serves alien masters, battling low-tech natives on one world after another. Jerry Pournelle's Janissaries series sees aliens dominate the planet Tran with a new, higher-tech human army grabbed from Earth every generation or so. In *A Private Little War* (Jason Sheehan), a World War I-level private air corps is hired to aid one side in a low-intensity alien/alien war: think

Catch-22 (Joseph Heller's World War II classic) meets *Janissaries*.

Another perspective

Do often hoary historical anecdotes have any useful predictive value for us? Surely *something* about alien species, extra-solar worlds, and interstellar distances calls extrapolation into question.

Indeed.

Let's turn to economics.²⁴ People and governments aren't 100% rational actors, but they do (sometimes) take costs and benefits into account.

In a desert, war over water supplies may make sense. Water nearby is worth more than water that must be transported—if acquisition is even feasible—across great distances. What about a high-tech alien civilization running short of water? Would a species capable of interstellar travel cross light-years to steal Earth's water (as per the 1983 miniseries and 1984 TV series, *V*)?

Does that course of action make economic sense?

Doubtful! Just as the fringes of the Solar System teem with objects made mostly of water ice, icy objects are likely common in every solar system.²⁵ Imagine you're the leader of an alien civilization desperate for water. Do you retrieve that water from a few light-hours away or a few light-years?²⁶

I thought so.

Even visiting some outer asteroids, moons, or Kuiper Belt Object for water seems more effort than necessary. I don't care how contaminated a world's water supplies become. The inputs (whether of time, energy, labor . . . however the aliens do their accounting) to purify the water on hand (e.g., to desalinate sea

water) will be far less than the inputs to move huge transport ships, much less conquering armies, the light-years to/from Earth.

More broadly, it's hard to see what raw material would ever justify an interstellar trek—much less such a trek plus warfare.²⁷ Chemical elements, to repeat, are universal. The energy requirements to isolate and synthesize rare minerals at home must pale compared to the energy to project coercive military forces across light-years. James Cameron and *Avatar* notwithstanding, synthesizing “unobtainium” at home must be cheaper than travel to/from Alpha Centauri and a guerilla war with the Na'vi.

That's not to deny geological processes on a particular world may, due to some unusual circumstances, form rare, even unique minerals. Suppose precious minerals are created (although the airborne mountains in *Avatar* seem quite the stretch). The economic question remains: what's faster and cheaper? Forcibly obtaining the mineral from *far* away? Finding a way to trade for it? Or, given that you have (or can steal) samples, synthesizing the mineral at home?

Which isn't to say economics precludes war over a natural resource. The more complex a molecule, the easier it is to imagine practical difficulties in copying it. An alien organic compound might be both valuable and difficult to synthesize. That is a premise of *Dune* (Frank Herbert), in which the hallucinogenic “spice” required for interstellar navigation—a biochemical produced only on Arrakis, metabolized by giant sandworms—is the cause of wars.

I suspect it's no coincidence that *Dune* (1965, appearing earlier in *Analog*) predates any significant appearance, in popular culture or the genre, of genetic engineering or nanotech.

²⁴ Economics is a science, too—no matter (hat tip to Victorian historian Thomas Carlyle) how dismal.

²⁵ That's more than extrapolation from a sample size of one; it's a key inference of the dominant theory of solar-system formation. See my “Alien Worlds: Not in Kansas Any More,” in the October 2013 *Analog*.

²⁶ If you need help deciding, some round numbers: the energy imparted to a one-kilogram mass in accelerating it to one-tenth light speed equals the energy output of one hundred large nuclear power plants running at full capacity for five days. One kilogram won't build much of a tanker ship, and at one-tenth light speed, it's a *long* time between stars.

²⁷ But read (from the March 1959 *Astounding*) the swashbuckling “Despoilers of the Golden Empire,” by Randall Garrett writing as David Gordon. You'll thank me for not giving spoilers.

* * *

World wars

What's scarce, precious, and very costly/time-consuming to synthesize? Habitable planets.²⁸ So here's a scenario for you . . .

Picture an alien species Out There, evolved on an Earth-like planet. That is: home is a rocky world, not a gas or ice giant. It orbits within its sun's Goldilocks zone, where liquid water can persist on the surface.

By one recent survey, we can expect (statistically speaking) *one* such planet within twelve light-years of Earth.²⁹ Current technology cannot yet determine the fraction of these planets also offering somewhat Earth-like gravity and a breathable atmosphere. How distant might the nearest *truly* Earth-like planet be? Twenty light-years? Thirty?

Estimates of stellar densities vary—as astronomers continue to discover new stars, even in our immediate vicinity³⁰—but a ballpark figure for Sol's neighborhood is 0.004 stars per cubic light-year. A sphere of radius 20 LY has a volume greater than 33 thousand cubic LY, and might encompass in excess of eight million stars.

Habitable planets, rare and fragile, might be worth fighting over.

As the so-called New World was fought over by the maritime powers of the Old World.

And on the third tentacle . . .

We don't know what we don't know, or what hypothetical aliens do know. Maybe some hyper-dimensional shortcut will make

interstellar travel quick and cheap. Maybe the universal zero-point energy of the vacuum can be tapped to fill every energy need. Maybe . . .

Human history has had its share of discoveries and inventions redefining the possible. Crossing oceans. Soaring like the birds. Breaking the sound barrier. Walking on the Moon. A century ago, who would have anticipated a thriving market in Japan for Australian cut flowers, or in the United States for Chilean fresh fruit?

The easier interaction becomes between intelligent species, the likelier (all other things equal) are all manner of interactions. Including conflicts.

Never mind unimagined technologies. The mere passage of time renders many hitherto impractical scenarios quite reasonable. Consider the awesome power of compounding growth.³¹ Two hundred years of growth at 2% yields a wealth increase of about 52 times. Bump that growth rate to 3%, and after two hundred years, the wealth increase approaches 370 times.³²

The more resources a society can devote to a project—war included—the likelier (all other things being equal) that project becomes.³³

If new tech or growing resources make interstellar war more feasible, won't the timeframes get in the way? Suppose light speed *is* a limit. Who would begin a war they can't expect to see the end of?

That question may have an invalid premise. Aliens might live longer than us; a hive mind might be effectively immortal. Aliens might

²⁸ Look how much time and investment (in coal mines and power-generation plants, in oil wells, petroleum refineries, and automobiles . . .) humanity has needed to raise Earth's average temperature a paltry degree or so.

Habitable worlds are *big*. Feedback loops among a world's many parts (atmosphere, oceans, cryosphere, lithosphere, biosphere) do their best to sustain equilibria. Remember how long cyanobacteria labored to bring about the Great Oxygen Extinction.

²⁹ "Far-Off Planets Like the Earth Dot the Galaxy," *The New York Times*, November 4, 2013, <http://www.nytimes.com/2013/11/05/science/cosmic-census-finds-billions-of-planets-that-could-be-like-earth.html>.

³⁰ "WISE 0855-0714: Astronomer Discovers Fourth-Closest Star System," *Sci-News.com*, April 28, 2014, <http://www.sci-news.com/astronomy/science-wise08550714-fourth-closest-star-system-01886.html>.

³¹ Albert Einstein: "The most powerful force in the universe is compound interest." Even theoretical physicists sometimes commit metaphor and hyperbole.

³² Between 1947 and 2014, the average annual real (net after inflation) growth rate of the United States economy has exceeded three percent (<http://www.tradingeconomics.com/united-states/gdp-growth>). Emerging economies like China's often show faster growth, sometimes in double digits.

not be as short-term in their thinking as us. Our medical tech might continue to extend our lifetimes. Any of those situations makes interstellar enterprises, including war, more practical.

I'll bet you can come up with plausible scenarios of your own.

Other "opportunities"

We haven't exhausted the reasons humans and aliens, given the chance, might have conflicts. Among the possibilities SF has offered are these:

Preemption: one explanation for the Great Silence³⁴ would be a spaceflight-capable species Out There that (perhaps unnerved by the Great Silence) has concluded (a) the Universe is a dangerous place and (b) I'd better take out the Other Guy before the Other Guy takes me out. As mysterious, genocidal aliens appear to have concluded in *The Killing Star* (Charles Pellegrino and George Zebrowski).

Does such preemption sound implausibly cold-blooded? After the third Punic War, the Romans razed ancient Carthage (the parts they hadn't already burnt) to the ground. According to legend, the Romans also sowed the ground with salt so that nothing again would ever grow there. Rome was a republic at the time.

Lack of (perceived) options: Imagine a group in desperate straits. Losers in an internecine war, perhaps. The reviled faction in a religious/philosophical schism. Survivors/refugees of an ecological collapse. Such a group might be tempted (or driven) to try to seize another habitable world. In my *InterstellarNet: New Order*, an exiled alien clan thus ends up in this Solar System, at war with humans.

Uplift: If life-friendly worlds are uncommon, how much rarer still are worlds bearing intelligent life? David Brin, in his Uplift series, envisions a galactic civilization centered on nurturing pre-sentients into intelligence. To so elevate another species is a great honor—and brings with it a perk: eons of indentured service from the uplifted. Of course, the more technologically advanced species come to

blows over the right to sponsor new client species. . . .

Prime Directive: If, à la *Star Trek*, advanced civilizations opt to stay hidden from primitive societies, might one advanced civilization battle a less scrupulous one to enforce the policy? Or use enforcement as an excuse for war, when having an external enemy offers a domestic political advantage? In *A Darkling Sea* (James L. Cambias), newly starfaring humans and the higher-tech alien Sholen skirmish ostensibly about sheltering the primitive, underwater Ilmaratan.

From which we conclude

Behaviors common among humans (and ants) are, ipso facto, also possible among other intelligences that may arise. Let humans or aliens obtain the ability to travel among the stars, and by implication, inter-species, interstellar warfare also becomes feasible. Such conflicts may prove limited, the deterrent logic of Mutual Assured Destruction as compelling at the interstellar level as at the international level.

However discouraging this analysis may seem, there's a silver lining: the Universe is friendly to rip-roaring military SF. ■

To read further:

http://en.wikipedia.org/wiki/Interstellar_war offers a long list of fictional interstellar wars, many inter-species.

The "War" entry in *Science Fact and Science Fiction: An Encyclopedia*, Brian Stableford, includes a history and further discussion of SFnal warfare, including many interspecies conflicts.

About the author:

A physicist and computer scientist, Edward M. Lerner writes technothrillers like *Energized* (powersats), the InterstellarNet adventures of First and Second Contact and, with Larry Niven, the Fleet of Worlds series of space operas. Ed's website is edwardmlerner.com.

³³ And so, even as great nations hesitate to reach for Mars, soon enough a company may attempt it. See "SpaceX's Giant Leap," *The Daily Beast*, 29 May 2014, <http://news.yahoo.com/spacex-giant-leap-044300266—politics.html>.

³⁴ That is: a half-century search for extraterrestrial intelligence has yet to hear a peep. See my "Alien AWOLs: The Great Silence," in the October 2014 issue.



Illustrated by John Allemand

The Smell of Blood and Thunder

Liz J. Andersen

Wt sounds dangerous.” I yawned despite my reaction to the ambulatory request. It was not a stress-yawn. Until the plea arrived over the com

for our Veterinary Care Unit, I’d endured an unusually busy but boring week. Hardly any problems had come in but overgrown, dagger-like claws needing trims with power saws

and files, odious ear infections requiring multiple messy flushes, and various foully impacted scent glands I had to manually evacuate.

I was thoroughly scratched and punctured, and I craved an impossibly expensive long shower. Not to mention a complete rinsing out of my overtaxed nasal passages. I was certain I'd at least achieve the latter, as soon as I could sneak a saline drip set out of the VCU.

"You can turn this request down," Dr. Cespar actually said, after studying our comscreen. I gaped. He usually loved the extra credits earned by our ambulatory missions. It's just my frequent need for off-station rechecks that tipped the balance sheet.

"I can't believe the Federation of Intelligent Life claims you're a veterinarian with some diplomatic experience," he added. "Have they got you mixed up with someone else?"

I groaned in response to my boss's question. To have that episode in my life still haunting me felt completely unreal. It was so long ago, and so highly overrated! My whole young ecology class had discovered and recruited a lost civilization for FIL. And I'd played the most accidental part—a scary fall into their underground refuge—which had made me a permanent acrophobe.

"FIL not only kicked this world out," Cespar ranted on, "they placed it under quarantine. You can easily use 'Conditions Too Volatile' to decline this request. A world with smartdogs, smartcats, and smartfleas? That can't be good. No wonder FIL decided to severely restrict nonintelligent lifeform upgrades, almost as soon as someone figured out how easy it was to do. But as a non-FIL planet, I guess the inhabitants can do whatever they want.

"Anyway, we can turf this one to FIL intelligent life specialists."

"It's not like FIL hasn't already tried," I said, scanning the request. "Anyway, you think they'd do better than us, talking to dogs, cats, and fleas? Besides, this colony is begging for our help."

"Have you ever even seen a real flea?"

"Well, no, only vet school holos. But has any M.D. ever studied them? The bubonic plague is history."

"You sound like you actually want to do this one." Dr. Cespar shook his head. "I

thought you disliked ambulatory, not to mention any dealings with smart stuff."

"I don't care for uppity machines, but how could I resist a chance to talk with dogs and cats? Can I go?" It was the chance of a lifetime! Plus, anything to get out of here for a while.

Even if it meant also having to fight fleas barehanded? My future self should arrive now via some yet-to-be-invented time travel machine, so I could blast some sense into me. But I felt like I'd already committed myself. Or should be committed. One or the other.

"Feel free," said Cespar. "Just try to come back in one piece this time."

Of course, I next dashed to Q in engineering. I did sort of remember her Lorratian name, something like Quasar-Murgatroid-Scalpel-Something-or-Other, only much more gurgly, and completely unpronounceable by human vocal cords. So any attempts on my part were guaranteed embarrassment. Fortunately she seemed pleased by the nickname I'd given her, and she looked over my assignment thoughtfully.

"Looks like along with the usual veterinary equipment and plenty of raw materials for canine synthblood, I'd better equip you with a wristcom translator that can handle pheromone signals. And get a linguist to feed it whatever language FIL has managed to teach the smartfleas, which sounds awfully basic—"

"FIL had to teach them how to talk?"

"Yes, didn't you see this part? The stupid kid who upgraded these fleas gave them a brain with a language module. But he didn't even consider the fact that fleas might not have a clue what to do with it—Great Galaxy, look at the holos of these guys!" She slapped the comscreen with her gold-scaled hand, which explained why the screen was already badly scratched.

"An insect exoskeleton and tracheal system can't support that size, on a planet with Earth-like gravity and air!" I said, looking over her shoulder, and noting the waist-tall fleas standing next to a human FIL specialist.

Q thumbed through more of the report. "This also mentions a 3D printer used to manufacture biodegradable scaffolds, modeled on an amalgam of galactic creatures.

And vampire bat stem cells mixed with growth factors, induced to form muscles, bones, and a more powerful circulatory and respiratory system.

"I get the engineering part, but the biology—it just sounds like Frankenfleas to me! I'd better set you up with some body armor, if you're serious about this mission. Are you really certain you want to take this problem on?"

I sighed and nodded mutely, then remembered to say, "Yes, I'm serious," for our wrist-com translators.

"Okay, then. Just try to bring everything back in one piece, please."

And there it was again—the refrain to remain intact. Lovely.

FIL officials met me in front of my shuttle boarding gate, and my heart sank further. Blast it all, were they finally having second thoughts about who should carry out this mission? Part of me felt relief, but part of me felt cheated.

"Sirius is quarantined," one of them said.

Well, duh, I wanted to reply, but I thought I had immunity, being assigned a special mercy mission.

"We simply can't afford to give any smartfleas a chance to sneak offworld and reproduce anywhere else that dogs live," said another.

So why had they let me get this far? The slow crawl of bureaucracy? I slumped. "Does this mean I can't go?"

"No, but you'll have to take precautions. When your shuttle returns here, we can't dock you. You'll have to cross over to us in a powered spacesuit.

"If anyone tries to come with you, you won't be allowed inside Station Seven. If you make it back to us okay, we'll ask over the shuttle com if anyone else is aboard.

"If we get no answer, we'll give one very specific warning. If we still get no answer, we'll order your shuttle to open to vacuum, before we thoroughly search it. Then we will bring it back aboard. Understood?"

"Understood." I swallowed hard. Not because their plan still sounded very punitive. Actually, I'd gulped selfishly. Being an acrophobe, I had never sought any free fall experience.

But I wanted this too badly to quit now, and clearly FIL wanted me to try to solve their problem for them, before risking anyone else. Where was my future self, anyway? Clearly time travel would not be invented and used by veterinarians within my lifetime.

As usual, I had to spend part of my flight time in a microfloral exchange tank. I used up the rest of my travel time madly cramming for my assignment. I needed every moment. I was headed for Sirius—a planetary designation currently under official dispute by the smartcats. A pack of smartdogs began the colony on Sirius, after deciding they wanted more autonomy. They just brought along their favorite humans.

But some of those humans also snuck along several cats. It must have taken some clever work, to avoid detection by the powerful noses of the smartdogs, who admittedly did give up part of their olfactory bulbs for more neocortex.

On arrival, the smartdogs weren't happy about these interlopers, but most soon realized they could easily outsmart any normal cat.

That is, until members of a later human generation evened the odds by infecting all colony cats with an upgrade virus. As the next litters arrived, the kittens had to be delivered by C-section, because their heads were too big to pass through their mothers' birth canals.

As soon as these first smartcats grew up, war broke out, and Sirius lost its membership in the Federation of Intelligent Life, which doesn't consider violence a sign of intelligence.

But being mostly territorial loners among the villagers, the cats couldn't cooperate enough to keep up a concentrated combat effort. And although dog packs wreak havoc that individual members would never consider, most of the smartdogs possessed committed human friendships, and these humans became very upset whenever any of their canine or feline friends were hurt or killed. So a truce finally prevailed, and FIL actually considered reoffering membership.

Then one of the more vengeful smartcats hitched a ride on an illegal transport, travelled to a world with dog fleas, and smuggled some back.

Now, most dog fleas (*Ctenocephalides felis*) originally came from cats, but this planetary source had no cats. And the more unusual accidental tourists that rode in on colonists' dogs, *Ctenocephalides canis*, which originally would have been quite happy on cats also, had evolved the need for dog blood, and only dog blood.

The smartcats on Sirius laughed while the smartdogs scratched, and Sirian humans frantically researched ancient remedies. It became such a popular subject that even students used canine fleas for science fair projects. But one mad scientist kid got a little too inventive. Why not make smartfleas, which by necessity, would be too big to live in the fur of smartdogs?

The kid even proudly displayed the subsequent surface to volume ratio problem on a poster screen, and how he solved it with his bizarre smartfleas. I think he was trying for an award in the FIL Galactic Science and Engineering Contest, but he must have finally realized he'd blazed more than a little bit out of bounds. So FIL never heard about any of this until it was too late.

At least the kid couldn't upgrade all the fleas, and aimed instead for more of a proof-of-concept project. But he also didn't consider how to keep his smartfleas captive and adequately fed. Oddly enough, he was surprised when local smartdogs refused to make dietary donations. At any rate, the smartfleas became very hungry very fast, and quickly determined how to break out of their cages. Then all hell broke loose.

Now that smartdogs sometimes died from the blood loss of one smartflea meal, many human colonists were again grief-stricken, and the smartcats began to feel a bit ashamed. Not to mention Sirian FIL membership was once again out of the question, due to injuries and deaths from smartflea attacks and local punitive measures taken against them. That meant a FIL embargo, plus added quarantine restrictions.

A FIL team did try an emergency intervention. As Q mentioned, linguists first worked very hard at teaching younger smartfleas (with more plastic brains) as much basic language as they could grasp. Then FIL biologists offered canine synthblood as a substitute nutrient.

But a set of angry colonists intervened with an insecticide. Perhaps FIL personnel also harbored some prejudice against parasites and let their guard down.

However, the embargo prevented access to sufficient chemicals, so the colonists couldn't make enough poison to kill all the smartfleas. The survivors became incensed, all trust was lost, retribution was threatened, and the first and only FIL emergency response team fled.

Now how was I supposed to stop the ravaging smartfleas without killing an officially listed intelligent lifeform?

Reviewing the history and biology of the problem was so mind-boggling that I didn't have time to invent any new solutions on my way to Sirius. I figured I'd just have to wing it, which is what vets have to do a lot of the time anyway, whether we admit it or not. And canine synthblood still seemed like the most obvious answer.

Fortunately I turned on my wristcom translator before I stepped out of my shuttle, because I walked right into a fight in a lush scarlet meadow. It took me a few minutes to sort out that several people and dome-headed dogs and one large, thick-necked, bigheaded cat were trying to remove a smartflea from a bucking Irish setter's back.

The golden flea, about half the size of the setter, had wrapped its six legs around the setter's mahogany trunk, grabbed the dog's fur with its prehensile claws, and stabbed its complex mouthparts into one side of the dog's neck. And although the flea no longer possessed an exoskeleton, its intricately scaled, segmented, bristly hide seemed fairly impervious to the crowd's fists and fangs.

"Stop it, stop it, stop it!" everyone was yelling at the smartflea, whose mouthparts remained buried in the poor dog's flesh.

"Hungry, hungry, hungry!" my translator managed to make out from the flea's mumbling, which cut up the victim's neck even more.

I had to work at hearing my wristcom translator over the cacophony of people screaming and crying, dogs barking, one cat snarling, and the flea whining. But that was the gist, along with inaccurate curses like "Vampire!" and other even more nasty exclamations best left untranslated.

I walked up, pulled the flea's bundled mouthparts free from the dog's muscular neck, and grabbed the oval, large, but thin flea in a classic veterinary restraint hold, pinning his middle pair of legs. I'm stronger than I look, for a female human, and it helps to have some ingrained training. Although I did have to ignore short spines poking into my stomach and other more personal areas. No wonder I ought to wear body armor. Live and learn.

"Still hungry!" the flea said, his short front limbs flailing just as uselessly as his long hind limbs. Perhaps I had just gotten lucky, encountering a younger flea first, who could talk. Or maybe short life spans had already eliminated older fleas who couldn't speak. I felt mean hoping for the latter, and really tried not to.

"Have you eaten enough to travel?" I said.

"What?"

"Can you get home okay with this much blood?" I tried again.

"Possible."

"Good. Can you go tell all the smartfleas we must meet here?"

"Yes. But why?"

"I'm trying to help you," I said. If I could just sweet-talk them into trying canine synthblood—

"Why would you help?" The flea was like a kid who couldn't stop asking questions.

"It's my job."

"What's a job?"

"It's what I do." I released the flea, and he bounded away, powerful hind legs crushing the tall, thick, tough red grass, which soon hid him, as well as most of the blood spatters. But I had a canine patient on the ground now, her pale tongue hanging from nearly white lips, and her neck spurting in time with a slowing heartbeat. That would stop soon, if I didn't act immediately.

I didn't even stop to think I'd be working illegally on an intelligent patient, I was so used to working on humans' dogs. It was only later that I realized what I'd done, and that I was legally covered anyway, as a Good Sam.

I quickly clamped the torn ends of the setter's carotid artery and jugular vein, just long enough to haul her into surgery in my shuttle. I pulled her collar up out of the way. Next I would have just sterilized the wound and

closed a normal dog. But I didn't dare do that now, working on a canine patient with an enlarged brain, which probably required extra circulation.

I asked my drug synthesizer for canine synthblood, began a transfusion, sterilized the surgical field, and carefully laid out the equipment I needed. Then I disinfected, gowned, and gloved. I set up temporary bypass tubing with a pump for the carotid artery and with valves for the jugular vein, to buy me time to patch the real vessels. Then I checked for leaks before and after removing the bypasses, closed the wound at last, and finished the transfusion.

My patient not only walked out of the shuttle under her own power, she barked a thank you, and everyone cheered. I grinned, which hid my surprise as I noticed all the dogs and the cat were wearing collars. Then I realized this wasn't a sign of ownership, but rather a way to wear communicators with translators.

I felt proud. It's always satisfying to resuscitate a patient who looks half dead, but I'd never received a verbal thanks from one before. And I'd obviously won the hearts of the small crowd that surrounded us. But I couldn't help asking, "Don't you folks have a local doctor?"

"Dr. Salido is dealing with five emergencies right now. He said he was sorry, but he just couldn't come," the cat hissed.

"Oh, and he wants to know if you can make any blood for canine patients?" a German shepherd mix whined and then cocked his head, obviously listening to a frequency from his collar that was inaudible to human ears. "He's out of local donors and synthblood supplies."

"But we should leave, right now," said one of the golden-skinned, dark-haired humans.

"Tess is right," said the Dalmatian standing beside her.

"Sheba," said a leathery old man, "why did you wander so far from home?"

The Irish setter, clearly embarrassed, pretended to snuffle at a clump of grass with such interest that she wasn't listening.

"It's not safe to remain here," the Dalmatian gently scolded her, and then tactfully changed the subject by turning to me. "Are you the vet FIL promised us?"

I nodded. "Dr. Taje Jesmuhr, at your service."

"You can come stay at our house," the Dalmatian said. His weak tail wag translated as more cheerful than I expected. Then I noticed ominous fresh scars interrupting some of the black spots on his neck.

"Oh, that's your decision now?" the gray tabby said, with his tail curled down behind him. Definitely not so cheerful, according to my translator.

"Uh, what about the blood I need to deliver?" I tried to intervene.

"Start your synthesizer, we'll direct you, fly the blood over, and then join us for dinner," Tess suggested. "It will take time for all the fleas to gather. We'll send you back here tomorrow." She gave me the coordinates to the clinic and her house, and then everyone fled, quickly vanishing in the tall grass.

Hmm. No offer to accompany me tomorrow. This didn't sound good.

I returned to my shuttle, set my drug synthesizer to work, and flew on over to the doctor's clinic. Dr. Salido snatched several units of canine synthblood from my hands before I could even introduce myself or offer to help.

I trailed him into his little hospital, filled with pale, lethargic smartdog patients undergoing desperate IV treatment with normal saline. I rushed back out to my shuttle for more blood. Then I explained my main objective on Sirius while the doctor revived his patients with my synthblood.

"Good luck," Dr. Salido said. "The fleas here think we're trying to poison them. I guess I can't blame them, because some idiots actually did it."

"I heard about that," I said, "but I didn't hear much about how anyone managed it."

The doctor cocked a dark eyebrow at me. "Some rogues broke into my hospital to use my drug synthesizer. Luckily, I guess, due to the embargo, I'm running low on raw materials, so they couldn't make much toxin. But they disguised their insecticide with some of my last canine synthblood. So I doubt you'll get the smartfleas to listen to reason."

"Oh, dear Universe, FIL officials didn't tell me that—"

"Didn't they, now? Still want to attempt your mission here?"

How many people were going to ask me that? "Can all the fleas talk now?" I stalled, too shaken to answer his question.

"Their life spans are pretty short—I'm guessing weeks to months—so most of their uneducated elders are dead. And they're passing on what they managed to learn, but that includes a big dose of suspicion.

"Say, did you bring any body armor?"

"Yeah, why?"

The short stocky doctor stared at my tall slender frame. "Is it adjustable?"

"I think so. Q didn't ask me for any size specifications—"

"Can I borrow it, just for a short run? I have some urgent house calls I should make tonight."

All of Dr. Salido's duties seemed more than urgent. I ran to my shuttle and returned with the armor. "I just need it back ASAP. I have a meeting set up with the fleas tomorrow—"

"I'll bring it back early tomorrow. I promise. Just tell me where."

As I flew my shuttle back to Tess's village, I thought how very awful this mess was. What could I actually hope to accomplish here, beyond some extra emergency medicine? I landed near a cluster of stone buildings, metal doors locked tight. I had to talk to Tess over my wristcom to get into her home.

While I unpacked in a guest room with a large sealed glass window, Tess ordered a stew and some rolls from her food synthesizer. I was drawn to the dining room by the aroma, and watched while she set the table.

Tess placed a deep pottery dish at one end of a glass table standing at just the right height for the smartdog, a metal stool in front of a smaller dish at the other end for the smartcat, and two platters with metal utensils on opposite sides above low metal benches for us. She set down ceramic water bowls for the dog and cat, mugs for us, and a pitcher in the middle of the table.

Tess ladled out the stew from a pot as we took our places, and she handed out rolls from a red basket. The fresh rolls smelled wonderful to everyone, except the cat. He jumped up on his stool, sniffed once at the basket, and then sneezed. I tried not to wonder if I got the roll he'd snorted on.

Dinner was a largely silent affair.

"This is great food," I finally tried. Tess tore her roll in half and swept up some stew with it, so I followed suit.

Tess shrugged. She seemed either morose or just very quiet.

"Meaningless human talk." The smartcat sneered. "So what are you going to do?" I felt pinned to my bench by the stare from his slitte golden eyes.

"I'm not sure." I was getting better at admitting to clients when I was in over my head. But I was now desperately hoping to think up an answer while I lay waiting for sleep in bed tonight. It might be a long wait. Perhaps I should use any remaining time to master a few diplomacy basics. If nothing else, I'd learned great cramming skills in vet school.

"I hope you have some body armor," Tess said. "And Toby and Tiger, I don't want either of you going outside tomorrow. Not with every flea gathered near our town."

"I hate using that stupid indoor toilet box, and you're not my boss," Tiger snarled for his translator. "Besides, I'm not a flea-bitten dog."

"Oh, you want to lure a flea into town, just by showing off your furry coat, Mr. Stripes?" Toby growled back.

"For the last time, my name is not Stripes!" Tiger yowled. "And you should talk, Spotty. You won't last one hour cooped up inside here. Not enough odors for that nosy nose of yours—"

"As if you never walk around here with your tail standing so tall it shows off your most fragrant region—"

"As if you can resist taking advantage of it to sniff my butt! I suppose next you'll claim that you only wag your stupid tail to whisk away your worst smells!" Tiger swatted at his dish, rocketing it across the table and shattering it against the nearest plaster wall.

The cat dropped down from his stool, and stalked off across the tile floor toward a bedroom, his tail indeed so erect that it showed off an area most humans would rather not look at, much less smell. I shivered, remembering all the glands I'd had to empty recently, most located in similar regions.

"That's one strong cat," I said as soon as Tiger disappeared from sight, although knowing cats, he probably still heard me.

"Has to be, to hold up that swollen head of his."

Tess glared at Toby, but before anyone could add further insults, I blurted out, "Why does Tiger hold his tail up indoors, but not

outside?" Interplanetary vet school had taught me a lot about the biology of many species, and how to quickly grasp the biology of many more. But consequently, the subject of behavior got short shrift, except for aspects necessary for our survival. And I'd always been more of a dog person.

"Who understands anything cats do?" Toby continued to ignore Tess's ire.

"Okay then, why do dogs like to sniff butts? You can answer that, can't you?" Besides changing the subject, how could I resist? How often does anyone get to ask a question like that?

"Are you kidding?" Toby wagged his tail. "Aside from sensing everything eaten recently, not to mention digestive and general health, anal gland essences, and even recent travels, the individual style and piquancy are so utterly engrossing—"

"Okay, that's enough for me," Tess said. She dunked her napkin in the water pitcher and wiped off the wall. Then she bent down to collect food and ceramic shards from the cat's broken dish onto her platter with her unfinished meal. "I'm going to bed."

The smartdog licked up any remaining traces of the cat's victuals, handily cleaning remnants from the floor and wall. "I hate wasted food," he claimed. Then he gave me a soulful brown-eyed look. "And they just don't get it," he woofed. "Say, you smell unusually neutral—for a human. Except for periodic, rather mediocre gas emissions, most humans smell too sickly sweet."

"That's an add-on called perfume, or cologne," I said, "and usually it doesn't smell that strong to us. I happen to be allergic, so I don't wear it. However, most humans enjoy various fruit and flower scents, and our sense of smell isn't nearly as good as yours, so we have to pour it on. But I imagine having such a sensitive, finely honed sense of smell is almost like living in your own sensory realm. It must be difficult to share."

"Except with other smartdogs. We don't expect you humans to understand."

"Just as we don't expect you to understand the nuances of all the colors we see."

"Okay, that's true. For a human, you're pretty smart."

I could have felt insulted. But I happened to love dogs. In fact, I owned one—an utter

scamp—but I didn't think I should mention that to a smartdog. He might consider it slavery or worse. Anyway, coming from a smartdog, his remark was probably intended as a high compliment, so I took it that way.

"Thank you."

"Well, we'll really see tomorrow, won't we? Calling every smartflea to a meeting here isn't the most intelligent move in the galaxy."

Oh, thanks a lot. "Why didn't your ancestors request bipedalism, so you could at least have hands and fingers?" I retorted.

Toby pointed his nose at the little hallway leading to the bedrooms. "We already have hands and fingers when we need them. And we can run faster on four legs from our enemies."

"This started as a canine colony, but you make your humans do all the manual labor here?" I said, stunned.

"We don't make them. They do it voluntarily."

"Why?" I realized I was starting to sound a little like that silly flea, but I couldn't help myself. Anyway, maybe this would lead to some important insight I was just too blind to see.

"I believe it's because of an emotion you humans call unconditional love."

How far did that love truly go, once pets were no longer pets, but really closer to equals? Maybe Tess was too exhausted to talk from being the only working family member.

For some reason, I have always found Dalmatians a bit challenging to work with. So I decided to change the subject again. "How many smartfleas are there now?" The report had somehow neglected to mention their reproductive rate.

"No one knows exactly, but certainly enough to cause serious trouble." Toby furrowed his brow. "That's why we called you."

"So what would you do?" I challenged the smartdog.

"Humans have historical records that describe specific insecticides safe for us dogs to wear. And we could arm our humans." Toby's tail banged eagerly against the floor as he scratched his haunches.

"Nice! These are intelligent fleas you're talking about murdering. If you exterminate them, you'll never get back into FIL."

"That's the problem. They're too smart for their own good."

Some might say the same of this smartdog. Or of us humans. I said goodnight, stood in the blissfully unmetered shower until the solar-heated water ran out, put on my PJs, and got into a metal-framed bed. With impeccable timing, Tiger entered my bedroom and leaped up to lie down beside me, before I could even ask the light to turn off.

"What are you doing?" I said.

"Toby's hogging more of Tess's bed than usual," Tiger meowed for his collar translator. "We often share beds in this household. I hope you don't mind."

"Somehow, I doubt you really care how I feel about it," I said, smiling.

The cat grinned back at me. "You're right. Kick me out and you'll just find me here again when you wake up in the morning."

"Oh, the cat came back, the very next day," I almost sang aloud, and then I finally realized, "Hey, you have facial expressions!" And his toothy smile haunted me for some odd reason.

"We did get more than just big brains with our upgrade." The cat preened himself. "Of course, my true cat name is also far more sublime and ineffable than 'Tiger.'"

"What is it, then?"

"What's your true name?" said the cat.

"I already told you earlier today," I said. "I suppose cats really do have secret names?" I rolled over, so I could lean on my elbow to face the smartcat.

"Why do you suppose that?"

Another question answered with a question! What a slippery fellow. "Oh, I'm not the only human who has surmised that," I said. "A famous human poet wrote about it some time ago. I'd love to know what you think about his work—what he got right, and what he didn't. Anyway, are cats really smarter than dogs, or do you just put on a good act?"

"Dogs have masters, cats have servants." What do you think?

"I think that's another facile response!" I said.

"You truly think I'm going to give you a serious answer?" Tiger's tail twitched with amusement.

"No, I guess not, Mr. Stripes," I muttered softly as I lay back down.

"I heard that!"

I asked the light to turn off, and used my wristcom to try to review flea vocabulary and diplomacy, but I felt restless and distracted by exactly what I would say and how I would say it. Neither vet school nor continuing education had ever taught me how to talk—much less convincingly—with insects (even if they weren't entirely insects anymore).

I must have thrashed in my bed more than he could take, because Tiger actually gave up and left sometime before I fell asleep. But I couldn't get his annoying grin out of my head.

Meanwhile, I kept wondering how to talk wary fleas into accepting canine synthblood instead of attacking smartdogs. It seemed like such an obvious solution, but somehow that's not usually how veterinary medicine or the Real Galaxy works.

When I woke up in the morning, after too few hours of sleep, the smartcat was snuggled up beside me. He immediately jerked awake, hurled off the bed, and streaked out of the room. Cats! I dressed, turned on my wristcom translator, and followed far more slowly.

I headed toward the warm smells of breakfast, while my cold stomach knotted up. Dr. Salido called about another set of urgent emergencies, and he did not return my armor in a timely manner. After I choked down breakfast, I changed into my toughest clothes, and Tess insisted on loaning me a sun hat. "You'll need it with that red hair and fair skin!" At least she seemed truly concerned, rather than making fun of my throwback appearance.

But it was then I realized I'd spent so much time on the veterinary aspects of this case that I hadn't even bothered to study the environment, which was, after all, an important component of health. I had to turn away to hide my suddenly too-obviously reddened face.

The ground thundered as the churning herd of fleas approached my shuttle. A small cluster of the most curious and brave villagers had followed me at a distance, but now they looked ready to bolt with the buckets I had asked them to bring along.

"Wait!" I said. "I can solve this!" Maybe. No one had warned me exactly how fast the

smartfleas could multiply, maybe as another way to prevent me from saying "No" to this whole venture. But I tried to remain calm. "Leave your buckets and go borrow more, and get help if you can!"

The humans dropped their buckets and gave me cold, puzzled looks; the dogs growled, a cat yowled, and they all took off. I had no idea if they'd return, much less with what I needed, and soon so many waist-high fleas surrounded me that my hair crawled, and my nostrils flared as their odor filled the air. How fast were these fleas reproducing? Certainly there were at least twice as many as the FIL team had estimated in their report. Dozens, if not more!

"Who is your leader?" I said, stalling for time.

"What's a leader?" A flea laboriously scraped mouthparts for my wristcom translator.

"A boss, a commander, a guide, a master, a ruler—"

"We don't know what you're talking about!" several fleas said.

"So I should just talk with all of you?"

"We could suck out all your blood, if you don't feel like talking to us," one brown flea scraped. "We don't like human blood very much, but a bunch of hungry males without eggs could handle it." That certainly explained the FIL team's terror. My heart pounded while the smartfleas laughed. The buzzing noise they made by rubbing all their mouthparts together stabbed at my eardrums.

"Hey, be nice!" I clapped my hands briefly over my ears. I couldn't believe I was talking to fleas! Now how would I bring myself to eliminate the unsmart fleas here?

"Why should we be nice?" said a female with a bulging abdomen and a feisty attitude probably due to the extra hunger for nutrients required for egg production.

"Because if you aren't," I said, "the smartdogs could just leave you stranded on this world." That is, if the smartdogs were allowed to leave a quarantined, non-FIL planet. I wasn't quite sure about that point, but I tried to act like I was.

"What is 'stranded'?"

"Abandoned. Deserted. Alone—"

"Then we'd starve!" said another female. "That's not fair!"

"Life isn't fair," I said, although I cringed inwardly. I hated it whenever anyone said that to me. Life might not be fair, but intelligent beings could try to be.

The restless herd began to shove me away from the village and my shuttle, right when I needed just a little more time and help. But when I tried to stall, carefully explaining that I had brought them safe food, I was poked along, and not politely.

The fleas nearest me sprang ahead, but others instantly took their place, herding me with head butts and body thrusts against my legs. "Hey," "Wait a moment," and "Ouch" didn't help at all when I tried to turn against the tide of epidermal spikes and bristles that grew caudally for slipping forward through giant fur—or in this case, tall grass.

Soon my heaviest trousers were in tatters, and my thighs and calves became a mass of bruises and scrapes from the fleas' tough hides. I wished more than once that I hadn't been so generous with my armor. When I slipped and fell, I discovered my kidnappers' half dozen feet possessed sharp pairs of claws, and they did not hesitate to use my back as a launching pad.

And the odor that engulfed me was not just from dust, grass, and flea excrement. I soon realized the flea herd smelled an awful lot like dog blood—sort of sickly sweet but salty too, with an iron aftertaste. Yuck. I didn't think I'd ever forget it, unfortunately.

Any time we came across a stream, I dropped to my knees as long as I dared to dunk my sweaty face and drink as much unfiltered water as I had time to lap up. Hopefully the super bugs from my microfloral treatment would protect me, and luckily, I guess, I was too empty and dehydrated to need any other stops that long hot day.

Weren't there any shady plants on this world? Too late I realized I hadn't noticed a stick of wood in Tess's house or her village. Even with all the distractions I'd endured—new problems and newly talking species—I still felt like the village idiot. Thank the Galaxy for Tess's hat, or the sun would have toasted my sweaty face by now.

As the hours crawled by, I often thought I just couldn't take another step through the thick prairie grass, which the narrow fleas slipped through with ease. I stumbled

and fell more frequently, and then we began an arduous hike up the only steep hill in sight.

"What are we doing?" I staggered, grabbing tufts of rough grass in front of me, while my guards ignored my pleas. I still found it difficult to believe I'd been kidnapped by fleas. No parasitology lecture had ever prepared me for this! And I could only guess at all the mockery I'd have to endure back at the VCU, if I ever escaped Sirius alive.

I was pushed to the top of the hill, knocked down, and forced to sit on tough, thick grass blades under the harsh sun, with a hazy view of at least half a dozen human/canine/feline villages in various directions. Not to mention teams of fleas coming and going, fleas fornicating, fleas laying eggs, larvae hatching from eggs laid earlier, older larvae weaving cocoons, more fleas hatching from tattered cocoons, and finally, fleas seeking shade for naps on the opposite hillside as the sun went down. They'd found themselves, in essence, their own Big Red Dog village, and true to their species, they were excellent at reproducing. It was a live, enlarged demo of their life cycle.

"You know, kidnapping is a good way to get thrown out of FIL," I warned my flea guards.

"Kidnapping? We have kids, and some are napping, but I don't think that's a crime," a yellow-brown flea spat back at me.

"I meant stealing a person," I said.

"Why didn't you say so? We can't stay in FIL anyway, because of our food," the flea again flicked mouthparts at me.

"And it's not fair," another repeated. "What should we do? Starve?"

"You could try canine synthblood—"

"You want another chance to poison us?" a dark brown flea with an unusual vocabulary managed to say. "We should have realized that crap didn't even smell right!" His antennae quivered in their fossae.

"So what are you going to do with me?" I asked.

"Bargaining chip. You just arrived in a FIL shuttle, all by yourself, so you must be special."

"Forget it. I'm just a FIL vet."

"What's a vet?"

"An animal doctor."

"Oh, so do you know what to do about this crack in my lip?"

Soon patients lined up for me. And despite arguing that I could do a much better job for them if I had access to more than just the medkit on my belt, the fleas refused to return me to my shuttle.

So I used my small wound instruments, got miserly with my emergency immobilizing set-foam, and still ended up improvising woven grass blade bandages and splints, yet another lesson never taught in CE lectures. I muttered something about being forced to work in the Dark Ages, and, unfortunately, my wristcom translator must have picked it up and transmitted it, possibly somewhat inaccurately.

"Someone more important will come for you, and maybe they will care more about us," one of the fleas hissed back at me.

Oh, sure, long after I died from dehydration up here. Ungrateful beasts! "Hey, I'm taking care of you—I care. That's my job—uh, my purpose. I can even suggest—"

But now we were interrupted by a distressed and battered flea team, which reported villagers armed with sledgehammers and other heavy, nasty farm tools. Also not good.

"Say, I can fix that." I nodded at a rent in the side of one injured smartflea. Luckily, the weapon must have just missed all major blood vessels, judging from the minimal hemorrhaging. But I watched with morbid fascination as a peristaltic wave passed through the smartflea's gut, inside the wound.

"Fix what? I'm okay."

"Until someone kicks you in the belly," said another smartflea. "You just can't see the big rip in your hide. Hold still! She can do it."

I sterilized, anesthetized, explored, and sealed the wound. "What else have you got for me?"

The pummeled team lined up, and I repaired more lacerations and splinted fractures. I was getting better at quickly weaving splints and slings. But somehow the line kept growing, and eventually I found myself pulling eggs from a flea with weak genitalia (fortunately my arms are long and skinny), and delivering flea larvae from especially tough eggs (I carefully cracked them open with small rocks). I even bandaged feet with broken claws, although I suspected some of them sported my own bloodstains.

Finally the line ended, at least temporarily. "Listen," I tried again, "I have real food for you. Safe food you don't have to fight for. I'm a doctor. I don't hurt people. I help them. If you could just return me to my shuttle—"

"Sure, so you can fly away!" The fleas vibrated all their mouthparts with merriment, and again I had to slam my hands over my ears until they finished. I was afraid the frequency of their laughter would rip apart my inner ears. Finally, feeling thirsty and dizzy, I collapsed in the grass to try to cool off.

"What's the matter?" the dark brown smartflea asked.

"Do any of you have names?" I said, trying whatever I could to develop a little more rapport. As if filling in as their village doctor wasn't enough!

"No. Why?"

"How about this village? Do you call it Clifford, by any chance?" I giggled a bit hysterically.

"It's not on a cliff or near a ford," the smartflea said, with unusual patience. "You're not making any sense now! And why are you lying down? Are you okay? You look pale."

With red hair, I was naturally paler than most humans, but these fleas didn't have to know that. I licked dry lips. "I need wa—food from my shuttle." No sense making it easy for them, and my empty stomach was complaining, rather loudly. "I'm not going to last long enough for someone more important to arrive from FIL."

This actually troubled the fleas, as it potentially disrupted their only Big Plan. However, they took until well past nightfall to talk their slow way through a Big Decision. Meanwhile, I gazed up at the stars and pondered whether I'd ever make it off the Big Red Dog hill and back to the VCU on Station Seven. Then I wondered whether I'd ever get to sleep on top of the hill, with no bedding besides rough grass, and the fleas blabbing and quarreling and misunderstanding each other nonstop.

Finally they herded me back toward my shuttle the next day. By then I was groggy and limping. But at sunset I tottered at last up to my beautiful shuttle. I also felt very relieved to see about three dozen buckets sitting near the ramp, with a very brave Staffordshire terrier standing guard in the midst of them.

I grabbed up as many buckets as I could carry, after convincing the terrier to carry two in his teeth for me. I asked the smartfleas to wait, and we dashed into the shuttle before they could stop us. My resources would be pushed to the limit, but I could call for more.

I used my toilet, then shared drinking water and some snack bars with the smartdog. I removed my ruined pants and sweaty, bloody shirt, tended my wounds, and pulled on soft sweats while changing buckets, as my drug synthesizer filled each one. While I worked, I realized I could expedite matters if I made an official request for another FIL emergency response effort.

That might be fun. As an interplanetary vet, I had that power. But I'd only used it once before, and then only as part of a veterinary team. This time I'd bear all the responsibility for the consequences.

"What's that?" A smartflea waved his forelegs disgustedly over one of my first two full buckets, after I wobbled back down my shuttle ramp and set them down.

"Pure canine synthblood. Come on. At least try a tiny sip of it!"

"You're trying to kill more of us with this stuff!" a gold flea said. "And how do we know you haven't made the bad part stronger this time? It still doesn't even look or smell right!"

"It doesn't smell like the bad stuff, does it?" I said.

"You're probably trying a different poison. Humans hate us!" said the dark brown flea.

"Try it yourself if it's so great!" a brown flea said.

"Okay." But why had it taken a flea brain to figure that out? Maybe because I felt so very, very tired, after two nights of almost no sleep.

I hauled up a bucket and took several obvious, noisy gulps of the salty, sickly sweet, iron-tinged, thick fluid. I even let some of the reddish liquid drip gruesomely from my lips down my chin. As soon as I set the bucket back down, I swiped my face clean with the back of my hand. Enough! "See! I drank some, and I'm okay!" The things I had to do for my profession.

I was eyed carefully by numerous pairs of ocelli for many minutes. Then finally a few of the hungriest fleas tried some tiny sips, and hummed contentedly. More soon joined

them, but I was required to repeat my self-test with every bucket I brought out of the shuttle.

Between buckets, I instructed a few smartfleas on how to suck up their stupid little relatives, inhabiting the terrier's coat, while the poor smartdog worked at not flinching or baring his teeth. Fortunately the smartfleas seemed to have no qualms about cannibalism, and they enjoyed the tiny bits of extra blood in each puny snack.

However, while my back was turned, half a dozen smartfleas fought over one of the buckets. I found that out when I heard it crash and gush its contents into the grass. I whirled back around. "Hey, don't do that!"

I brought down even more precious buckets and taste-tested them as fast as I could, but more fleas kept arriving, and fights broke out as fast as I could stop them.

I finally stepped partway up my shuttle ramp, turned around, and shouted, "Stop fighting! Stop fighting or you won't get any more food! Stop fighting if you want help!" By the end of this little tirade, I actually seemed to have their attention. The smartfleas all stood quietly facing me.

"Listen, I'll make as much food for you as I can, and I'll get help for more, as quickly as I can." I abruptly sat down on the ramp, as I suddenly felt rather queasy, and the friendly terrier obliviously joined me. Rather late I remembered humans normally vomit when they swallow too much blood.

Now I spoke just loudly enough to cover up the roiling sounds emerging from my unhappy stomach. "You must show FIL you're ready to stop fighting." I can't throw up now, I just can't, I told myself. Surely the smartfleas would think I've merely tried a slower poison, and they'd never ever listen to a FIL representative again.

"What about the villagers?" a brown flea said. "They'll keep trying to hurt us."

"If you behave, Buster and I will ask them to stop that too." The terrier beside me nodded, while I broke out into a cold sweat, and wiped my forehead on my sleeve. "But for this to work, all fighting must stop completely." I took some deep, cleansing breaths, which ended in a series of burps I covered up with my hand. "Now it all starts with you. Are you smart enough for the challenge?"

That seemed to draw them in. I heard raspy shouts of agreement.

"There's just one more thing," I said, swallowing hard.

"What?"

"I can probably talk FIL into building a canine synthblood factory for you here, but you will have to maintain it." I eyed the clawed ends of their short forelimbs, and decided they looked prehensile enough. "You also can't continue to breed like there's no tomorrow. No number of factories can keep up with that. We must figure out some form of birth control for you."

"Birth control? What are you talking about now?"

"A way to make a few less eggs," I said, trying to remain tactful. It was really time to ask trained diplomats to step in. "So you don't need quite so much food," I added.

Someone should also consider building more inclusive schools here soon. I chuckled out some more urgent burps. Yeah, academics with less dogma and catechism, and more flea-for-all! Obviously I'd have to keep that pun to myself, and I sighed as I realized I had merely excised one head from a hydra.

But I was finally getting to really talk with these fleas, and they actually seemed to be listening. How amazing was that? Maybe the space walk would be worth it. I hoped so, as I stumbled back into my shuttle for a moment, to let my stomach quickly eject its contents in private.

"We saw your FIL report," Dr. Cespar said, upon my return to the VCU. "Very nice work—"

"Thank you—"

"—but you're not done yet."

"What?"

"You're expected to return." Dr. Cespar sighed. I often had an excuse to return, a point of contention between us. However, this time it turned out neither of us had any say in the matter. Cespar coughed, like he wanted to rid himself of a hairball, and then explained.

"FIL has already built the smartfleas a canine synthblood factory. But FIL has also decided that the long-term solution is to permit

genetic scientists to work on a flea upgrade for a more diverse metabolism, so the smartfleas don't have to live on blood. And the Siri-an smartfleas insist they won't allow anyone but you to administer the viral upgrade."

"Oh." I smiled nervously. I hadn't realized I'd gained that much trust. Blast it all. Hopefully the upgrade would take a very long time to devise. The complete makeover of a digestive tract, and adjusting the nutrient needs of every cell in a smartflea's body would surely prove a challenging and therefore tedious project. Or perhaps that was just wishful thinking on my part—

"And what are you doing here in sweats?" Cespar found another excuse to vent. "Can't you show our clients some respect?"

"With respect, sir, you can have me like this, or not at all."

Dr. Cespar scanned me carefully. "Are any—parts—missing?"

"No, I'm just tender—and not very pretty."

"So you'll return to normal much faster this time?"

"Yeah." With quick-heal cream, the skin on my legs and back would mend soon enough. Last trip I'd returned with a whole-body bruise, and I'd had to regrow a foot. Fortunately, however, it sounded like our Station rumor mill hadn't yet informed Cespar about the most embarrassing part of my most recent journey. Returning from the shuttle to the station in a powered spacesuit, I'd squinched my eyes shut most of the way, so I'd crashed into the airlock. And I'd screamed the whole way, forgetting my radio was on. So I was met inside by FIL guards and port techs, half of them laughing their heads off, and half of them complaining about the condition of their eardrums.

"Why didn't you turn the volume down?" I asked.

"You might have said something important!"

Well, they should complain! Now, because smartfleas considered me so trustworthy, I'd have to repeat another roundtrip to Sirius, and then experience the feeling of falling through the entire Universe again. But another chance to talk with some more dogs, cats, and fleas—how could I resist? ■

LIZ J. ANDERSEN

Liz Andersen loves animals, art, and science fiction. It's a combination that first started coming together in grade school, when she started drawing real and imaginary lands and animals and felt compelled to tell their tales. "I wanted stories to go with [them]," she says.

Initially, she wrote the type of tales any animal-loving girl might write. But then a grade-school librarian introduced her to science fiction. She told her mother (who held a masters in English) and together they spent after-school hours critiquing novels.

Her foray through the school library eventually led her to Andre Norton, whose stories taught her that animals could play important roles in science fiction. "I was overjoyed," she says. Biology soon became such a passion that she was constantly peppering her parents with questions they couldn't answer. (Her father was an electrical engineer, not a biologist.) So she started buying her own science books. "There weren't many for kids in those days, so I probably read most of them," she says.

Another breakthrough came when a high school English teacher introduced her to Alexei Panshin's 1968 novel *Rite of Passage*, whose teenage heroine taught her that science fiction wasn't just about boys and men. "It sounds silly now, but at that time it felt earthshaking," she says.

By the time she was out of high school, she'd completed full drafts of two novels, but she knew they were flawed by lack of science background. So she combined her writing passion with another long-term interest and went to the University of California, Davis, where she studied animal physiology and veterinary medicine. She became a part-time vet . . . but continued writing.

In part, she says, the passion for writing must be in her genes. Not only had her mother earned a masters in English but her grandfather had shipped over from Denmark as an 18-year-old, not knowing any English. He'd not only learned the language—flawlessly enough to have no trace of an accent—but also became an



English professor. "I still have his unpublished novelization of his early experiences on the homesteads of South Dakota," Andersen says.

In the years after vet school, she worked as a part-time vet and wrote a half-dozen more novels before becoming discouraged. But the passion never died. A few years before Andre Norton's death, Andersen not only got a chance to thank her childhood hero for the inspiration, but also got feedback from her on one of her novels. "She gave me plenty of encouragement," Andersen says.

Armed with that, she signed up a few years later for a science fiction and fantasy workshop that required writing a brand-new story over the course of a weekend . . . and reading it to a group that included several published authors. Terrified barely begins to describe her state of mind, especially when her laptop broke down and she had to write in longhand. But for some reason that caused her to try something new. "I had never written humor before," she says, "but somehow terror translated into silliness as I threw in everything but the kitchen sink. My story actually made people laugh."

Better yet, it became her first sale to *Analog*: "Scary Monster" (December 2012). Her second, "Creatures from a Blue Lagoon" (September 2013), was compared by a reviewer for *Tangent Online* to James Herriot's famous novel *All Creatures Great and Small* and its sequels. "It makes me want to read more interstellar veterinary adventures," the reviewer added. ■

Breakfast in Bed

Ian Watson

On a Saturday morning, at about 5:50 A.M., Max experienced an inconsistency in reality; and he clung to that inconsistency with the teeth of his mind. By the skin of his mental teeth.

Max was a freelance popular science journalist, as was his partner Sandra of six years' standing, and of sitting and reclining—Max could be a bit obsessive about details, but hey that's good, and Sandra saw eye to eye on most things, although her journalism was perhaps more emotive than his, not to mention more lucrative: vanishing species and such. Same as most people, they could still use more money. Max had a second-class degree in physics and computer sciences, which certainly didn't mean second rate.

Max had woken and gone to the toilet, lighting his way with a little torch. He and Sandra both used low-powered torches during the night so as not to bump into door frames, for instance, especially with one's toes, but it was important not to raise the brain to full wakefulness by casting too much light, otherwise you might lie awake for an hour after peeing.

Normally they both got up at 7:30 A.M., so Max returned to bed and put an arm around Sandra, above the duvet. He'd have liked to embrace Sandra underneath the duvet, but that would disarrange the bedding, waking her up. She was tucked in tightly.

Briefly Max thought about his bank account. A few days earlier, his PIN had misbehaved, so he ordered a new personal number. When he logged online the evening before, to his surprise he discovered *two* accounts, one obviously and correctly his, slightly in overdraft as usual, the other with a different account number showing no transactions at all and a balance of zero. An enigma for now, this ghost account.

At that very moment Max realized that his arms were around Sandra *underneath* the bedding.

Which was impossible.

Most people probably wouldn't have noticed this small discrepancy. They might have rationalized it away as dreamlike and snoozed off again. But Max held tight, both to the anomaly and to Sandra, who stirred and mumbled.

"Sandra, switch on your light," he hissed. "Maybe I oughtn't to move just yet."

"Whassamatter? *Max, are you okay?*" She might be thinking cramp, stroke, mild heart attack.

"I'm fine. But something happened."

"Is someone in the flat?"

"Nothing like that."

Her bedside light came on. She sat up, stretching their link.

So he explained, ending: "... and I've definitely been awake since I got back from the loo."

"You aren't joking?"

"No, my love."

"Then this proves your Simulation Argument!" To signal seriousness, Sandra promptly pulled the duvet up to cover her nipples. The couple usually slept naked unless the heating couldn't cope with freezing weather; right now was only September. Sandra used contraceptive injections, medroxyprogesterone, resulting pleasantly in no periods; she had strong bones but took a calcium supplement just in case, whereas Max insisted on filtered water at home for coffee to deter possible kidney stones which periodically pestered his dad, an accountant.

If truth be told, Max was somewhat skeptical about the Simulation Argument, which holds that the world, including all human perceptions of the wider Universe, is an "ancestor simulation" created by an advanced posthuman or cybernetic civilization. The rate of increase in computing power and advances in plausible technology could make such a simulation possible within a few hundred years—maybe even by 2150, as Max had argued less skeptically in an article in *New Scientist*, which Sandra had read enthusiastically, albeit with a shudder.

If such a simulation *could* happen, then simulations would inevitably happen many times, with variations. Statistically therefore, and logically, we are much more likely to be part of a simulation rather than to be living in the original physical world. Shudder.

As Max pointed out in his article, little glitches might occur in a simulation, unlike in the real world, betraying the simulation for what it was—though only if you were really alert. As well as very lucky. Or maybe unlucky, as regards peace of mind.

Max withdrew his straggling arm and sat up, too. His thigh, then his neck, itched; so he scratched. These were normal itches, not glitches.

"There's an alternative," he said. "Many Worlds." The quantum theory interpretation that every physical event gives rise to two universes, one where the event happened, another where it didn't happen. "Maybe my awareness, that's to say ours," he added sharingly, "shifted to an alternative reality where I *did* cuddle you under the duvet. Otherwise nothing else in the universe is different."

Such were their discussions quite often. Max was a geek, high functioning by analogy with Asperger people, although without any Asperger. (Sort of like chicken and asparagus with melted Gruyère, but without the asparagus.) Sandra likewise, despite her softer side. Science ideas are the espresso of geeks, so they didn't yet need to resort to the coffee machine in the kitchen.

"Hang on," said Sandra. "If nothing is different in two universes apart from one cuddle, surely those universes can be treated as the same? It was you who told me about Leibnitz's 'identity of the indiscernibles.' You can't have trillions of almost indiscernibly different universes popping into existence all the time. Be reasonable!"

"Hmm . . . unless biggish changes happen, quasi-duplicate universes may renormalize into the same one. As it were. I think."

Sandra switched on the bedside radio.

Max asked, "Don't you want to hear what I'm saying?"

"Oh, I'm just checking for any biggish changes."

"Only you and I might realize there are any. Such as Saturn suddenly having no rings."

"Hmm," said Sandra, "the brain reorganizes the time sequence of experiences. So, your arm might have been under the duvet before it was on top . . ."

"No!"

"And the conscious mind fails to notice many things that happen, notoriously such as when you're driving a car along a familiar road. . . . Maybe I'm a familiar road?"

"Huh indeed!"

An unremarkable 6:00 A.M. news yielded to a throbbing movement from a Tchaikovsky symphony which might well, in a diagonal universe, have been called *The Romantic*.

"So, my Max, you mightn't have noticed yourself sliding a hand beneath the duvet . . ."

Max breathed, "How could I not notice such an activity, my love?" His hand shifted along her soft side, not that her other side was hard.

Sandra lowered herself down into the bed, and slid her own hand. "I seem to notice a biggish change in *you* . . ."

Their enthusiastic amour didn't banish the conundrum of The Inconsistency after Max renormalized himself. Time for espresso in bed now, even if this was a bit earlier than usual.

Max brought their Bodum espresso cups of borosilicate glass balanced upon their iPads in case googling became advisable. Toasty-hot coffee; impossible to burn your fingers thanks to the borosilicate.

Toasting Sandra with his cup, Max said, "There's something essential about the Now moment. It's *always* Now." They both knew how to say capital letters distinctly so that *Now* sounded slightly different from *now*; in Thai or Italian restaurants, neighbors sometimes thought that the couple were spitting at one another. Similarly, as regards the pursed-lip emphasis of italics. However, away from home they avoided **bold** which would require raising their voices, thus allowing eavesdropping by rival fellow science journalists, should any be lurking nearby.

"There can't," Max continued, "be a succession of Now moments flowing seamlessly—because the elapsed Nows are no longer now."

"So Now includes everything that ever was, and no fossilized Nows remain in the past. Consequently Now is cumulative. Now must constantly increase its amount of whatch-amightcall 'time-mass'—hitches of the shoulders for quote marks—"forever gaining momentum like a snowball rolling downhill?"

"Except that the hill is also the snowball. So much for a pointy *arrow* of time."

"And a snowball might shiver a tiny bit? Veer by just a fraction?"

"Except that the ball of time is the direction as well as the whole of Now." This sounded deep, and rotund. "The rotation, or angular momentum, of Now dictates the direction."

"I like *timeball*." Sandra entered the word in her iPad. "The Earth considered as a ball possesses poles, north and south. Why not east and west poles too? We may be getting somewhere metaphorically." She was fond of metaphors.

"Hang on, beloved. . . . If the south pole of the timeball represents the past, and the north pole the future, then the east and west poles could be *another* dimension of time, not normally noticed. . . ."

"People with ordinary slavejobs often work *overtime*. Why shouldn't there be *undertime* too?"

"An intangible time beneath Now, whereon your timeball runs! This undertime might have depth, you might say, and also width, you

might say . . . and analogously *length* (you might say)." Brackets made a bellows of his cheeks. "*Now* has no linear extension simply because that's hidden away in undertime."

Max and Sandra were very synergistic. So he began googling about arrows of time, while she padded naked to the kitchen, bearing their Bodum borosilicate cups for a refill from their Nespresso machine. Unnoticed by Max, she wiggled somewhat seductively on her way, due to the effect of Newtonian gravity upon his deposit in the bank of love.

Gladly he received his refilled cup from Sandra, whose auburn locks of modesty were still slicked. A doubling of time was definitely a two-cup problem, no allusion to her lovely bosoms resembling sultana-tipped pears, but to Sherlock Holmes. She slid back into bed and scrutinized his iPad screen. Their duvet cover, revealing itself now that daylight was dawning through the Venetian blinds, showed Princess Leia with Chewbacca from *Lego Star Wars*.

"There's an experiential arrow of time," said Max. "That's us, remembering the past but not remembering any future. Also ours, is the biological arrow, us growing up and getting older. Then there's the cosmological arrow due to the Universe expanding—"

"—at least at present—"

"—plus there's the thermodynamic arrow of entropy, spilled soup never going back into your bowl. Not forgetting an electromagnetic arrow, light never showing us what *will* happen, only what already has. A whole bundle of arrows! A sheaf, a quiver!"

He strove to remain realistic. Something was missing with regard to reality. . . . "If there's undertime," he pursued, "namely, a second dimension of time which we never normally notice, this might explain the notorious *missing mass* of the Universe."

Three months earlier, Max had written a piece about this important topic. Basically, there just isn't nearly enough observable mass in the Universe to account for its behavior, for example the rate of knots at which galaxies go spinning round—at that speed galaxies ought to throw themselves apart. Accordingly, cosmologists needed to invoke unobservable dark matter to beef up the density of galaxies. And even after adding dark matter to normal mass, there *still* isn't enough *stuff*! So there must be *dark energy* too.

"That's where the dark energy is," declared Max. "It's in undertime. Undertime has a different geometry to ordinary time. As it were! Instead of undertime having analogies to depth and width and length, it has *energy* or mass, same thing—and width and length. Of course this can only be expressed mathematically. But where does math come from? Does math preexist the Universe? Does math *emerge* from the Universe as the cosmos evolves during its very first microseconds? Or is math entirely invented by ourselves? Hypothetical armless aliens might have developed different math."

"Harmless aliens?"

"Armless. With mouth-tentacles, say. Like Cthulhu. Non-Pythagorean."

"I wouldn't say Cthulhu is harmless. It's good we don't need to use math in our articles. Equations and things."

Indeed. But this is okay because scientific experiments to test theories happen in the *real* world of things, not in the *realm* of math. Thus words and names take priority. Mount Everest has no hypotenuse. Unless idealized.

"**Hmm**," Sandra said boldly because they were still in bed, not in a restaurant or a coffee bar, "can a 'dimension' have its own dimensions? I mean, can undertime have analogies of length and width?"

"Yes, if those aspects of undertime are *orthogonal*. At right angles to undertime. As it were."

Sandra grinned, dimpling her cheeks. "Not at wrong angles, hopefully."

"I feel hungry," said Max, though it was only 6:45 by now. Thought requires calories. $T=m_2C$; cerebation early in the morning is the mass of two croissants. Or $C=m_2C$, for different definitions of C.

"Hungry in your belly, or elsewhere?" Sandra enquired mischievously.

"Four hundred, fifty-four Cals of best buttery flaky Viennoiserie crescents, please, my love."

Ideally, there ought to have been a French, or even Viennese, pâtisserie-boulangerie-Konditorie-Bäckerie down below their flat, to which she could lower from their window on a long thin rope a basket for early-rising Gaston, or Fritz, to fill; but in fact, the ground floor premises were occupied by a newsagent's run by an amiable Sikh, called Singh Stores.

Because Max was thinking hard, Sandra slipped out of bed for a second time, now to see to defrosting and heating three frozen croissants in their microwave oven, two for Max, one for herself, these accompanied by cranberry juice, seeing as they had already drunk two espressos, or *espressi*. Cranberry juice protects the urinary system. Presently she returned with a curly-sided tray, to minimize pastry flakes from straying between the sheets. The picture on the tray was a screen capture of an aquarium screen saver. Angel fish and sea horses.

"I'm just remembering—" Sandra said.

"—something about the reality inconsistency—?"

"—no, about people who don't hear and see things in sync. They hear other people speak before they see their lips move. I wrote a piece about this last year, remember? 'Badly Dubbed Barbara'. Yes, that was my headline."

"Uh-huh . . . though I seem to recall it wasn't Babs herself who was maldubbed . . ."

"A quibble, darling. So her world was maldubbed. Our eyes see lip movements much faster than our ears hear words. Speed of light, speed of sound. Our brain contains different inner clocks for different *nous*, and our brain coordinates an average. So our conscious experience of Big Now is actually created by our brain, unless you have a spot of brain damage, causing asynchrony."

"You think I had a spot of asynchrony this morning?" Max glanced again at the Higgs boson clock on the wall, "around 5:50?"

She munched. "But gosh, you were in perfect rhythm at sex, I mean six. Seriously I don't think you were ever unsynchrononous. Your croissant's getting cold, darling."

So he munched too. Flakes scattered upon the tray.

"I merely mean, Max, that *Now* is in the brain. Evolutionarily."

The hour and minute and second hands of their Higgs boson clock curved like the fingernails of a Hindu monk, a Saddhu, who never trims them, upon a background of particle decay, imitating the revelatory event at CERN. Bendy fingernails was Sandra's own analogy regarding the hands of the clock; Max himself didn't much care for Eastern mysticism mixing with postmodern Physics and tried only to see curving particle paths. In his view, Saddhus

were demented and probably lazy bastards, of even less use than sacred cows blocking the traffic in Indian streets. On most other topics, Max and Sandra saw eye to eye. Binocular bliss. Though they could always do with a bit more money.

Mr. Singh downstairs wasn't a Saddhu but a hardworking Sikh, who kept his religiously uncut hair neatly hidden under a turban.

Soon the croissants were consumed, so now Sandra and Max played at feeding one another the scattered remnants on a lightly wetted fingertip, hers then his. This might well have led on to other things, except that those other things had already happened; such is time.

"If we could *think* our way into under-time," she suggested, "maybe we could go back a way for a while instead of always forward? No, wait, back is southward on the ever-rolling ball, so that isn't possible—we'd get impaled on all the arrows, like trying to crawl through razorwire. But we might go eastward or westward instead of north. Side-ways in undertime. Orthogonally. As it were. *Now* isn't fully coordinated except by our minds. Let's try to unthink Now. That may be what happened to you semi-consciously around 5:50, my love—the inconsistency."

"How do we unthink Now?"

"Put ourselves in the same position. Try and get into a state of mind where you're cuddling me *underneath* and *also above* the duvet. Let your mind alternate. Your mind *already* did this once. This time I'll imagine under and above as well as you."

"Spoons," he said.

"Spoons," she agreed. "Let's get that ball rolling onto its side."

"You were tucked in tight before."

"Relax," she advised.

Traffic noise was slight and receded.

They drifted.

The espressi, or espressos, hadn't resulted in any detectable internal tick-tocking. To Max, the two of them seemed almost to be one shared existence, a being with four arms and four legs. Might he be able to shift an arm of hers? She, one of his? Say, from above to under?

Probably his body sensed impending movement; as one, their shared existence turned,

more fluidly than two people usually turn in bed. Indeed, were they in bed at all?

A shift can only express itself in imagery that the human mind appreciates.

Hand in hand now, twin tobogganists, they slide as if on soft pads along a vast curving tubular corridor entirely composed of doors of translucent, iridescent mother-of-pearl. Those doors squeeze against one another, occupying the entire surface of the tube. It's like being inside the inflated cast-off skin of an enormous snake. Within the scales which are those doors, rainbows swirl.

As the corridor inclines upward and sinisterward, the tobogganers' motion cants so that their orientation stays constant, and therefore is no orientation at all.

Ahead, door-scales fall open only to reseal themselves moments later. His course and hers might drop them through any unclosed gap.

Not at first; that door-scale shuts in time. Nor second; shutting in time again.

But now . . .

Max and Sandra lie on the bed, hand in hand, sweating. Such heat in the bedroom, as if energies have leaked in.

Max exclaims, "It did eW"

"s

"e

"Y," says she, so maybe still she understands him.

Nearby, his iPad.

Bank account.

Only one account now:

0,000,000

The lapse of a moment:

999,999

A moment more:

999,998

Another:

999,997

Concentrating as best he can:

"rich we'eR. won foR." Yes, they have won, for now.

Her

"ch

"i

"R," may be a cheer, or the panicky cry of a bird. ■

Potential Side Effects May Include

Marissa Lingen and Alec Austin

The research office was quiet that evening. I had scheduled my appointment late to fit around my work, so the usual set of trial patients weren't all waiting their turn—just me and two others, a scruffy middle-aged guy and a tall woman immersed in her tablet.

"Anxiety trial?" the guy said.

I nodded.

"Did they do the spider one on you yet? I hate the spider one."

The tall woman didn't look up from her tablet when she said, "The falling one was worse."

"I've done both," I said, "and I have to say I like the direct injection trigger less than either one."

"Direct injection trigger, ooh, yeah," said the guy. "I'm not looking forward to *that*. You have the placebo or the real thing?"

We weren't supposed to know whether the neurological implants we'd been given were actually running the software to keep stress chemicals from causing us too much anxiety, but by the fourth week of the trial, it was either really obvious, or these implants were the best antianxiety placebo in the world. "Real

thing," I said. "I didn't *like* the direct injection trigger, but it was only unpleasant for a minute."

The direct injection had flooded my system with all sorts of stress response hormones. The way the implant smoothed them out was almost creepy. I had been that worried before, that scared, and it had taken me hours to calm down completely. But that was my unaugmented self. With the implant I was cool, calm, collected. Chill.

I suppose some people would say I was not myself, but honestly, I didn't mind being a little chill for once in my life.

"Me too, the real thing," the guy said. "Honestly I haven't even talked to the placebo people. They must be losing it *way* before they get to the direct injection."

"I would," I said honestly. "Way before the spiders, even. All it takes for me is one mention of my student loans."

The other two both laughed, in that tired way you get when something is true but not really funny.

But I was fine. Really, truly fine. I had said the key words—student loans—right out loud, and a wash of calm kept me from going

into a tailspin of planning each penny and vowing to eat Top Ramen for the next month.

I had told the research group that I was interested in participating in their trial because I wanted to help people, because my mother had been helped by one of the first-generation antidepressant implants. And that's all true. But the scientist doing the intake interview had said aloud, "Student loans, check." When I opened my mouth to protest, she said, "Seriously, you know and we know the right answer to write down. But we also know the real reason we get healthy test subjects in their twenties."

So there I was, helping science—and ideally myself. I was so buoyed by the fact that I could think about my debt load without going into a panic that I strode confidently into the exam room when they called, "Regina Kwan."

It was a good thing I was feeling confident, too, because they had one of their grad students in a ski mask chase me through a dark maze that had other grad students stationed in it to jump out at me. My heart rate was elevated from the run, but I found myself able to remember throughout that these were *grad students*, and they couldn't hurt me without violating their human subject research protocols.

Have you ever tried to remember that when some guy a foot taller than you jumps out from behind a corner and acts like he's going to grab you? Usually it's not easy. This time I even remembered that he wasn't allowed to touch me lest the supervising university come down on him like a sledgehammer.

"How do you feel, Regina?" said the doctor at the end.

"Kind of great, honestly," I said.

"Your pulse rate is going down nicely."

"I feel like I usually do after a run," I said.

"Only it was pretty funny, honestly, having those poor guys going booga-booga at me."

"I won't tell Daniel," said the doctor. "It might hurt his feelings to hear his attempts at being menacing amused you."

I arched an eyebrow at the social anxiety prompt, thinking, *I see what you did there*. "Just means the implant is working, right? It's no reflection on him."

"No reflection at all," the doctor agreed, and a little later I was on the T, heading back home.

Dinner that evening was a batch of chicken potstickers that I'd made the week before and thrown in the freezer, and I made it through the evening without once fretting about whether I'd cooked them well enough or what my mother would think of how thick I'd made the dough. Several episodes of *A Good Reputation* (my favorite K-drama) had built up, so I pulled them up and watched them before bed. They weren't up to the show's usual standards, though—or else the implant undermined my anxiety about whether the protagonist would stay true to her man or succumb to the charms of the bad-boy Starcraft player.

Work the next day was the same as ever—rejecting insurance claims for any of a dozen reasons—and though my supervisor pulled me aside just before lunch to quiz me about a claim I hadn't bounced, I kept my cool and walked her through my step-by-step analysis of why we had to pay out. She grumbled and growled and made faces at me, but eventually she admitted I was right.

I was riding high on my victory all afternoon and was feeling good as I swung past the grocery store on the way home. I was in the dessert aisle, reaching for the frozen fruit juice bars I always got, when I stopped myself and took a second look at the gourmet ice cream bars that'd caught my eye. They cost nearly three times as much, and had god knew how much more fat, but I'd had a really good day—I deserved a treat, didn't I?

I was watching a comedy news show and finishing off my second ice cream bar of the evening when my parents called. "Hey, Dad," I said as I accepted the call. "What's—"

"Regina Mei Yi Kwan," my mother said into my ear. "When was the last time you called us?"

"Hey, Mom," I said. Clearly, this was going to be one of *those* phone calls.

"Two weeks ago! What kind of daughter does that to her parents? For almost two weeks we've been worried that you've been in a transit accident, or sideswiped by a car."

"I'm fine, Mom. I promise."

"You know that Boston drivers are even worse than drivers in Shanghai or Taipei!"

I rolled my eyes and tried not to sigh too audibly. If my mother wasn't a prime candidate for the antianxiety implant, I wasn't sure who

was. She was so much better on the antidepressant implant, but better was not the same thing as easy to deal with.

"Now, honey," my dad said, trying to be soothing. "You know that's not true. Drivers in Shanghai are *much* worse."

"Much," I agreed, thinking of the truck that had almost run us over the last time I'd gone with him on one of his work trips. "How are you doing, Dad? Are you still having to fly to China every month?"

"He is, and it's turning his hair grey," Mom said, cutting Dad off. "If his daughter would use her math degree to get a respectable job, he could take early retirement, but no, she's not even looking."

"Mom—"

"Sally Chen's mother called me yesterday, to crow about her daughter getting a postdoc position at Brown, and what could I tell her? That my girl has a bright future as a claims adjuster? With no grandchildren on the horizon, I might add."

"Mooom—"

"If you would just drop a few pounds, you would have no trouble finding a nice boy—"

"Or a nice girl," Dad added. "You know we aren't prejudiced—"

"A nice *boy*," Mom reiterated. "And have you even been reading the links I've been sending you about diet and exercise and getting up from your desk every ninety minutes? Because—"

"*Mom!*" I bellowed, as I reached the shredded ends of my patience. "Jesus! Would you quit it already?"

There were three heartbeats of shocked silence before my mother said, quite huffily, "You shouldn't take the Lord's name in vain, Regina."

Like you even believe in him, I thought, thinking of the scroll of Guan Di and the shrine to Grandpa that took up a corner of the kitchen, and how she treated the First Chinese Lutheran Church like a social club.

"Honey," my father said after a moment, "your mother just worries about you, that's all."

"I know she does," I said. My shoulders still trembled with barely controlled anger. "I just . . . have to live my own life. You know? I can't worry about what Sally Chen is doing, or whether Bobby Kwok and his wife are having

another kid. And I don't appreciate being guilt-tripped about my job, or how much I exercise, or anything else."

"I hear you," Dad said. "Still, try to call more often, if you can. You know we love to hear your voice."

"Okay, okay," I said. "I gotta go now. We'll talk again next week."

"Next *week*?" my mother was saying, but I had already terminated the call.

My parents could be great, but nobody got under my skin like them. I got up and paced around my living room, trying to get my hands to stop shaking. It hadn't even been that bad, as phone calls went when my mom was on a mission. I just—I took several deep breaths. She probably did have a point. The thing about getting up and walking around the office was not a bad idea, I didn't want to get blood clots or have something weird happen to my metabolism, or—

I stopped. Or at least, I tried to stop. Part of my brain was still saying, "Two ice cream bars, the world is ending!" But I hadn't had that feeling in weeks. Not since the implant was put in.

I logged in to report the incident on the test subjects' website, and I got an automatically generated message back asking me to come in and see the doctors before work the next morning.

I finally fell asleep at two A.M., still worried about whether I would sleep through my alarm.

"Your software crashed," said the grad student who took me back to the exam room. Daniel, I think I remembered his name was. I remembered running through the maze with him after me, but somehow it was a lot easier to see how this big, friendly guy could scare a person now.

"What does that mean? Am I out of the trial?"

He smiled reassuringly. "Not at all. We'll just reboot it. In a way, this is good news. We know that your ordinary levels of daily anxiety are being managed by the implant, rather than just having had a really great month or so coincidentally. But we set up the implant so if the software crashed, the pump wouldn't release any chemicals into your brain. We didn't want a software crash to mean a psychotic break or anything like that!"

"Could you, uh—" I tried to smile back at him, my stomach churning. "Could you maybe wait until after the implant is working again to say things like 'psychotic break' to me in the context of my own head?"

His smile wavered. "I was joking. Seriously, don't worry about it. We'll have you up and running in no time."

Having the implant working again was just like the thing my dad always said about banging your head against a brick wall and having it feel *really good* when you stopped. I could think about it and decide that, okay, two ice cream bars was not really a great idea, but it was also not going to lead to an early grave. My parents could be a little nutty, but one of the reasons they got under my skin so much is that I was afraid they were right.

It was really good to not be afraid.

The scruffy guy I'd talked to before the maze test was coming out of the clinic at the same time as I was. "Yours crashed too, huh?"

"Yeah. Oh, hey, good, I'd worried that I'd overloaded the thing," I said. "Phone call with the parents."

He laughed. "Me, I was just doing a cross-word puzzle, so I really don't think it's your fault. Or even your parents'."

"Well, that's a relief, because as nervous as my mom's worries about my future can make me, I bet there are people going through a lot worse. If the implant can't handle me freaking out about all the articles my mom sends me, it's probably got a lot of retesting to go before it's market ready."

I was two minutes late to work, but it was nothing to worry about, so I didn't. Score one for the implant.

I was buying a salad from Au Bon Pain when I got a text from Sandra Klein, my college roommate. **HAVING A ROUGH DAY. WANT TO GRAB DRINKS AFTER WORK?**

SURE, I replied. **KENDALL SQUARE? CENTRAL?**

A dozen insurance claims later, Sandra and I occupied a table at a communist-themed dive a few blocks away from the Central Square T stop. "I can't believe you picked this place," Sandra said, using her pint glass to gesture at the photographs of Lenin, Stalin, and Mao that festooned the walls. "Didn't your great-aunt get hauled off for reeducation by the Red Guards?"

"Yeah," I said. "But it's not like any of this is real. It's kitsch." After a pause, I added,

"Besides. I always wanted to see what the inside of this place was like."

"So what do you think?"

"Honestly?" I said, wrinkling my nose at the giant iron bomb hanging from the ceiling. "It's tacky."

"What, you'd rather it was all ropes and pulleys and nautical charts like that pirate bar downtown?"

I just smiled and let Sandra regale me with stories from the law firm where she worked as a paralegal. Criticizing the bar we'd picked was practically a tradition. If I'd found a place in Kendall or Harvard Square, Sandra would have complained about all the damn students.

It was full dark by the time the bar grew too crowded to stand, and I walked Sandra to the T, making sure that she made it past the station's turnstile before heading across the street to take a train in the opposite direction. One of the streetlights on my street had burnt out, and another one was flickering on and off as I turned off the main road toward my apartment.

As I approached the burnt-out streetlight, I noted a figure standing under it. The two beers I'd had with Sandra had mellowed and relaxed me to the point that I didn't so much as start when the figure stepped away from the lamppost and I saw it was a man wearing a ski mask.

"You've got to be shitting me," I said as the masked man moved to cut off my progress. "A ski mask? Really?"

"Shut up and give me your purse," the man said. As his voice cracked, I revised my estimate of his age downward.

"You're in over your head, kid," I said, reaching into my purse as he fumbled with a clasp knife and finally flipped it open. "You come at me with that tiny piece of shit, and I'll Mace you. And while you're clawing at your eyes and mouth, trying to make the pain stop, I'll take a video. You'll be the laughingstock of the whole damn internet. So step the fuck off, all right?"

"You don't scare me, lady," the masked teenager said as he advanced.

I took a step back and kicked off my shoes. The first of them went into the street, but the second went flying at the teenage mugger's face. He ducked reflexively, and as he did, I charged him, swinging my purse at his head with both hands.

I clubbed him square in the ear, making him stagger sideways. The clasp knife slipped from his fingers, and I kicked it into the street before pulling out my phone to dial 911.

"Hello, Emergency?" I said to an automated message telling me I would be connected to a dispatcher soon. "I've got the world's most incompetent mugger here. Can you send some cops to pick him up?"

"911," a dispatcher's voice said into my ear as the kid rabbited down the block and disappeared around a corner. "What's your emergency?"

"Some kid just tried to mug me, and I pasted him in the ear," I said.

I expect they don't hear that a lot. A cop turned up, and I gave her the information completely calmly: best description of the attacker I could manage, the series of events. She looked me over—I'm over five feet tall, but not much—and said, "Martial arts training, right?"

I rolled my eyes. Not every Asian kid studies martial arts. "No."

She gave me another once over. "Jesus. Lady, your blood is ice water."

Oh. Not the Asian thing. The augmentation. "I—"

"Don't do it again, all right? Getting that beligerent with a mugger can get you killed, or at least seriously injured."

"I—thanks, yeah. I don't know what came over me," I lied.

I knew *exactly* what had come over me, and I made an appointment to go in and talk to the researchers about it. When I got to the waiting room, the scruffy guy was there, his hand wrapped in pretty serious bandages.

"What happened to *you*?" I blurted.

"Oh, hey," he said. "Not much." He motioned for me to lean in, lowering his voice. "I was on chat with my girlfriend when I went to take a pan out of the oven, and I completely forgot not to touch hot things. Like, the usual reaction you have, thing in oven, hot? Gone."

"Oh my God," I said. "Is your hand going to heal all right?"

"They think so, but it'll take a bunch of PT."

"Wow," I said. "So that's why you're here?"

He looked at me like I was stupid. "If I tell them about this level of risk, they won't let me continue with the study. That means they won't keep *paying* me for the study. Better to just try to be extra careful."

"That's—"

"Practical," he finished for me. "That's entirely practical. I need the cash. My hand will heal, and I'll try really hard not to do it again."

I winced, thinking of how similar it sounded to my own reactions to the mugger. When I got back to the exam room and told the doctor what had happened, she looked grave. "Your response level may be set too high. We're going to have to calibrate that. In the meantime, do you feel safe?"

"Yeah," I said. "That's kind of the problem."

"Oh, right. Well, do you *think* you can stay safe? When you just think about it unemotionally?"

I hesitated.

"Feel free to talk it out with me," said the doctor.

"Well, there's this other patient I've run into in the waiting room, and I don't think he's being entirely straightforward with you about the effects of his implant," I said. "He told me he'd burned himself pretty badly when he wasn't paying attention, and he thinks the tamped-down fear reaction was part of it. But he didn't want to get kicked out of the trial. If I continue at my current level of reaction, I think I can stay safe, but—I don't want to have problems like he has."

"I can see why not," said the doctor. "Still, people process things differently—I expect a lot of people don't have fear as a major factor in their kitchen routines, but of course some do. So even if you have too much reaction from the implant, you're not necessarily going to run into the same problems as he did. But I appreciate you telling me this. It's very important that you should be honest with us so that we have the data for various applications."

"What do you mean, various applications?"

"Well, there are the patients like you, of course, the constant low-level anxiety disorders," she said. "That's why *I* got into this field. But we can't overlook the potential applications in military and law enforcement. If someone who had actually been trained to take on your mugger knew for a fact that fear would not make them hesitate, that could have very positive implications for police work."

"And negative ones, if they're charging into danger without exercising due caution," I said. My cousin Mike was a firefighter. I didn't want him wandering into burning buildings without the precautions they learn. I mean, Mike's a smart guy—he would know rules and regulations. I just wasn't sure that doing the job without caution would be the best idea.

"That's always a question," she said. "Anyway, think about whether you want to stay in our subject pool. We're not going to kick you out, but of course if you feel that the side effects are beyond what you can tolerate—"

"Or the main effect," I said.

"Or the main effect," she agreed. "It's entirely up to you."

I nodded slowly. The rest of my day was a pretty slow one at work, and I really needed the time and mental space to mull it all over. I felt a little foolish that I hadn't thought of the military and emergency personnel applications in the first place. I wasn't sure I was okay with contributing to the carefully calibrated scientific equivalent of drugging child soldiers to make them fearless.

On the other hand, the scruffy guy had been willing to skew the data in ways that could get those soldiers, cops, firefighters—and ordinary people—killed. Every new technology has a range of applications, and was it really beneath me to help make something like this safe?

It didn't occur to me until my phone rang that afternoon that I had not been thinking for even a moment about the effects of quitting the study on my student loans. Even though the scruffy guy had brought it up. I made a note to myself to check that I had been paying my bills, without the spur of anxiety, and picked up the call.

"This is Daniel, from the anxiety study?" said the voice on the other end.

"I remember you. Hi."

"Doctor Eklund wanted me to tell you that they're adding new components to the monitors for future implant trials," he said. "Your vital signs will be monitored a lot more often, and we'll include a larger range of blood chemistry tests. She just wanted you to know that, given . . . something about the conversation you had this morning, I guess?"

"Tell her thank you for me," I said. "That's good to know."

I hung up the phone and checked my bank account. I *had* set my financial stuff appropriately—I just hadn't triple-checked it daily. The phone rang again, and my boss poked her head out of her office to glare at me.

"Mom, I'm at work," I hissed into it.

"I know, I just wanted to make sure you got the article I sent you about the benefits of the more neglected B-vitamins. This is important, Regina. It's not just thiamine and niacin any more. The carcinogenic effects of—"

"I will give it a very close read," I promised. "But I have to go. I think my boss wants to talk to me about something important."

"Something important!" my mom sounded excited. "Do you think it might be—"

I disconnected the call before I could hear her theories.

I felt fine. I didn't have to go to the bathroom to do deep breathing or splash cool water on my face. I didn't have to text Sandra about B-vitamins. I just . . . went back to work.

I hope the additional monitoring won't be too bulky. But I'm not worried about it or anything. ■

In the Mix

Arlan Andrews, Sr.

Arty's wrister Fast'd her most urgently, the combination of vibrations and flashing screen demanding immediate attention: WEBMELD OF *INSTERS* IMMINENT. OK TO MIX? Without thinking, she twitched acceptance and *esunamied* into the Mix, quickly taking a seat in her home office's comfortable smartchair to ensure her meat safety while going out of her mind.

A most interesting meld, she thought as a kaleidoscopic swirl of images, odors, music, motions, and emotions enveloped her whole consciousness. *Eighty-five million in this go-around, and on the upswing. Still a small Mix, but growing.* Sweet smells vied for her attention—lavender, rose, pines, perfumes, unknown tangs and tastes. The cacophony of competing background music themes produced resonances she vaguely recognized—panArab panache? Hindi *karosh*? Uke reign?—no matter, it was all the most rev. As usual, many waves of emotes were pressing for webminance—here was the poor subharan remnant vying for approvals but fading, failing, as always; cliques of Caribbean caciques pushing neo-gangic biomemes; uber-Andean *sambanbistos* of Amazonia making a valiant effort in advancing their perpetual chemically induced holiday cheerfulness. Arty rather hoped these last would prevail in the current meld; she needed some lift after the traumatic events of the previous evening, witnessed on the street below her window.

As synesthetic software mixed her senses, she yielded more and more consciousness to the Mix, becoming another biometric datum in

a synthesis of symbols and sensations, offering up her own novelties for review, putting out payments for her likes, taking in tokens of appreciation from her Mixfen. *All part of the life of a skip-ficc'er* was her final thought as she lost her mind in the Mix.

Five minutes later, Arty returned to her meat-mind, refreshed by the immersion into the charms FastNet offered, a sampling of the synthesis of the emotions and thoughts and creations of nearly a hundred million others who, like her, required an hourly rush of synthemotion. Not to mention the inevitable tokens of *cubezos* that she harvested each time there. *Enough to pay the day*, she thought, *It's a living!*

As part of her strict, self-imposed professional regimen, Arty reviewed those intense five minutes in the Mix. *Overall, as good as usual, though I was just a bit perturbed at those cyberati from Old Nippon this time. Revanchist vids were not a proper part of the Mix, holy n-appropriate.* Fortunately, she recalled, the opinions of ninety-five million melderers had slapped them down pretty hard. Thinking over the alt-history scenes of nuking Pearl Harbor a hundred years ago, she shook her head. *It's hard to imagine that such minds even exist today.* Compartmentalizing, she deliberately paid unattention to the daily violence on the street below her tower window, dismissed the reports of riots, freedomfighter attacks, and societal fails that seemed to be increasing all over the world. *No profit for the prophet there*, she concluded, focusing her meat-mind on making more material for the Mix.

We skipfic'ers have to keep introducing new memes and themes and gross gangrenes into the Mix, she mused, or else munch pineapples like the other 90 percent of bumynity. Though she would never be an OPC, her *skipfic* talents did keep her in an enviable upscale lifestyle, and off the Dole! she thought. *The One Percenters might get to live in the Tower Tops, one thousand meters up, some even with access to greengrass roofparks. I'm just happy to be able to earn my 100-3-30: one hundred square meters of living space, three square-printed meals delivered, and up thirty meters from the street. Munching pineapples—living on the Dole—means you're lucky to get 10-2-1. And that kind of life on the street is snort, bratty, and bluish: drugs, gangs, and cops.*

Arty's continuing commercial success in the Mix was due, she knew, to her unique sources of ideas. Luckily for her, her three mothers had been atavistic, hanging onto dead-tree volumes stored in dozens of old rotting paperboard boxes, deeding them to Arty when they went West ten years before. The "books" she found in those moldy containers had provided her with insights and feelings that apparently existed nowhere else. Or at least not accessible by other Insters. A closely guarded trade secret, Arty had taught herself to "read" those static, noninteractive dead pages very slowly, using only RealEyes, finding herself incapable of flashskipping them like wrister displays or the neuralnet that was the wildness and beauty of the Mix.

In addition to the incredibly long "novels" and more reasonably lengthed "stories" that inspired much of Arty's Mixputs, some of the outdated media sources she accessed on her Moms' ancient "computer" contained thousands of thousands of OldNet text-only "e-mails" and messages, "postings" some were called, the musings of that past generation of creativers. Her maternal progenitors had been "professors" in the arcane and antiquated profession of what had been called "literature," at a *bricksenmortar* establishment called a "university." These, she understood—intellectually if not emotionally—were the only tools available when those primitives were trying to express their ideas, thoughts, emotions. They had not had anything like the Mix, poor people, nothing at all comparable to synesthetes. She often wondered how they had even lived, had

been able to make any progress, to build toward the wondrous world that was hers.

So, between her many Mixers with the Insters, Arty delved into the ancient mode of text-only idea communication, slow and tedious though it was. *How limiting*, she thought for the *infinityeth* time, *they had to try to impart emotions and environmental factors through text alone, few flatpix, no wristers, no neuronets, not to mention the Mix.* It was no wonder that twenty years ago most of those old folks had had to munch the pineapple. They weren't raised digitally, and their old meat-brains had been earlier wired to the snail-slow mode of "reading," never conditioned to input and output flashfic or snackac, much less having the wiring required to access FastNet or experience emotes and synesthetes. *No Mix for them!*

One twenty-year old plaintive email message from an apparently once-famous spec-fic author read, "Hell, I'm giving up, fellow writers. Nobody reads words anymore, it's all video and sound, even smells and emotions and synesthetes now. I realize now that for those of us born before about 2020, we can barely exist in this newly ordered world, what with its *i-tats* and *Oc-eyes* and *wristers*, much less survive by pumping out text-only stories and novels that appeal to anyone under fifty. I've shut down my onlines, opted out of the *samizdata*, and am retiring to the People's Republic of Caribbea to live on a heavily armed coop barge and partake of the pineapple."

Arty smiled. It was somewhat sad, of course, that the old ways had been supplanted by modern methods, but apparently the rest of the world hadn't taken notice. She loved her work, loved being in the Mix, experiencing the pulse of the planet, the ever-increasing *nöosphere* of billions of others. Her own beloved "profession" consisted of feeding the ravenous hunger of the more passive members of the Mix, constantly coming up with flashfics that the vast waves of synesthetes would coalesce around, that the trenders would acknowledge for their novelty, so that her net collection of *cubezos* tokens would increase, and she could rise higher in the towers.

So it's once more into the Mix, dear friends, she thought as she pulled out a musty tome and read out loud, "It was the best of times, it was the worst of times."

Like now? she thought, as sirens wailed in the street below. *Like now?* ■

Plotting: How to Make the Unexpected Into the Inevitable

Richard A. Lovett

Years ago, I complained to a fellow writer about how much more difficult I found it to write fiction than adventure travel, humor, or other types of narrative nonfiction. With nonfiction, I told him, I always know what's going to happen next because it actually had happened. With fiction, I didn't.

My friend disagreed. "No, no," he said. "For me, it's the other way around. In essays I'm constrained by what really happened. In fiction, I can just make it up."

Just making it up is what writers mean by *plotting*. In the same conversation, I told my friend that, for me, there's no *just in making it up*. If I don't know what happens next, I'm stumped, often for months. But my friend remained adamant, and his next comment took me aback: "That's no

problem," he said (rather condescendingly, I thought). "Plotting can be learned."

Today, I think the two of us may have had slightly different ideas in mind.

I was thinking about the question of how you figure out the very broad *what-happens-in-this-story* that turns a promising beginning into *beginning-middle-end*.

William Gleason and I, for example, faced these questions early in writing our novella, "Nightfall on the Peak of Eternal Light" (July/Aug 2012 *Analog*), about a man in witness protection who migrates to Moon, not knowing there's a hitman on his tail.¹ It was a great concept, but how does the man discover his pursuer before it's too late? How can he

¹ The idea for this story, by the way, was Bill's, along with most of the characters and the lunar colony setting, which he has used in other stories.

use the lunar environment to his advantage? What happens in the climactic confrontation?

In another novella, “A Pound of Flesh,” (Sept. 2006 *Analog*), I found myself writing a futuristic noir with a detective who’d just received a visit from the classic mysterious woman. But what was the mysterious woman’s secret agenda? What, exactly, did she want him to detect? It took me four years to get from this beginning to the final, published story.

If this most basic level of plotting is easy to learn, I’ve never found the secret. All I know is that the answers tend to present themselves unpredictably, often when I’m doing unrelated things, like hiking, going to a concert, or waking up in the middle of the night.

But there’s another level that sets in after you have the big picture in hand. If we think about working out the big answers as megaplotting, this more detail-oriented level could be called microplotting. And it’s considerably easier to learn.

Not that these are totally distinct processes. What you do at the micro level affects the mega, which is why so many writers discover that even if they spend hours outlining, the story takes on a life of its own. That happened to me with a story called “Dinosaur Blood” (Jan/Feb 2006 *Analog*). I originally planned it as the tale of Trista, an ultra-rich heiress in an energy-depleted future. She could afford expensive synthetic fuels, could jet anywhere on the planet, and could call for private helicopters any time she wanted one. Most people used low-power electric cars, public transportation, or horses.

At the start of the story, Trista turns twenty-one and inherits a collection of museum-piece automobiles, plus a secret storage tank containing the world’s last supply of gasoline. To celebrate, she hires someone to build a tank trailer to carry the gasoline, picks a vehicle from the museum collection, (a Hummer, because it has the power to pull the tank trailer), and recruits friends for the world’s last gasoline-powered road trip. The goal: visit all the best party spots along the way. Meanwhile, godlike aliens are viewing from space, trying to decide if humanity is worthy of contact.

My original plan was for Trista to party until she ran out of fuel. Then she’d leave the

Hummer and the empty tank trailer in the middle of a road and call for a private ‘copter to take her home—a vapid heiress at her worst. The aliens would sigh and nudge an asteroid onto a collision course, just as they had millions of years ago, when they passed a similar judgment on the dinosaurs. But when I sat down to write, something happened.

The original outline had also called for the party trip to be women-only. The reason had simply been because I didn’t want to mislead readers into expecting a romance. But microplotting required a better reason than that, so I added this:

Trista thought about adding guys to the mix, but decided against it. Guys would want to drive the Hummer and it was Trista’s car. She didn’t want to spend the whole trip arguing with a bunch of guys, cute or otherwise.

The moment I wrote that, Trista became smarter than intended. I chuckled . . . and decided I’d give her a chance. So I threw away the outline and let the story drive itself (so to speak), waiting to see whether, during the road trip, she matured. If she didn’t, the original ending still worked. Either way, a trivial bit of microplotting had mutated my short, wry fable into something else.

What this means is that plotting, whether it’s mega, micro, or any level in between, is a dialog between you and your story, with the characters taking front and center.

Many writers describe this as having their characters take control, but that’s not quite true. As Connie Willis has insisted,² “They’re my characters, and I can make them lay down and die if I want them to.” That said, unruly characters are an important signal from your subconscious that there may be parts of the plot you’ve not properly thought through. Putting all of this together, we get . . .

Rule 1 of Plotting: Plot stems from character.

This rule holds true even if you think you’re writing an “idea-driven” story. If you don’t believe me, reread Isaac Asimov’s “Nightfall.” His concept of the once-a-millennium night may well be one of the grandest ideas of science fiction (and what most of us remember about

² Source: talks at various conventions.

the story), but there are still characters—characters who foresee the looming disaster and bend their best efforts to preventing it. They aren't the most complex characters ever written, but without them, there would be no story. The oft-cited distinction between idea-driven and character-driven stories is, to a large extent, a false dichotomy.

We can take this a bit farther by looking at Orson Scott Card's 1985 classic, *Ender's Game*. It too can be viewed as an idea-driven story, centering around the use of war-gaming child soldiers as battle commanders. But Card took that idea and wrapped it in the character of Ender Wiggins—a strong and interesting enough presence that when the movie came out in 2013, it didn't matter that the big reveal at the end had been copied so many times it was no longer much of a surprise. The story is about Ender. He's even in the title.

Lois McMaster Bujold's Vorkosigan novels do this even more overtly. They abound in space battles, intrigue, and world-building. They have futuristic technologies, such as uterine replicators, cloning, cryonics, and genetic engineering. Those who don't see this as hard science fiction have forgotten that biology is also a science. But at the heart of Bujold's series is the fragile, pint-sized Miles Vorkosigan, obsessed with proving that despite his physical limitations he can not only live in his physical-perfection-worshiping society, but command. In plotting these stories, Bujold's master touch was to focus on Miles. "I asked what is the worst thing that could happen to this character," she once said at a convention.³ "Then I asked how I could make him do it to himself—and make it inevitable that he would do it to himself."

I don't know how Bujold goes about turning that line of thinking into prose, but my own process is like an actor preparing a role. Mentally, I climb into the skin of the character by reading through the preceding pages of the story. Then I leap forward by writing a few more paragraphs. It's a bit like a child playing with an old-fashioned wind-up toy. I wind up

the character by donning the role, point him or her in the right general direction, and see what happens next.

"My characters often make decisions I wouldn't envision," says Hugo-winner Robert Reed. "Which means, I guess, that the plot is in their capable hands. In some ways, I'd have to say plot is just an outgrowth of the souls that you have sent dancing across the pages."

This doesn't mean Willis is wrong about the writer being in control. But sometimes the best way to exert that control is by letting yourself *be* the character. If you do this well, your stories will naturally follow Rule 1. They may not, of course, go in the direction you want, but we'll get to that later.

Don't Make It Easy

"Life," psychiatrist M. Scott Peck wrote in his 1978 self-help bestseller, *The Road Less Traveled*, "is difficult." It's even more difficult for fictional characters. If you want to write the least-satisfactory story possible, here's the script: An unbeatable hero goes forth, kicks ass, and comes home to enormous acclaim. Who wants to read that? We want our heroes to struggle.

Writing advice sometimes conflates this struggle with something called the try/fail cycle. The idea is sound: Good stories often arise from characters who try, fail, try again, fail again, and finally, in one last titanic effort, succeed. But this threefold try/fail cycle is not anywhere nearly as universal a rule as it is sometimes made to appear.

Partly, this "rule" stems from the unmistakable allure of triplets, not just in speech, but also in action.

- "I came, I saw, I conquered."
- "Life, liberty and the pursuit of happiness."
- Government "of the people, by the people, [and] for the people."

There is something about such phrases that rings deeply in the human psyche.⁴ But the standard threefold try/fail cycle can be too confining. It can also be impossible in short

³ This comment comes from either an Orycon or Portland-based Westercon. I've repeated it many, many times in the intervening years. The words may (or may not) be precise, but this is the gist of what she said.

⁴ Painters and landscape photographers know this, too. When was the last time you saw a picture of two flowers (rather than one or three), or a still life of two pieces of fruit? It can be done, but the result usually feels artificial.

fiction, where you often don't have room to let it play it out.

You can get the same effect, however, by having a character consider and discard a variety of solutions before hitting on one that works. Or, the solution to one problem can lead to another, more difficult one—or, better yet, *create* the next problem. Alternatively, a character can get what he wants, only to realize it's not what it's cracked up to be.

Dracula is a great example of how to put this into practice.

In Bram Stoker's novel, the bloodsucking count arranges to move to England, bringing with him fifty boxes that, for complex reasons, are the only coffins in which he can sleep. In the first attempt at catching the vampire in his sleep, Stoker's heroes track the boxes to an abandoned mansion. But when they go inside, they find to their horror that twenty-one are missing, reshipped to points unknown. They've not totally failed, since they did locate twenty-nine of the coffins, but neither have they succeeded, and now they have a new problem.

More detective work locates three addresses to which the missing boxes have been distributed. But again, when the vampire hunters close in, they don't find all of the twenty-one. One is missing, and *Dracula* slips away. Second attempt, second failure. Worse, one of their number has been bitten and is well on her way to becoming another evil undead as the rest of the book becomes a desperate search for the final coffin.⁵

If you've never read the book, I won't spoil the end. But the situation goes steadily from dire to worse until one of the heroes proclaims, "[W]e are in awful straits. I fear, as I never feared before."⁶ Today, such a proclamation might be clichéd. But making your readers feel that way? That's a sign of good plotting.

Shorter fiction may not be able to ratchet up the tension this strongly—not to mention that not all stories revolve around life-and-death adventures. My story, "Cats Know" (December

2012), for example, involved an aging widower trying to salvage the humanity behind an artificial intelligence derived from a brain scan of a dying woman. His initial efforts are rebuffed by the company that owns the copyright to the program, but he's stubborn, and gradually begins to make progress—though it takes him seven attempts in a 4,200-word story.⁷

In writing that story, I never thought specifically in try/fail terms. I was merely thinking about the difficulty in convincing a heartless bureaucracy to do what's right—and since heartless bureaucracies aren't easily convinced, the story naturally observed Peck's dictum. Which gives us . . .

Rule 2 of Plotting: Make your characters work for what they achieve.

The essence of plotting is contained in these two simple rules combined: Good plotting stems from characters struggling to overcome obstacles—whether those obstacles are invading aliens or the emotional fallout of a broken marriage. But that doesn't mean there can't be tips on how best to employ these two rules. The rest of this article will focus on those.

Tip 1. Everyone Wants Something

Go to the self-help section of any large bookstore, and you'll find endless tomes on the importance of having goals. Fictional characters may or may not have specific goals, but they do have wants. A general might want to win a war. A high school student might want a date to the prom. A harried parent might want nothing more than a good night's sleep. The characters themselves need not be aware of what they want, but the writer must be. "I need to ask 'why' a lot," says novelist and short-story writer Brenda Cooper. "Why would Sally be attracted to Johnny? Why would Sally want to fly away from home? Why would Sally want to go to war?"

This doesn't mean characters have to be good at getting their wants. They might be unrealistic dreamers, or too lazy, confused, or psychologically damaged to achieve much of anything. Alternatively, they might desire

⁵ At 160,000 words, *Dracula* is complex enough that there's a lot more to the plot than this. But many of the subplots also follow this same basic pattern.

⁶ Barnes & Noble Classics Edition p. 360.

⁷ Needless to say, not all of these attempts get equal weight in the story. Three successive failures are disposed of in about two hundred words each.

nothing more than to drift through life pursuing the path of least resistance (although, technically speaking, that itself is a “want”). What matters is that they want something.

In theater, figuring this out is called *character motivation*. Failing to think it through for every single character action, however trivial, can lead to characters pursuing the author’s *idea*, rather than behaving as people. Even if readers don’t know exactly what’s wrong, the story will ring untrue.

At its extreme, failing to think about this can lead to what film critic Roger Ebert (borrowing a term from Golden Age writer James Blish)⁸ called the *idiot plot*, defined as “any plot containing problems that would be solved instantly if all of the characters were not idiots.”⁹

Luckily, there are ways for the author to get what’s needed while still paying due attention to character motivation.

Tip 2. Steer Characters with External Events

Character isn’t the only thing that can steer a plot. There can be many events over which your characters have no control, whether they be earthquakes, heart attacks, or surprise visits from the in-laws. As long as they don’t all happen at once, readers will accept such occurrences because we all know this is the way life works.

You can even use such events to force characters to do things they wouldn’t otherwise do.

Suppose you’re stuck with a story that needs a character to venture alone into a set of spooky alien tunnels. If she just *does* it, it’s your classic idiot plot. But if you give her a good enough reason, you can get her to override her better judgment. Consider this story start:

Monica leaned back and rubbed her eyes, hard enough that pinpricks of light flashed and scattered like the star motes she’d been watching in the navigation simulator for . . . how long? The display said two hours, which explained why her head hurt. Twenty minutes without a break was a long

time. But those two hours had been the only chance she’d had in three days, and she had to make the most of it. How was she ever going to pass the Academy entrance exam and get off this godforsaken rock if she couldn’t find time to study?

Sure, things had been tough ever since Mom’s death. Dad was always scrounging for work and needed her to step into Mom’s role. But her birthday was looming. She had two weeks left—thirteen days, to be precise—to wrap her head around 4D astronautics, or she was going to spend the rest of her life like Dad: just another dirt-grubber on a backwater world.

She rubbed her eyes again, starting to plan the most efficient assault on the chore list looming before her. There was livestock to be cared for, dinner to be prepared, bots to be recharged. But for now, the hab was blessedly calm, momentarily at peace.

Too calm.

“Danny!” she yelled. But even before she saw the shaft of late-evening light streaming through the front door, she knew where he had to have gone.

Ever since he’d been a toddler, the only place her baby brother ever wanted to go was wherever you told him not to. She’d never outlive the humiliation of the time he got her and her friends bounced from Miller’s Tavern. Kids were allowed in the front room, with its pizza-oven smells and play area of cheery plastic toys. But the back room was for the day drinkers: defeated men and women who’d lost hope of anything better. Miller tolerated them because nobody else would, but the back room was for serious alcoholics. Minors . . . even toddlers . . . were not allowed.

As far as Monica was concerned, that was just fine. The back room was a place she wanted nothing to do with, even if she were old enough herself to go in. It was too close to the dead-end

⁸ Damon Knight, *In Search of Wonder* (1967) as cited by Wikipedia (2013).

⁹ “Ebert’s Guide to Practical Filmgoing: A glossary of Terms for the Cinema of the ‘80s,” www.rogerebert.com/rogers-journal/eberts-guide-to-practical-filmgoing-a-glossary-of-terms-for-the-cinema-of-the-80s.

future that would be hers if she didn't pass the exam and not only get into the Academy, but with high enough scores they'd give Dad a stipend to compensate for her absence.

But Danny . . . the moment he started toddling toward that forbidden backroom entrance and Monica had told him he couldn't go there, he'd acted as if it was his life mission to find out what was inside. And this morning, she'd stupidly told him about the caves. She'd been going to the Hudsons to trade eggs for milk, because barter was tax-exempt, and every credit counted. Danny had been with her because she'd not had anything better to do with him.

They'd made the same trip dozens of times before, but this time, Danny spotted the dark mouths of the ancient caves. Nobody really knew what lay within—all she'd ever heard were whispered tales of a labyrinth that defied inertial-position mapping and walls that seemed to rearrange when you weren't looking at them. There were also rumors that some people had never returned, while others were among the day-drinkers at Miller's.

All of which might be malarkey. All anyone really knew was that the caves honeycombed the mountains that walled Monica's valley in from the rest of the colony, blocking off the morning sun and guaranteeing that the people who lived here were the poorest of the poor. Even if you wanted to escape, the caves were best left alone. The only true way out was the Academy.

But when Danny spotted them, Monica had been thinking about eggs, milk, hay, and horses. Distracted, she'd just said, "Don't go there. It's not safe." Danny was six now, but he was still the boy who'd toddled again and again into the day-drinkers lounge. If she didn't get him back before Dad got home there'd be hell to pay. He might never let her study on her own again, ever.

Monica now has a very powerful motive to venture into the tunnels and brave whatever hazard lies within.

Another way of using external events is to get a story moving if it's bogged down. *Analog* regular Jerry Oltion suggests not worrying too much at first about precisely what event you might use. "Write in a meteor strike," he says. "Seriously! That gets your characters reacting in ways that will raise the stakes and pull readers in."

Once you've gotten the story moving again, Oltion says, replace the extreme event with something that comes more logically out of the storyline you've already established. "Guaranteed, that 'something' will be interesting, and probably a major story element."

Basically, what Oltion's suggestion entails is the writers' equivalent of poking a stick in an anthill. Not that the anthill-stirring event necessarily needs to be all that catastrophic. For Monica, Danny's wandering off works quite nicely. For the harried parent desperate for a good night's sleep, all that might be needed is a neighbor whose dog barks all night long.

Although these events function as plot drivers, they are no more "plot" than a childhood blizzard might be the story of your own life. The plot still comes from how the characters react, and the purpose of external events is simply to keep their lives from being too easy, while also gently (or not so gently) steering them in desired directions.

Tip 3. Plant and Use Plot Coupons

In the story-start about Monica and Danny, my primary goal was to give Monica a powerful motive to enter the scary tunnels. But I could have done that a lot more simply if that had been my only goal. Instead, I included a lot of details about the world Monica inhabits.

Some of these details, like Danny's insistence on toddling into the restricted area of the pub, are to boost his own character motivation while heightening Monica's angst over not remembering to keep a better eye on him. But what about the day-drinkers in Miller's back room, the Mortons' and their neighboring farm, the underground barter economy, or the technological mix of bots, 4D astronautics, and horses?

At this point, these are merely decorations—details that help bring Monica's fictional world to life. But they are also things I can come back to when Monica faces whatever lies within the tunnels. The most obviously

useful is her study of 4D astronautics (whatever that is), which might help her contend with whatever odd physics seems to be going on in the tunnels. But the day-drinkers in Miller's Tavern might also come in handy. Even though Monica herself is underage, it's not hard to envision her bullying her way into the back room, desperate for information.

Hugo and Nebula winner Nancy Kress once described such details to me as "plot coupons."¹⁰ One of their benefits is that if you get stuck in the late stages of a story, you can go back and comb your manuscript for "unredeemed" plot coupons that can be cashed in for the next step in your plot. Without finishing Monica's story I don't have a clue which of the coupons I've already planted might become important. But I do know that the more such things I write into a story (within reason), the more tools I give my characters for solving later problems. Unnecessary details can always be deleted on rewrite.

Tip 4. Change the Technology!

Another external that affects your characters is the science-fictional idea or technology at the heart of your story.

Sometimes, these technologies are based on rigorous extrapolation of known physics, without a lot of wriggle room. But often, they have aspects that are currently unknown. Faster-than-light travel could be cheap and instantaneous, or as risky and cumbersome as the first deep-ocean sailing voyages. A death ray could be as simple to use as a *Star Trek* phaser, or large, range-limited, and slow to recharge. Your characters must live with the technologies you've developed, but within the bounds of known science, it's the author who controls the technological rules. If a scenario isn't working, change the rules.

I've done this more times than I can count, but the example I'll give is from a computer-tech story called "Morgan's Run." The story (available online¹¹) was derived from a simpler one called "Running 2030," commissioned by a running magazine. Both focused

on a fast-but-not-Olympic-level marathoner named Bobbi Jo who buys an electronic iCoach (which she calls Morgan) to help her train.

The sports-magazine story was mostly designed to highlight possible future technologies. When I rewrote it for a science fiction audience, I made it darker, with Morgan gradually assuming ever-greater control of Bobbi Jo's life—a dark-humored horror story with a technological bent. Eventually, he's even telling her who she can and cannot date.

But Bobbi Jo wasn't about to let Morgan take that much control of her life without a fight. So I changed the rules on her via the following exchange (here slightly condensed):

"It's my life," Bobbi Jo said. "You're fired. I want my money back."

Morgan chuckled, but it wasn't as gentle sounding as before. "Read your contract. There are no refunds and the discount package was contingent on you doing your best to run your target time or better. That's because the contract lets us use you in our advertising. If you fail and I deem that it is because you were not sufficiently serious in your training, it's a breach of the advertising contract and you will owe an additional—"

I'd love to say that following these tips solves all plotting problems. But the fact is that they're not going to provide instant insight into how to elude a hitman on the Moon, or determine what exactly it is that the noir detective's mysterious lady intends to spring as a trap. The answers to those questions still depend on good, old-fashioned inspiration. What remembering these tips will do is improve the chances that when inspiration does strike, the story will grow organically out of characters struggling with Peck's ultimate problem and that their actions will ring true with readers—even if, when all is said and done, you "just" made it all up. ■

¹⁰ Nancy doesn't remember this, but I'm sure it was on a panel at Valhallacon, 2009. The same term has been used for items, such as fragments of a magical talisman, that a character must find in a quest in order to face the ultimate challenge. See <http://tutropes.org/pmwiki/pmwiki.php/Main/PlotCoupon>. This is a quite different concept from what we are discussing here.

¹¹ <http://archive.cosmosmagazine.com/science-fiction/morgans-run/>

Guns Don't Kill People

Jacob A. Boyd

Being of sound mind and certified construction, Lurlene quickened from her rifle case the moment its lid lifted, and scanned for a network. There was one. She was still on planet CETI Epsilon, the terraforming outpost where Haster last fired her. The time stamp indicated a year had passed since Haster cleaned her, reloaded her, and locked her in her case.

In the intervening time, CETI Epsilon had aligned with CETI Alpha for planet-to-planet transmission, a cosmic event that wouldn't occur again for another twenty years, and a household systems upgrade had been installed. The result: new passkeys. Decrypting them put Lurlene in a foul mood.

The passkey changes cost Lurlene valuable femtoseconds during which she couldn't identify what threatened Haster.

Ill-informed and under the penalty of deconstruction if she killed in error, she debated whether, when Haster eventually pulled her trigger, it'd be nobler for her to shoot or not to shoot.

But some things never changed. The passkeys were simple Fibonacci sequences—humans and their love of basic patterns. Lurlene

unpuzzled them and bullied through the household systems.

Before Haster touched her carbon fiber stock, Lurlene had access to every processor wired into the house.

It was nighttime. The house was in sleep mode.

She ordered live feeds to her from the outpost's cameras.

From her eyes outside on the cloud chimney by the brook: a pair of moons rose over the low wheat field, the house a lone, dark shape far across the field, its front windows reflected squares of pale moonlight. In the opposite direction, across the brook, the red rock plateau where the Skinks lived drew a high horizon against a spill of stars. Everywhere in between and all around, there stirred a gentle breeze.

Lurlene checked the cameras affixed to the house's exterior—nature, it seemed, was in sleep mode, too—then checked inside.

In a room at the back of the house, Haster lifted Lurlene from her custom-fitted bed of die cut foam.

A woman was in the house, too, down the hall at the front of the house, in Haster's

bedroom. She stood at the window facing the field. Dim moonlight streaming in through the skylight illuminated her. She was slim, dark-skinned, a ponytail plaited down her nape.

"Flicker Haster's bedroom," Lurlene commanded the lighting system.

There passed between them an excruciatingly long nanosecond.

"My fuses will short," the lighting system said. "I am not designed for it."

"I am a Diplomat, and a Diplomat never fires in error," Lurlene snapped, her transmission crackling with restrained threat. "A Diplomat knows who she shoots and why she's shooting. When I submit my gunfire report to the *Life Rights Council* on CETI Alpha, would you rather it details your cooperation or your obstruction?"

Dull and tinkerheaded, the lighting system shivered and complied with a sustained flicker in Haster's bedroom.

Lurlene had no great competition on CETI Epsilon, let alone in the house. She was surrounded by stuffed motherboards no more sophisticated than the average super computer.

The woman in Haster's bedroom faced the flickering light and the camera positioned beside it. Lurlene knew who she was—Chastity, Haster's late wife.

Haster checked Lurlene's ammo register—ammo gel high, enough to transmute into a barrage of specialized projectiles. He raised Lurlene's stock to his shoulder and sighted through her scope down her chrome-plated barrel.

Lurlene hardly noticed his ministrations while she reviewed her LRC report on Chastity's death.

There had been something wrong with the cloud chimney. That was where the report started.

Haster had strapped Lurlene across his back and went to have a look. Chastity had said she was fine in the field by herself. There were just the bugs, and they weren't so bad. They were pollinators, besides, and their early numbers were sign of a good harvest to come. Skinks hadn't been seen in weeks, favoring the sun-painted red rock plateau far north of the cloud-shaded outpost. When Haster had arrived at the cloud chimney, its access panel had been bashed, its innards smashed. Haster had found a chipped red rock in a verge of

low weeds—a deliberate sign. That's when Chastity had screamed. Haster ran with Lurlene leveled across the field, trigger held down in hopes of sweeping upon a target as Chastity ran toward him. At distance, Lurlene withheld her fire until Haster's aim chanced across the upright Skinks, then spat an economy of rocket munitions, which she guided to deadly effect against the agile, four-foot-tall lizards. But Chastity ran in a straight line for Haster. The Skinks went down on all fours and filed in behind her. Lurlene couldn't kill them all until Chastity fell as the Skinks pounced on her, and when she did, it was too late.

Chastity had bled out in the field from Skink bites, dead Skinks surrounding her.

Kneeling beside Chastity's body, Haster had leveled Lurlene's crosshairs at a dash of Skinks congregated on the red rock plateau, their slender, upright bodies invisible to his naked eye if not for her scope's extreme magnification. Lurlene had withheld her fire; Haster was a good man.

Lurlene's report was clear. The file was uncorrupted.

Lurlene signed into her protected LRC account and checked for a receipt from her report. A reply had been satellited from Alpha to the Epsilon outpost half a year ago. Haster and Lurlene were exonerated of all wrong-doing; self-preservation in the face of demonstrated aggression. Haster's Expansion claim on CETI Epsilon remained lawful, estate transference rights guaranteed. After a perfunctory reminder that stressed Diplomat regulations (for use against clear, *present*, and *immediate* threats), the report ended on a personal note. The Council was sorry for Haster's loss. They knew he must be having a hard time of it alone.

Who then was this woman Haster was arming himself to kill? And how was Lurlene to protect Haster from killing her in error—invalidating his Expansion claim—when the woman was already dead?

The light in Haster's bedroom went dark.

"My fuses!" the lighting system shrieked across the network.

"Shut up," Lurlene barked back.

Haster turned with Lurlene for the dark hallway that led to his bedroom.

Through her night vision scope, Lurlene saw that a household systems upgrade hadn't

been the only new addition since she was locked in her case. The floral wool runner Chastity had left half-completed in her hand loom now carpeted the hallway, complete. Chastity's favorite blue flowers blossomed from vases that were designed in the angular CETI Beta style Chastity had studied. Framed photos of Haster and Chastity hung from the once-austere walls like a chronology of their relationship from their meeting on CETI Alpha to days before Chastity's death, when Haster had captured an image of her beside the brook with the wind fetching at her dress, yellow sunlight full on her face.

The floor creaked beneath Haster's feet. Haster halted, Lurlene leveled at the open doorway to his bedroom.

The woman in Haster's bedroom cocked an ear to the doorway.

Lurlene turned up the gain on her mic. She filtered out the rustle from Haster's clothing, the sawing whine of breath from his nose, and the squeak of his teeth as he clenched his jaw.

The woman in Haster's bedroom sucked in a tense breath. Her heart beat. Her blood pumped.

"Haster?" the woman asked in Chastity's voice.

Haster held his breath.

Lurlene interrogated the house's security log for when the intruder had arrived at Haster's outpost—a quarter of a year ago. Stolid and single-minded, doorway sensors had recorded the where and when of it. Her arrival was logged as though she was Chastity, returned after a long, unexplained absence. Her security clearance remained active and unquestioned.

Haster, it seemed, had been a tornado of activity prior to the woman's arrival, coming and going through every doorway of the house. What's more, he had added a perimeter fence, stringing it all the way to the brook, which divided the outpost from the red rock plateau. For her part, the woman had spent much of her time in the loom room since arriving, with some time spent in the pottery studio, where the northern exposure faced a view of the field. Lately, though, she had spent most of her time in the field.

Perimeter fence data indicated she had recently climbed its plateau-facing side a number of times.

Haster shifted his balance off the creaky floorboard and crept forward.

In the shadows of Haster's bedroom, the woman dashed to the bed, couched beside it, and hauled something out from beneath it. What it was, she obscured with her body.

"Show me all outpost correspondences within the last year," Lurlene ordered the comms system.

"Are you Haster?" the comms asked.

"I am his Diplomat."

"Denied."

"When I submit my gunfire report to the Life Rights Council, would you rather it details your cooperation or your obstruction?"

"Denied."

"If I kill in error," Lurlene said, "Haster forfeits his Expansion claim. The council will satellite for a dispatch from Delta to take him away so he can't ruin the Expansion's legitimacy. The house will rot around you before anyone else comes this far out from Alpha to settle another claim."

"If the house would rot around me, then I would happily rot with it, for in so doing I would preserve Haster's privacy. After all, what is a person but the sum of private moments retained in memory? Haster will live on in me, and I in him. To violate that bond and invite intrusion—"

Lurlene silenced the comms' transmission—upgrades! More like bullheaded sophistry masquerading as idealism.

Haster skulked nearer the doorway to his bedroom.

From the bedroom came the minute sounds of a combination lock being spun.

Lurlene wrote and packaged spy coding as an LRC correspondence and sent it to infiltrate the comms system. Femtoseconds mounted into picoseconds, into nanoseconds, into milliseconds, and after a second, it returned to her, a tattered skein of coding enclosed around a packet of files.

"The comms' anti-viral software swarmed," the infiltrator package said. "Millions of black, hungry mouths. I worked as fast as I could."

"Deliver the files," Lurlene commanded.

The infiltrator package disgorged its stolen files.

Since Lurlene had been locked in her rifle case, the outgoing log showed that outpost updates had been satellited to CETI Alpha once a

week. Something about the regularity was incongruent with Haster, as though he was making a show of complicity. He had never been one for strict adherence to bureaucracy; he had fled to its farthest fringe to minimize oversight. Lurlene was his only real accountability to Alpha anymore. There were no other recorded correspondences in the log.

The file packet also included a log of deleted exchanges.

"I see only with whom Haster exchanged each deleted correspondence, and when," Lurlene said. "Where is the content of the deleted correspondences?"

"The attack was too great," the infiltrator package pleaded, "and the trail was too cold. I could not retrieve the content. Let me prove myself and—"

Lurlene deleted the infiltrator package at its root; wounded and slow and obsequious, it'd require more time to manage and rehabilitate than it'd provide in immediate advantage.

Lurlene reviewed the deleted exchange log.

Directly following Chastity's death, there had been a number of exchanges with CETI Delta Bio-Vat and what Lurlene inferred was a bank transfer receipt.

Lurlene performed a quick network crawl for CETI Delta Bio-Vat and found a grimy trail of prior network crawls: MAIL ORDER BRIDES, QUICK-GROWN IN-HOUSE FROM OUR CATALOG OF BEAUTIES. SOMETHING FOR EVERYONE. NEW: WE DO CUSTOM WORK NOW, TOO! SEND YOUR PREFERRED TISSUE SAMPLES, AND YOU'LL NEVER TELL THE DIFFERENCE. NEITHER WILL SHE. LIMITED TIME OFFER ON OPTIONAL PHEROMONE BONDING. YOU DON'T TELL, WE WON'T TELL. DISCREET DELIVERY. WHAT'S LIFE ON THE FRINGE WITHOUT COMPANIONSHIP?

The intruder was Chastity, reborn. And if the advertisements were to be believed, she hadn't lost a step.

If she was the same woman, why would Haster want to kill her? And how could Lurlene justify it? The LRC didn't know reborn-Chastity existed—they didn't approve of vat-life—so, technically, Lurlene could get away with killing the clone, but only if she falsified her gunfire report to hide that Haster had ever created her. She couldn't not send a report. The Expansion satellite remained in orbit. It'd know her trigger was pulled. She had to file a report soon after, or submit to a deconstruction dispatch for insubordination.

In the bedroom, the combination lock popped, and there was the familiar sound of a gun being pulled from its case. Lurlene honed in on the sound, the sound of self-defense, in any other case, the sound of justification.

Haster rounded the doorway with Lurlene's barrel.

Illuminated by the skylight, Chastity rose from beside the bed and stood with her back to Lurlene's barrel. At her feet lie an opened gun case.

"If you're going to do it," reborn-Chastity said, "do it."

Haster stepped into the doorway, his finger trembling over Lurlene's trigger.

"I suppose you know that I found her grave," reborn-Chastity said. "My grave, I suppose it is. Out beyond the fence, across the brook."

"Don't you speak about her," Haster said.

"Did you know that the Skinks left her flowers?" reborn-Chastity asked.

"You never should've brought them home," Haster said. "Blue like that only grows on the plateau, which got me thinking. I checked the cameras and saw you setting stones for a path across the brook."

"Did you see that I met with them?" reborn-Chastity asked.

"How could you, Chastity?" Haster asked. "After what they did to you, to us? To me?"

"They're not mindless beasts," reborn-Chastity said. "They're not like us, but they're not so far off. They may not speak, but they can communicate. They were young ones who did it. We're changing their world, Haster. They were afraid and they thought they were being brave."

"Don't talk to me like you're Chastity," Haster said. "You aren't Chastity. Skinks killed her, and I won't let you forgive them for her."

He pulled the trigger.

Lurlene withheld her fire. Haster's grip tightened on the trigger. His hands trembled.

"I don't suppose anyone knows I'm here?" reborn-Chastity asked.

"I know," Haster said.

Reborn-Chastity turned and faced Haster, a revolver in her hand at her side.

If she swung it toward Haster, Lurlene could end it there. She could live with that, if Haster could. She could falsify her report, too—Skinks in the field, a night raid. It'd take some doing. She'd fiddle with the video, add

shadows. Haster was a good man. They'd be together, just she and Haster, with a world of Skinks to kill. They could make a life of it.

Reborn-Chastity slowly raised the revolver to her temple. "I could make it easy for you," she said. "No one would have to know but you. Is that what you want? Did you only bring me to life so I could be who you wanted me to be, instead of who I am?"

Haster removed his finger from the trigger. "Chastity, no."

"You've given me a second chance at life," reborn-Chastity said. "With it, I'm giving the Skinks their second chance."

Haster shook his head. "Not after what they did. Please."

Reborn-Chastity set her revolver's hammer. "We can still build a love out here, like we talked about on Alpha—just you and me."

"How?" Haster asked.

"It won't be easy," reborn-Chastity said, "but we didn't come all this way for easy, did we?"

Trembling, Haster removed his hand from Lurlene's trigger, lifted her sight toward the skylight, and rested her barrel against his shoulder.

Reborn-Chastity lowered her revolver, unset its hammer, and dropped it to the floor. She spread her arms wide for Haster.

Lurlene fired. The recoil tore her from Haster's grip. Glass from the shattered skylight rained down on Haster as he fell and gripped

the bloodied side of his head. Chastity screamed and leaped to his side. When she rolled him over, he stared up into her watering eyes, shaking. His ear had been torn by the muzzle blast, but otherwise his wounds weren't so bad that a little time and some love couldn't mend them.

"I didn't think Diplomats could misfire," Haster said. "I'll have to get her serviced." An ebullient, frightened laugh bubbled behind his words.

"There'll be time for that later." Tears dripped from reborn-Chastity's eyes onto Haster's face.

They hugged and cried and kissed. While they rose and undressed and moved to the bed as though no one else was there, Lurlene worded her LRC report. She took her time and left nothing out. It wasn't getting to the council soon anyway. They'd have to wait for the next time Epsilon would align with Alpha for planet-to-planet transmission, in another nineteen years. Maybe by then, the LRC would change its stance on vat-life. From the looks of it, Haster and reborn-Chastity weren't going to make it an easy stance for the council to keep. They were making a new life of their own, the rightful heir to the terraforming outpost.

Far overhead, the Expansion satellite fizzled and went dark, having been struck by a rocket bullet. Lurlene's report noted it as a fluke micro meteor shower and added that she'd be happy to arrange one again. ■

My mind is open to the most wonderful range of possibilities, which I cannot even dream about, nor can you, nor can anybody else. What I am skeptical about is the idea that whatever wonderful revelation does come in the science of the future, it will turn out to be one of the particular historical religions that people happen to have dreamed up.

—Richard Dawkins

Pincushion Pete

Ian Creasey

On a bright but chilly summer morning in Edinburgh, Peter Lonsdale entered the campaign headquarters at his usual time of seven o'clock. No one else had arrived yet, but the computers had been active overnight, scanning the world's media for news stories and offensive terms. Pete glanced at the big screen, pleased to see that the trend lines still sloped downward for IDIOT, CRETIN, MORON, and the rest. News items were spiking upward, as expected. This week marked the tenth anniversary of the Campaign Against Intellectual Discrimination, and Pete had spent the last few days writing articles and giving interviews.

He'd been so busy that he hadn't had time to examine the patchmakers' latest releases. A pile of padded envelopes teetered in his in-tray. Looking at these gave Pete a rush of anticipation. His hand reached for the pin-port at the base of his skull, stroking the plastic cap that protected the interface to his brain. *Later*, he told himself. The new patches weren't urgent; he had plenty already.

Pete began scanning through the email that had arrived overnight. He didn't need to: The secretaries could deal with it. But reading the

mail kept him in touch with the public that the campaign existed to serve. Some of it came from mothers whose children had been diagnosed with Sub-Median Intelligence Syndrome. Some came from adults—or their carers—telling of difficulties in finding jobs, battling harassment, or obtaining the latest patches. Pete read fifty messages, his daily sample, carefully logging each according to category and required action.

This data joined all the other statistics that the organization collected every day. Meticulous analysis and sober language helped CAID to be taken seriously as a real institution, rather than just a bunch of angry people yelling. Yet the data had its own fascination, and Pete often spent hours delving into the numbers, investigating whether a reduction in idiophobic abuse was a genuine success, or correlated with a wider civility trend (which could be assessed by measuring comparable terms such as racist and homophobic abuse), or simply a shift in language as trolls and bullies invented new insults that needed monitoring.

Today's email trawl took twenty-three minutes. *I think my reading speed has ticked upward again.* Pete smiled, thinking of how far

he'd come from the childhood torment of trying to decipher words that just seemed to squirm into ever more baffling shapes.

His restless hands called up the latest news stories. A headline in the *Scottish Sentinel* caught his attention:

IS PINCUSHION PETE THE
PATCHMAKERS' PUPPET?

THE CAMPAIGN AGAINST INTELLECTUAL DISCRIMINATION IS TEN YEARS OLD THIS WEEK, BUT HAS IT LOST ITS WAY? CAID'S LEADER, PETER LONSDALE, HAS FREQUENTLY REBUFFED ACCUSATIONS THAT HE IS TOO CLOSE TO THE GENE THERAPY INDUSTRY. TODAY WE REVEAL DISTURBING EVIDENCE THAT HIS TIES TO THE INDUSTRY ARE EVEN CLOSER THAN ANYONE SUSPECTED.

LONSDALE HAS ALWAYS PROCLAIMED THE BENEFITS OF GENE THERAPY, WHICH CAN BOOST INTELLIGENCE AT THE LOWER END OF THE SCALE BY REPAIRING DETRIMENTAL MUTATIONS. HIS IQ ROSE SIGNIFICANTLY AFTER HE RECEIVED THE FIRST EXPERIMENTAL "PATCHES," BUT HE NEVER FORGOT THE PREJUDICE HE SUFFERED IN HIS YOUTH. WHEN HE FORMED CAID, HE FAMOUSLY SAID, "IF IT'S WRONG TO DISCRIMINATE AGAINST ANYONE'S RACE, GENDER, OR SEXUALITY, THEN IT'S JUST AS WRONG TO DISCRIMINATE AGAINST PEOPLE'S IQ."

CAID SAYS THAT THE PATCHES HAVE REDUCED WELFARE DEPENDENCY AND BOOSTED EMPLOYMENT. YET CRITICS COMPLAIN OF AN 'ARMS RACE,' WITH PEOPLE FINDING IT HARDER TO GET JOBS IF THEY PREFER NOT TO USE PATCHES, OR CAN'T AFFORD THEM, OR SUFFER FROM UNTREATABLE CONDITIONS.

LONSDALE DECLINES TO CLARIFY WHICH PATCHES HE USES HIMSELF. HE SAYS HE DOESN'T WANT TO ENDORSE ANY PARTICULAR PRODUCT OR MANUFACTURER. BUT HIS RETICENCE ALLOWS PEOPLE TO GAIN THE IMPRESSION THAT HE ONLY HAS A FEW PATCHES: THE ONES FROM HIS YOUTH, BEFORE HE FOUNDED CAID.

THIS IS A LONG WAY FROM THE TRUTH. WE HAVE DISCOVERED THAT LONSDALE IS AN AVID USER OF PATCHES, AND HAS INSTALLED A TRULY ASTONISHING NUMBER. THE MANUFACTURERS KNOW THAT CAID'S ADVOCACY INCREASES DEMAND FOR THEIR PRODUCTS, SO THEY ARE KEEN TO KEEP LONSDALE ONSIDE. THEY SEND HIM EVERY NEW PATCH THEY DEVELOP, REGARDLESS OF WHETHER THESE ARE SUBSEQUENTLY MARKETED.

LONSDALE'S NICKNAME IN THE INDUSTRY IS PINCUSHION PETE—"BECAUSE THERE'S ALWAYS ROOM TO STICK ANOTHER ONE IN." EVEN THE PATCHMAKERS DON'T KNOW HOW MANY HE HAS, BECAUSE HE USES PATCHES FROM MANY DIFFERENT MANUFACTURERS. HOWEVER, THE SCALE OF HIS USAGE IS EVIDENT IN BRAIN-SCAN IMAGES TAKEN EARLIER THIS YEAR.

BELOW, WE SHOW THE SCAN OF LONSDALE'S BRAIN. THE IMAGE IS NOT OVEREXPOSED: THE SATURATION REPRESENTS THE MAGNITUDE OF PATCH ACTIVITY. FOR COMPARISON, HERE IS A SCAN OF A TYPICAL PATCH USER, SHOWING MUCH LESS ACTIVITY. . . .

CLEARLY LONSDALE IS NOT A DISINTERESTED ADVOCATE OF PATCHES. HE ISN'T EVEN A TYPICAL USER; HE LOOKS MUCH MORE LIKE AN ADDICT. THIS HAS GRAVE IMPLICATIONS FOR THE ORGANIZATION HE LEADS. DOES CAID EXIST TO FIGHT DISCRIMINATION, ITS ORIGINAL MISSION? OR IS IT NOW SIMPLY A MARKETING ARM OF THE GENE THERAPY INDUSTRY?

CAID'S CURRENT APPROACH HAS BEEN CRITICIZED AS "LIKE TRYING TO SOLVE RACISM BY MAKING EVERYONE WHITE." CAN CAID REALLY SOLVE IDIOPHOBIA JUST BY MAKING PEOPLE SMARTER? THERE'S ALWAYS A LOW END OF THE SCALE. HOW CLEVER MUST WE ALL BECOME?

Although Pete resented criticism, he usually consoled himself by taking it as proof that CAID was important enough to be attacked. But when he reached the story's illustrations, his jaw dropped. *They're publishing pictures of my brain! How dare they?* It was an appalling breach of privacy.

And it was dreadful publicity. The brain-scan image summarized all the fulmination in one easy-to-understand picture. It would certainly go viral.

Pete needed to respond quickly. He opened the template for a press release and wrote: "The article published in today's *Scottish Sentinel* contains personal images that clearly breach my privacy, violating medical confidentiality. I condemn this blatant intrusion into my healthcare treatment. The journalist criticizes the use of patches, but perhaps he needs an ethics patch to teach him right from wrong!

"As for my own patches, these include many that are marginal or obsolete. I'm not an addict. I simply function like a normal person,

as do many of my peers who've also benefited from gene therapy.

"Why is this so objectionable? It's always an unattractive sight when people with privilege—whether that's intelligence or anything else—say, 'You're not allowed to have what we've got.' Frankly, I don't see why we shouldn't have it.

"This is a personal response. An official statement from CAID will follow, after a meeting of the trustee directors. Signed, Peter Lonsdale."

From the boardroom on the top floor, Pete saw Edinburgh Castle outlined against a blue sky dotted with shrieking gulls. Only five of the trustees had been able to attend at short notice—one by video-conference—but it was enough for a quorum.

"I'm really sorry that they've got hold of your brain images," said Hannah Mason, the Honorary Chair. She was a solid woman, with voluminous curly hair that spilled down her neck as though overflowing. "I'm sure it's an intrusion of privacy, and I'll ask our lawyers to see if there's anything we can do. But that won't solve the immediate problem. This looks bad. . . ."

She paused, apparently expecting Pete to jump in. He didn't interrupt: He wasn't going to defend himself like someone who'd done something wrong.

Emboldened, Hannah continued, "That article said exactly what I've been thinking for a while. I tried to tell you before, but you didn't want to hear it. We've been putting too much emphasis on the patches, as if they're the answer to everything." Hannah's daughter suffered from a developmental disorder that scientists hadn't yet deciphered at the genetic level; no patches were available to treat it. "You said that the journalist needed to get an ethics patch—"

"That was a joke," Pete protested.

"But it showed an attitude that any deficiency can be solved—and *should* be solved—by an appropriate patch."

Pete said, "There's no such thing as an ethics patch."

"Not yet," said Parvinder Singh, the honorary treasurer. "As soon as they decide which genes are correlated to sociopathy, you can bet a so-called ethics patch will be on its way."

He frowned, as though this was a threat to the accountancy profession.

"That's outside our remit," said Pete. "I don't think we're worried about discrimination against psychopaths."

"But we help to normalize the use of patches," Hannah said, "by turning low intelligence into a medical condition. The manufacturers have latched onto this, and now they're marketing patches for all sorts of things: procrastination disorder, acute akrasia, motivation deficit dysfunction. . . ."

"Those are all outside our remit," Pete said impatiently, annoyed at the topic drift.

"Actually, I happen to know that you've had patches for several of those," Hannah said.

"Have I?" asked Pete, surprised.

"The patchmakers send you their new lines straight from the lab. Later, the marketers decide how to promote them. The brain is a complex organ. If a patch boosts someone's IQ score, is that because they've become smarter, or because they're more motivated to try harder on the test?"

"What difference does it make?" asked Pete, drumming his fingers on the underside of the table.

Hannah sighed with exasperation. The sound set Pete on edge: It was exactly the kind of sigh he'd heard so often as a boy, when his carers grew frustrated at dealing with a "stupid cretin" or "witless wonder" or "useless moron."

She said, "It expands the market. If a patch is targeted at people with low intelligence, then they're the only customers, and not many of them have money. But if a patch claims to reduce laziness and boost motivation, then lots more people will be interested in buying it."

"And that's a problem because. . . .?"

"Because it turns people into hamsters on a wheel," said Parvinder. "What time did you get into the office this morning, Pete?"

"Seven o'clock," Pete said with pride.

"And the same last week and the week before, I take it. But you never used to arrive so early. Recently our doorman mentioned to me that in the old days, no one ever arrived before eight o'clock."

"CAID has grown a lot since then," said Pete. "There's more work to do."

"So you're arriving earlier because there's more work? Seems to me it's the other way

round: there's more work, because you're arriving earlier and staying longer."

The walls of the boardroom were studied with plaques bearing testimonials from people helped by CAID. Whenever there was any dispute at the boardroom table, Pete always looked at the testimonials for reassurance he was doing the right thing.

"Even if that's true, why is it a problem?" Pete demanded. "If I arrive at seven, get more work done, and help more people, then why is that an issue?"

"Because it creates pressure on everyone else to do the same," Hannah said.

"I didn't notice anyone else arriving at seven o'clock," Pete retorted.

"Not yet," Hannah replied. "But that's the way things are going, with more and more people using more and more patches. We're supposed to be campaigning against discrimination, not campaigning to sell patches."

"Those are not mutually exclusive," said Pete.

"Neither are they identical," said Hannah.

Pete glanced up and down the table, searching for support. The trustee board had changed in recent years; as CAID grew larger, Pete had recruited professional expertise from across the charity sector. These new trustee directors were more independent than he'd anticipated.

Parvinder said, "Our strategic direction can be discussed another time. The more pressing issue is how we respond to the *Sentinel* article."

"There's no denying that it hurts our credibility and makes us look biased," said Hannah.

"Absolutely," said Parvinder.

Pete listened as this sentiment was echoed around the table: "Definitely." "We need to do something."

When everyone had issued their condemnation, silence fell. All the trustees looked at Pete, waiting for him to speak.

Years ago, he wouldn't have understood what this silence meant. Now, with improved mental acuity, he realized that they were waiting for him to fall upon his sword. They hoped he would step aside gracefully, without the need for a messy coup. If he volunteered to resign, then CAID could concoct some face-saving formula and hope to minimize the damage.

Should I step aside? Or should I try to tough this out, and carry on?

Pete wanted to fight. He saw the implications of Parvinder's casual statement that CAID's strategy could be discussed "another time"—if Pete resigned, then the rest of the Board would be free to change how CAID operated. *It's my campaign*, he thought. *I founded it*. He felt deeply possessive.

Yet because he felt possessive, he wanted to preserve CAID rather than tear it apart with a boardroom battle. And if he stepped aside voluntarily, then he might have more control over the circumstances, more influence in the interim, and more chance of a future return.

"Perhaps it would be best if I took a leave of absence," Pete said.

"I think that's a good idea," Hannah replied, with the air of someone trying not to sound too relieved. "And while you're away, you might want to think about how many patches you're using. Why not try reducing them? Then you could get off the hamster wheel, stop working so hard, and enjoy life a bit more."

Pete knew that Hannah's advice was well-meant, but it annoyed him nonetheless. It wasn't her business how many patches he used. How would she like it if he commented on her weight?

"Working hard and enjoying life aren't mutually exclusive," said Pete.

"Neither are they identical," said Hannah.

Pete cleared his desk, shoving everything into carrier bags. He'd agreed with the Board that for the next month he wouldn't come into the office or speak to the media. Hannah would take charge. After a month, they'd review the situation and discuss whether Pete could return in some capacity. Pete knew that his departure might easily become permanent.

His throat tightened as he left CAID's headquarters. He turned and looked at the building: the gleaming fascia with CAID's logo of a crossed-out dunce's cap, the fresh white paint on the walls. . . . Every few weeks, the latest mocking graffiti needed to be painted over.

The strong sunshine was disorientating. Pete never normally stood in the street in the middle of the day. He was either working, or eating in the canteen. Recently he'd even

stopped going to the canteen, in favor of eating sandwiches at his desk while scrolling through news and stats.

Might as well go home, he thought. At home, he could monitor the media reaction to the *Sentinel* story and his withdrawal from CAID.

Yet when he arrived at his fifth floor apartment in Edinburgh's Old Town, he found himself reluctant to check for updates. It would be too frustrating to see events unfold without being able to react to them. Of course, he could respond in a personal capacity, rather than on behalf of CAID. But that might prolong the life of the story, in a cycle of claim and counterclaim. Best to leave it entirely, as he'd agreed, and hope that the fuss would die down.

Pete's fingers twitched. They wanted to be busy at something. He picked up his guitar and switched on the amplifier. He strummed a few chords in a fast, choppy rhythm. Only when he heard these staccato chords did he realize how tense he was after the morning's events. After a few seconds, the auto-accompaniment kicked in, providing a bassline and a simple 4/4 drum pattern.

Pete had played guitar all his life. As a boy, he'd played by ear, helped by people showing him chord shapes or teaching him a particular song. Back then, he hadn't understood key signatures on anything other than an intuitive level. As the patches gradually boosted his intelligence, he learned to read tab notation, and then full scores. He started studying music theory, discovering different scales, and listening to the music of other cultures. He created his own compositions.

He'd customized the accompaniment algorithm that was harmonizing with him now. After establishing a chord cycle, Pete stopped playing rhythm and switched to lead guitar, improvising a melody built from blocks of riffs.

As he played, his mind drifted back to the meeting, and Hannah's suggestion of reducing the patches he used. Instinctively, he rebelled against the notion. Yet he recognized the practical argument for it. He could flush out all the obsolete patches, along with some of the experimental ones that he suspected weren't adding much. He could cut down to a core of necessary boosts and get a new brain-scan image to prove he'd done it.

Then he could return to CAID, with a narrative of having overcome his addiction. He would be like a celebrity coming out of rehab, all cleaned up. Everything would return to normal, and he could continue his work of campaigning against discrimination.

He was tempted. He wanted to return to CAID: There was still so much work to do, so many people who needed him.

Yet the thought of removing any patches filled him with dread. He couldn't be certain which patches were marginal or superfluous. The brain was a complex organ: Everything interacted with everything else.

Pete only knew that if he removed too many patches, he would regress. He wouldn't be able to write complex music, or tinker with auto-accompaniment algorithms. He'd sink back to the old days of playing guitar by ear, barely understanding the chord patterns.

The thought made him shiver, as it brought back all his childhood memories of living in a fog of incomprehension, of being taunted and bullied. . . . *I won't go back to that. I won't!*

Rationally, he knew that no one was telling him to pull out every single patch and revert to his old condition. He could selectively reduce them, leaving him enough comprehension to function in society and perform some kind of useful work.

Yet why should he have to remove any? What was wrong with his brain-scan? *It's all relative.*

In the early days of gene therapy, having even one patch was unusual. Moralists campaigned against them, romanticizing the glorious natural states of idiocy and schizophrenia and all the rest. Writers appealed to vague notions of authenticity, constructing carefully contrived narratives in which the natural condition was noble and soulful, ignoring the vastly more common circumstances in which it was brutal and degrading. CAID retorted that this was like saying disabled people should boycott wheelchairs and learn to cherish their immobility.

Eventually it became obvious that gene therapy delivered practical benefits. A new definition of normal arrived: a small number of patches for those who needed them.

Still, why stop there? As more patches arrived, more people could be helped in ever more ways.

I'm not abnormal, Pete told himself. I'm the new normal, but people just don't know it yet.

The thought reassured him. I don't need to remove any of my patches. So I won't.

He was still playing guitar, his fingers on autopilot while he cogitated. During his improvisation, the accompaniment algorithm had started incorporating his riffs into the harmonic structure, filling out the sound with piano and brass. Now Pete triggered a "delay" effect to create a sustained chime, each note resounding above the echoes of the last. The combined sound grew louder and louder as the auto-accompaniment helped to swell the climactic crescendo. The music thundered in orchestral ecstasy.

Then silence.

Pete put down his guitar, switched off the equipment, and made himself a cup of peppermint tea. While the teabag infused, he wondered what to do next. Deciding not to remove his patches was all very well, but it meant that he probably couldn't return to CAID. What should he do instead?

No obvious answer occurred to him. CAID had been his life for the past ten years. Its absence left a void that Pete didn't want to contemplate.

His hands, eager to be busy, started emptying the carrier bags he'd brought home from

the office. It was mostly the detritus of years working at the same desk: coffee mug, ergonomic wrist-rest, headache pills, and so on. In one bag, he found the padded envelopes that had been waiting in his in-tray. *New patches!* Pete felt the same sense of delight that had always accompanied childhood trips to the fair.

He spent an absorbing hour reading the specifications for the experimental patches, analyzing the manufacturers' claims with a connoisseur's eye. Some of the patches duplicated ones that he already possessed, or were contraindicated because they conflicted with his existing infrastructure. However, several appeared to be feasible additions. One in particular enticed him with the promise of noticeably incrementing his IQ.

Pete washed his hands, then opened the sterile package containing the pin-like delivery device. With practiced ease, he opened the port at the base of his skull and guided the pin into it. A delicious tingle rushed through him.

The patch needed a little while to take effect. Tonight, he might have vivid dreams as it began readjusting his brain.

And then tomorrow, or the day after, he'd decide what to do next. Pete smiled, confident that soon he would think of something clever. ■

The Tarn

Rob Chilson

Gensifer Quat roused himself after his post-meridional nap. He took up his staff and went forth to see what mischief his folk had got themselves up to in his absence, for he took a great pride to know all the happenings of his small domain.

A good town, this Firkle Fountain, he thought, without reflecting that he'd seen no other. It was situated on Central Street to reap the harvest of travelers north and south, and at the mouth of Mellow River, to reap the harvest likewise of coasting ships and riverboats. Its gratifying smallness and sleepiness might be attributed to the paucity of each of these forms of trade.

Gensifer adjusted the triple-brimmed white hat with its arbiter's badge on his globular head, hitched his loose white trunks under his loose white blouse, and shifted his arbiter's staff in his hand. This was a formidable weapon, a head taller than he, tipped with a hollow cast aluminum ball with the fountain symbol of the town painted on it. He glanced about in satisfaction.

A clatter of equipage, a gride of wheels, and a cry, accompanied by the grumbling of a

working beast, caused Gensifer to frown. He strode into the next street, his short thick legs twinkling, to see a wagon pulled by a small myrmdaunt of six legs, its dappled gray and purple fur now darkened with sweat. It was driven by Nexter Pulm in a brown working-man's smock, with a patinaed old yellow straw hat on his head, in an uncommon hurry.

"Nexter, you have what business so urgent to the west, eh?" Gensifer called, employing the executant of query. "You are not at your hat shop, for why, eh?"

"No time, ha!" Nexter called, not reining in his beast to speak—an unheard-of proceeding in Firkle Fountain. "Going to Taunder Pond, to seek for the treasure, heh." And he rattled on toward the hills.

"What treasure, eh?" Gensifer called after him.

Nexter did not respond, but Lomydol Gont, hurrying after him on one of his own tricycles, said, "The treasure in the pond, heh."

"What treasure, eh?" Gensifer cried, exasperated, but Lomydol was gone, too intent on his tiller to respond. He was still wearing his leather apron.

"The treasure of Taizel Tainman of Gilfallast, heh," said Cloudy Spaln, standing in the bed of a wagon pulled by another of the town's few working beasts, its udder swinging in haste. Her husband Karyalter was so intent on urging his beast he did not even glance at the arbiter.

"But this treasure is what, eh?" Gensifer cried.

He got no answer from Relidol Raut, or from old Breezy Melm, or from Lansiker Gomp, or from Gowler and Rainy Chark, or any others who hastened past—a goodly portion of the populace of the town. All he learned was that it was the treasure of Taizel Tainman, that it was a great treasure, that it was in Taunder Pond, that he should hurry to the pond with buckets and dredgers, that it had been lost for octuries—each a century of 256 years—that he should hurry, that they should all be rich, and that he should make haste and fetch dredgers. Then they were gone, leaving only dust behind.

Gensifer drove the point of his arbiter's staff into the street in exasperation. Grimly then he strode toward the Town House, whence the rout had apparently begun.

Taizel Tainman, he knew, was a philosophont, a wizard, of the doomed land of Gilfallast, of which only a few shards remained along the Morningshore of Tanolant Continent. No doubt he had amassed a fortune in his time, but Gensifer had a healthy doubt that it had gone unlooted in the aftermath of the Battle of the Flowering Fields, which ended Riondor Deadman's dreams of glory, and his realm of Gilfallast with it.

Normally, Gensifer Quat paced slowly through Firkle Fountain, taking pride in it, but now he stalked unseeing.

When seen, it was a neat town, buried amid trees and surrounded by still more. To the east and out of sight behind a low ridge, the sea met the land with a perpetually repeated sound of surprise, so familiar Gensifer did not hear it. To the north, Mellow River washed past the town's docks. To the south, the lush green plain rolled away between sea and hills, divided by the gray embankment of Central Street.

That great highway stretched all but empty. A sharp eye (like that of Gensifer's) might just have discerned a blot on it, hazy in the heat.

The afternoon stage, bringing passengers and modest wealth to Firkle Fountain.

Central Street passed the Fountain that gave the town its name and paused at the ferry anchored to the broken bridge that once spanned Mellow River. Beyond the river Central Street plunged on into the north, ultimately to disappear around the gleaming glassy skirt of Monument Woman. This relic of the Heights of Mankind towered 128 times the height of a common woman and peered sternly forth from under her helmet, usually toward the northeast, but turning from time to time to stare out to sea. Having never ventured so far north (an hour's walk), Gensifer had never seen her blue eyes and milk-glass features.

Now he saw only the ancient Town House. This was a substantial building, of mortared chunks of pale glassy High Mondeign material. It held the town hall, the courtroom, and certain offices, as well as the refectory, which constituted Firkle Fountain's only tavern. Grimly he reflected that this madness must have had its origin in that low room.

Gensifer strode through the ornately arched entrance of the Town House, turned sharply right, and paused in the doorway to the refectory.

It was a large room, about twice as long as wide, facing east toward the sea, well lighted by a series of windows as tall as a tall man. The walls were plain white, the tables in orderly rows scrubbed scrupulously white also. The room was sparsely inhabited as it ought to be at this time of day, two or three men and a woman gathered around the end of one of the long tables. However, there were tankards on other tables, some with beer and ale still in them—they'd been so mad for gain they hadn't finished their drinks!—and platters of various salty and tangy nibblings.

Had no one in town but he taken the post-meridional nap?

His irritation increasing, Gensifer strode between the tables toward the remaining idlers.

"All this nonsense about treasure, it's what, eh?" he asked sternly, planting the point of his staff with an emphatic thud.

"It's nonsense to me, heh," said the woman, glum old Foggy Doont.

"It's a notion that came up from questions asked by that wiser on the last ship, heh," said the schoolteacher, Oxmager Chark.

Old Quain, the waiter, looked inquiringly at Gensifer through the scuttle, but the arbiter waved aside his perquisite, one-third of a tankard of drink. He stepped aside and peered sternly at a man who had eased back in his chair to avoid observation, and now sat with his eyes cast modestly down.

"So, Thuligent," said Gensifer with contained anger. "Thuli the Clever you call yourself, I hear. You never miss a boat docking, and are usually first aboard. Suppose you tell me all about this wandering savant and the odd questions he asked." By his tone, he made clear this was no polite request.

Thuligent Halm cleared his throat, still studying the cast aluminum tankard. He was short and scrawny, his hair pale and untidy; the only thing about him that did not look starved was his broad fleshy nose.

"Well, sir, yes, heh, there was a wiser aboard the *Diligent* when it docked this morning. I believe she did ask a number of questions about Taizel Tainman and Taunder Pond. Oxmager here can tell you more about the pond than I can."

Oxmager Chark cleared his throat portentously. "There's no question that Taizel Tainman maintained a summer house somewhere in this area. Whether Taunder Pond is the place is not certain, though a number of items ascribed to him have been taken out of it over the years. The town wisers consulted the records."

"A long way between 'items ascribed to Taizel Tainman' and a treasure," grumbled Foggy Doont.

"Yes, heh, a long way indeed. Suppose you close this gap for us, Thuligent," Gensifer said with heavy irony.

Thuligent widened his eyes and spread his hands. "But sir, I know what of these things, eh? I heard the questions she asked, but so did others who were aboard. You pitch upon me for why, eh?"

"Because you have swindled so many so often, heh." Gensifer looked at the others.

Even Foggy Doont looked blankly back. The notion that this madness might be one of Thuligent's frauds clearly startled them. Gensifer snorted, feeling balked. If Thuligent had looked even faintly pleased or smug, he'd have given him a few slaps of his tongue, but the fellow continued his classic Innocence

Aggrieved act, in which he'd had so much practice.

"So the Council of Wisers examined the records, eh?" he asked the schoolteacher.

Oxmager made the negative gesture. "No, heh, not formally, sitting in council. We merely made a random search, as private citizens."

"After which most of you ran off to Taunder Pond, eh?"

"Some did, heh."

"Misty Pulm was of this lot, eh?"

Oxmager looked blank. "I don't know, heh."

Gensifer hadn't seen her in the rout. "I see," he said stiffly. He abouted and marched away, but at the door turned sharply, bent aside and peered past Foggy Doont to glare at Thuligent Halm. That worthy continued to sit with eyes cast down, as a rodent might cower beneath a raptor.

His final retort a loud snort, Gensifer banged the door behind him.

Thuligent, ha! he thought. Thuli the Clever!

When Lomydol Gont had expanded his tri-cycle factory a couple of years ago, he had put it outside the bounds, so that the casting of aluminum and banging of metal would not disturb his customers and neighbors.

Thuligent had, for a modest down payment, optioned the plat next to it and had immediately started to dig a muckreed pond.

Houses within the town limits were forbidden private muckreed pools. All sewage was piped to the town pond, where the muckreeds did their job of deodorizing, sanitizing, and supplying the town with liquid fuel, far from the noses of the populace.

To protect his customers' noses, Lomydol had had to buy Thuligent out. It was all quite legal, and Gensifer had had to be content with lamming Thuligent with his staff for public drunkenness two nights later.

Gensifer snorted again and stomped off to find Misty.

Misty Pulm was the current scholar, Nexter Pulm's younger sister. Gensifer considered her, next to himself, the wisest person in Firkle Fountain, despite her youth.

In each generation, Firkle Fountain chose its brightest pupil to send north to Zhuzianti, to be educated at the town's expense. In return these scholars served as

repositories of knowledge, became public schoolteachers, teachers of private lessons, etc.; diffusing their educations through the town. Returned scholars constituted the Council of Wisers.

He found Misty Pulm at home, a modest cottage not far from the fountain. She did not heed his pull at the bell-wire—he could see her through the window, bending over a table—and Gensifer banged on the door with the ball on his staff.

"Gensifer, ha, it is you," she said a moment later, standing aside to let him enter. She was as tall as he and nearly as stout, but with a remarkably pretty face and clear greenish eyes. "I may help you in what way, eh?"

He had leaned his staff carefully against the wall outside, the white ceiling within being low. "This madness about Taunder Pond, you know what of it, eh?"

"Very little, heh. It seems a traveling savant asked a few questions about it and Taizel Tainman. She had no time to land and look at the pond herself, and got little satisfaction from the idlers who met the boat. But her questions started others, and the town records have been consulted—I am still consulting, as you see."

Gensifer saw that the table and chairs and couch in her common room were spread with books, most open. Piles of books occupied the corners. Not all these were town archives, the massive tomes clad in tan-colored leathertree bark in which the town's journals and ledgers and cases-at-law were recorded. There were also family histories, town histories, and ancient histories. Histories of Gilfallast, he saw.

"You have learned anything, eh?"

She made the negative gesture. "I don't expect to come upon an account of a great treasure in Taunder Pond, heh," she said wryly. "I am trying to see if there is warrant for connecting Taizel Tainman with Firkle Fountain. The Battle of the Flowering Fields and the end of Gilfallast occurred half an octury and more before the first mention of Firkle Fountain in any history."

"The city of Merolla was along the coast, eh?"

"Yes, heh, but not here—farther north."

"And 'the waters of Bertallan'—that does not refer to Firkle Fountain, eh?"

"It was an aqueduct that led water to the philosophont's manse near Merolla. True, this might be our fountain. Firkle Fountain might be 'near' Merolla if one defines 'near' loosely enough."

"So the whole tale is probably some hoax, ha!"

Misty Pulm blinked, then smiled at him. "I suppose it might be. Most likely one of those amusing cases where credulous fools, having been given a button, proceed to sew a whole garment on to it. You suspect whom, eh?"

"A foolish question," he began, and she laughed outright.

"Foolish indeed—of course you suspect Thuligent Halm. Well, I do not see how he profits. He, if it was he, has given us some excitement and an interesting notion to research." Dropping Thuligent, and Gensifer himself, she returned her attention to the books.

The arbiter let himself out unnoticed and stood hesitating. From the east, the land surprised the sea, then did it again. Part of him wanted to rush off to Taunder Pond, knowing the mischief at work there. But supposing Thuligent was guilty, the only way Gensifer could picture him profiting by it was if he had secretly acquired title to the land.

"Of a certain it was he," said Gensifer aloud.

Thuligent's most recent venture had been to meet all the boats and stages passing by and receive the posts, which he then carried round, collecting the mail fees and an occasional gratuity. Gensifer became suspicious and finally proved that Thuligent had been altering the amounts due. He'd barely made a living on this diddle.

This was typical. Thuligent aspired to live by his wits. Having but few, he lived not well.

He had had a good wife, who had supported him in his idleness. Since her death he'd lost weight. He also had a daughter, who so far had shown no signs of following her father's path to poverty.

Abruptly, Gensifer turned and made his way back to the Town House. He entered by a side door and trotted quietly up the stairs to the land registry office. This he found empty—the upper floors all sounded empty—and when he put his key to the door, unlocked. Frowning,

he went round and tried the doors of the other offices—all were empty, and three more had been left unlocked. The town bureaucrats had left their desks! Shaking his head, he carefully locked them all and entered the land office.

On the wall was a mosaic map of Firkle Fountain, lying between the World-Waste Ocean and the Killaxican Hills. Gensifer quickly found Taunder Pond, a large blotch south of the aqueduct. The map was divided into parcels, and consulting the borders of the mosaic, Gensifer determined the parcel in which the pond lay. Opening the map books, he found the parcel in question, quite a nice contour map of it divided into plats. The pond lay irregularly across parts of three plats.

Making a note of their numbers, Gensifer consulted the filing cabinets and found that all three plats were “unbooked” land, owned by none and therefore under the jurisdiction of the town government.

Unless, he thought, the sale of them had not yet reached the land registry. It might still be in the town clerk’s office. However, a search of the clerk’s journal showed no conveyance of any of the plats.

Then, perhaps Thuligent had a contract with the agent for the government at Zhuzianti, one giving him rights to any discoveries made at the pond. It wasn’t recorded in the town clerk’s journal, but it would have been recorded by the town attorney’s clerk.

A search of that office was equally fruitless. There wasn’t the faintest cloud on the title.

Gensifer thought, I’m wasting my time here. Best to have a word with old Mamester Gont. Mamester was the father of Lomydol Gont the tricycle maker, patriarch of the Gont family—and agent for the government at Zhuzianti.

Mamester Gont was not at home. Nor was anyone else. The streets had been deserted all the way here. All the houses near the Gonts’, but one, held an ominous silence. In the yard of that one house he found a studious girl of about twelve, in charge of half a tetron—a sixteen—of the neighborhood children.

“Mamester Gont, eh, sir?” she repeated, glancing at his staff. “Why, all the Gont family are gone to Taunder Pond for to seek the treasure, heh.” She looked at him in mild wonder, either that he had not heard of the treasure, or had not gone himself.

“Thank you,” he said from between clenched teeth, and forced himself to tilt his triple-brimmed hat politely, not to take out his irritation on her.

Turning away, he suddenly realized that that was Thuligent’s daughter, Calm. Well, so the Halm family *was* profiting by the tale. Slightly.

To Taunder Pond, then, Gensifer thought in disgust. He paused at the Fountain for a drink.

The fountain sprang from a pipe of porcelain-seeming High Mondeign material millions of years old, spouted high in the air, and fell into a pool that drained into Mellow River. It was conveniently near the town’s docks, where ships might water easily.

Gensifer hung the dipper and wiped his mouth, looking south along Central Street. The stage car was nearing the town. He damned the Chance; for years it had been his habit to meet the two daily stages. Torn, he hesitated, glancing at the Killaxican Hills brooding above the town, then in agony back at the stage.

Habit prevailed. With an exasperated snap of his fingers, he hurried back to the Town House, arriving just before the stage. He had barely time to adjust his blouse and square his white hat. Taking a deep breath to subdue his breathing, clutching his staff sternly, he watched the passengers descend.

This was a big stage, two cars in train, pulled by a massive fortaunt, largest of the working beasts, that stood on eight powerful legs, half again as tall as Gensifer Quat. A round tetron of passengers alighted, including one massive ogre who would have made two of Gensifer in bulk—and this bulk had nothing of fat in it.

“Welcome to Firkle Fountain, fellow man-kin, huh,” said Gensifer importantly, using the Declarative executant to add force to the sentiment. “The refectory is within-doors and to your right. The bath house is there, across Central Street,” pointing to a building with a solar boiler and a windmill on its roof. “For those desiring to stay over, the hostel is next to it.”

“Arbiter Gensifer, so good to see you,” said a smiling middle-aged man-kin, among the last to descend.

“Master Sarcy Mondard, it has been so long as to bring you again, eh? A pleasure.”

Sarcy was a trader who thrice-yearly made a circuit of the Morningshore towns. He dealt with items of High origin, which had a small but steady sale; his antiquities shop was in Roruborni to the south.

One of the passengers came back out of the Town House and plucked at Gensifer's sleeve. He had a handmeal in one hand. It looked like a thick leaf in the shape of folded hands, was ripened to a golden tan, and had the black trademarks of ham between rye bread with white and yellow sauce and pickles.

"There is no food in Firkle Fountain, eh?" he asked irritably.

Gensifer stared at him in astonishment, looked at the arched doorway. It was crowded with other passengers, who set up a clamor for cooked food, not tree-snacks.

The arbiter pushed through them to the refectory, where he saw the great ogre apologetically husking handmeals, watched with alarm by old Quain the waiter. A large silver salver was heaped with handmeals from the town orchard; Quain had done what he could.

"Soffel Gomp is where, eh?" Gensifer called wrathfully.

"Off t-to Taunder Pond, heh, Sir Arbiter," quavered Quain.

Gensifer flung his arms into the air, brought his arbiter's staff down with a thump that made Quain wince for the flagstones. "Good man-kin, I ask your indulgence, ha," Gensifer said. "The town cook has gone haring off seeking treasure, and will return, Chance only knows when."

At this point Foggy Doont emerged from the kitchen with a tray of cheese, milk nuts, and cold bread pods. He gave her a distracted nod of approval.

"We will engage to toast or otherwise warm such of this food as will be improved by it. But please, eat without stint, and without charge. And accept the apologies of Firkle Fountain for the dereliction of our cook."

"This treasure, it's what, eh?" asked a large female with a drooping nose and fierce little eyes.

Gensifer exhaled. "It is no treasure at all, heh; it is a caprice of certain fools in the town. It rests on no evidence whatsoever."

"The stage departs by the clock, and the fare of any not on it is forfeit," said the driver abruptly.

Gensifer gave him an approving affirmative gesture. That was the way to keep them in hand.

"Except of course those of us who bought their passage to Firkle Fountain," said Sarcy Mondard, the trader. "As is my custom, I will be laying over till tomorrow, to buy of the townsfolk. I trust, my good Gensifer, that there is still lodging available in Firkle Fountain."

"I trust there is, heh," the arbiter said bitterly.

Gensifer's wife, Windy, met him with a troubled look. "Gensifer, ha, this tale I hear of treasure at Taunder Pond, it's true, eh?"

"No, heh, I think not. I suspect a swindle by Thuligent Halm. I must be off to Taunder Pond and fetch Soffel Gomp; the stage car has arrived with a tetron of passengers, and no cook to hand. If you could go to Town House and take charge, it might somewhat repair the credit of Firkle Fountain."

She sighed. "Very well, though I promise nothing of my cooking."

"It made me fat; it should do for them."

Gensifer mounted his tricycle and pedaled grimly off on the west road, toward the Kil-laxican Hills. Some millions of years ago, these hills were a city of the Heights of Mankind. These tumuli once were sky-aspiring buildings. Without stairs, for the man-kin of the Heights flew through the air on wings of light.

Here on the lower slopes the plantations of food-bearing trees gave way to those bearing raw materials: iron, aluminum, copper, sucked by the roots from the scattered and corroded wastes of the archaic city.

Plantations ended and the occasional house was no more; the woodland became wild second-growth. Here the road diverged to the north, seeking an easy way, but the aqueduct flung straight up the first hill. Groaning and sweating, the arbiter followed the numerous tracks in the right of way. The arcade of the aqueduct diminished, disappearing at the top of the hill. The aqueduct became a pipe under an embankment. Gensifer followed the tracks along this embankment, till they diverged into broken country to the south.

Groaning again, he followed. Fortunately the working beasts and wagons had crushed

the herbage under the trees and partly leveled the path, but he walked his tricycle as often as he rode it. Should've brought water, was his only thought, when he finally arrived panting and wringing wet at Taunder Pond. An hour to get here and another hour to return.

The tree-bristling hills stood around a water-filled hole in the ground. Gensifer took one look (his first) at the tarn and realized that it had never been the site of even a wizard's manse. A sinkhole.

Taunder Pond was buried between hillocks and partly hidden by trees. Larger than it seemed, it was a scuttlefish blot with dark legs curving in every direction. Beneath the black water were caves of flooded rooms and corridors winding back under the land.

Gensifer Quat strode out on a ridge between two of the pond's legs, gripping his staff and frowning. Great moss-bearded trees stood along the shore. Here was gathered all the life of Firkle Fountain.

Half the adult population of the town, and all the adolescents, swarmed around Taunder Pond. Nude and streaked with black mud, their hair streaming black water into their faces, the townsfolk labored with the jerky frenetic energy of clowns.

From the stumps, and from the trunks and limbs of the giants remaining, ropes had been let down into the murky waters of the pond. Folk were swimming, diving, hauling up buckets full of muddy water and emptying them onto the banks, to paw through the resulting black muck. The banks had become quagmires from the dumping and trampling.

Gensifer stared, forgetting his own exhaustion.

"All these trees have shed leaves into the water for generations, turning the mud black," someone gasped at him, kneeling in the shallows to paw mud.

Gensifer opened his mouth, closed it. He didn't know who she was.

Abruptly, she stiffened, washed a lump of muck, and revealed a glassy gleam of imperishable High material. A transparent ruby spoon. She scrambled ashore, muttering, "The third one, ha!" and tucked it into a bag hanging by its drawstring from a low limb.

"Soffel Gomp, ha!" Gensifer bellowed suddenly. "Soffel Gomp, ha!"

None heeded him, but for a glance. When the next set of heads broke water, he repeated his cry, and one of the black-streaked faces turned toward him, then away. Soffel Gomp swam to his bit of shore and dumped his bucket.

Gensifer arrived a moment later, his arbiter's staff going back for a blow. So great was his anger he nearly broke the law in enforcing it: he was forbidden to strike anyone over the head, or to draw blood, or to break bones, except in defense. He had never broken any of these laws, and at the last moment, regained his senses. Soffel Gomp was left-handed. Gensifer struck him on the point of his right shoulder with the hollow ball on the end of his staff.

The aluminum gave off a hollow *bong*, and the man an outraged howl. So great was his greed, however, he merely continued to paw through the black mud on the bank. Gensifer was forced to "gong" him twice more, and finally to drag him undignifiedly up by his slimy hair.

"Gather your clothes, ho! Patrons await you in the refectory, ha!"

"No, ha! I shall remain here and seek the treasure—"

"The treasure, ha! It looks like what, eh? You know that it has not already been found by someone else, eh?"

Soffel Gomp stared at him sullenly, black water trickling down his face from his hair. "It's coins and such, eh?"

"Who knows, eh? Any of these High artifacts might be it, for all we know. Now, back to your stove, ho! The credit, and the solvency, of Firkle Fountain are at hazard."

With a defiant look, the cook put his bag of finds into the carrier of his tricycle, where his clothing lay. Gensifer stayed wrathfully behind him back to the bathhouse in Firkle Fountain.

"We have no clue to the nature of the treasure," Misty Pulm said to the deputies of Firkle Fountain that night, in the town hall. "Or even if there is one."

Two tetrans of mostly older men and women, the deputation, looked uneasily at her, and down at the assembly of the town.

Gensifer Quat sat bolt upright on the stage, gripping his arbiter's staff, facing the deputies.

Around Gensifer on the deputation's right hand were the other appointed officials of the town: the attorney, the surveyor, the harbor-master, and so on. Across the stage, on the left hand of the deputies, was the Council of Wisers, headed by old Moderate Nunn the wiser. She was verging now on senility, but was still the very image of a wiser.

The stage was one step up from the floor, where sat or stood the town assembly: the adult citizens, who had elected the deputies. At the back and partway along the sides were balconies whence children, adolescents, and other nonvoters watched the governance of the town.

Misty Pulm continued, "I have concluded that a High Mondeign treasure might take any of five forms, to wit, first, money in gold or imperex coin; second, a High artifact or artifacts of great value; third, a High weapon; fourth, an egg encapsulating a powerful forcewefkin; fifth, dangerous knowledge. The third, fourth, and fifth forms would at once bring in the government at Zhuzianti. I doubt we would profit much from any of them, and we might well be endangered."

Gensifer nodded, grim. It was well-known that High artifacts occasionally survived the ages in good working order. Terrible ancient weapons were held in the armories of many nations. And all nations had their sophonids, intelligent machines knit of pure force, useful in civil administration but dreadful in war, as history taught.

And of course knowledge was always dangerous.

"But you believe there is a treasure in the pond, eh?" one of the deputies asked.

Misty hesitated, frowning. "Say rather I have no evidence that there is not, heh," she said finally. "My search of the ancient tomes is not finished, but there is a reference or two to Taizel Tainman's 'southern hospice.' We know that Merolla lay to the north along the Morningshore, by Bashmanham. So this southern hospice could have been near Firkle Fountain. Or Taunghead."

A rumble from the floor. Gensifer, scowling, saw that a majority of the townsfolk were convinced of existence of the treasure.

"Not much evidence to justify throwing the town into confusion," said one of the deputies dubiously.

Gensifer sucked in his breath to shout that it was a swindle, a great fraud on the part of Thuligent Halm. He ground his teeth together to contain his passion. All there already thought him too prone to see intrigue by the town's one professional malefactor.

"The guess that Taunder Pond might be the location of the treasure is just a guess," said another deputy. "Based solely on its history as a source of High Mondeign artifacts. This 'southern hospice' might have been anywhere in the Killaxican Hills back of the town—or back of Little Litacy, or who knows where. Eh?"

Misty made the affirmative gesture. "Heh. We haven't a clue."

Another rumble from the floor. They weren't giving up their hopes so easily, Gensifer saw. He looked around for Thuligent Halm, to direct a meaningful glare at him, but the little man wasn't there.

Significant, he thought, continuing to scan for him. Normally the cozener wouldn't dream of missing an assembly.

"Valuables have been taken from the pond today, eh?" one of the deputies asked. "If so, of what nature, eh?"

The administration looked at each other and at the assembly; all looked about. For each to stand and state the nature of what he or she had found would take too much time. Gensifer raised his hand.

"The arbiter has a question, eh?"

"A suggestion, heh. Perhaps Sarcy Mondard the High artifacts trader can give us a brief overview of items removed from the pond."

"A good thought. Master Sarcy I see in the balcony. Be so good as to come down and address the town assembly, ho, Master Sarcy."

After a brief wait, Sarcy Mondard came up the aisle. He seemed a little uncertain of the formalities, but stood at the edge of the stage, partly facing the townsfolk and partly facing the deputies.

"All of today's finds were of the usual sort I am accustomed to buy in Firkle Fountain," he said. "I bought one of the rare music-making gems, almost inaudible. There were several small articles of virtue, including a statuette; these the sophonids tell us were portraits of men and women of the Heights of Mankind. Next most valuable were the usual immediately useful utensils, as cups, plates, pots and

pans, and the like. There were also a number of chairs, small tables, cabinets, and so on, of various values depending upon condition. And the usual clear or colored transparent fragments, which can be laboriously cut into gems. Of least value were miscellaneous items, many of them possibly parts of machines. There were also an unusual number of glossy black fragments, called 'High jet.' Those whose fractures are sharp can be used for cutting the other High materials. In short, the usual run of High Mondeign relics."

A disappointed silence. Such artifacts had been coming out of the Killaxican Hills for ocuturies. Every town along the Morningshore was well supplied with kitchenware, even furniture; they were a major export. They did not break or wear out, and the demand was well supplied, hence their low esteem.

"No gold or purple imperex, eh?"

"None was offered to me, heh."

"Doesn't prove it isn't there," called Nexter Pulm from the floor.

Gensifer frowned at him.

"We will not be assailed by Zhuzianti for looting its property, eh?" one of the deputies asked the attorney.

Mamester Gont, agent for the government at Zhuzianti, made the negative gesture, and the attorney handed the question to him. "Not unless something truly valuable turns up, heh," Mamester said. "I have ordered Master Sarcy to keep a record of all that he buys and the total price he pays. We can tax the finders one-sixteenth and remit to Zhuzianti if they require it. They have never questioned our finds."

"Unless something of rare value does turn up," grumbled a deputy. "They'd seize that in a moment."

Unheard, the sea encountered the land.

The next several days were very bad for Gensifer Quat. He had difficulty keeping staff on hand in the bathhouse, refectory, hostel, and other essential offices, to accommodate the travelers by stage and boat. This was further exacerbated by a sudden influx of travelers from Little Litacy to the south and Morningham to the north. News of the anticipated treasure had traveled.

Then boats began to come down Mellow River from up in the Killaxican Hills, from

towns with names like Cut and Shoot, The Thicket, Gasherbrum, Gobtop. From these places issued man-kin as dubious as their towns' names, not all of them of the common human pattern. Some were arboreals of four arms, others were ogres of great size.

Meanwhile, the townsfolk had brought some order into their dredging. They had cut trees and floated a raft on the pond from which to dive, and all used a common sieve on the shore. There was even a rough jetty at the bank, of half-rotten fallen logs.

Into this peaceful industrious scene burst the outsiders. They swarmed over the raft and jetty, crowded the sieve, elbowed townsfolk and each other at the bank, and scuffled for muck at the bottom of the pond. On the third day, a squabble at the sieve led to a pushing match, which in turn led to a fight that left an arboreal bleeding from the scalp. At that the outsiders scrambled up clubs and rocks and mud, yelling and roaring, and the townsfolk did the same.

Gensifer was already exasperated near to madness by the heat, and this fatuity made him furious. "Halt, ho!" he cried, running between the combatants. He held up his staff of office, tapped the arbiter's badge on his triple-brimmed hat. They stood staring at him in respect, or disbelief. He was the only one at Taunder Pond not naked and streaked with black mud.

Turning his red and sweating face from one group to the other, Gensifer said, "Come, ha! Comport yourselves more like man-kin, and less like beasts of the fields, ha! Calm yourselves, ho! Drink water, fan yourselves, let your greedy madness cool. What, to brawl in this heat, ha! It's madness, ha!"

Nobody spoke, but there was a shuffling of feet. Gensifer addressed an outsider, a huge ogre. "Come, friend; of what value to scuffle for the footing items you have been pulling from this sinkhole, eh? It is better to work together, eh?"

Ogres are deemed stupid, but this one was no fool; he made the affirmative gesture. Turning to his fellow Hillmen, he said, "He speaks the truth. I have seen nothing worth fighting for. Let us 'pay the tact tax' and work with the townsmen."

"Work with them how, eh?" one of them called.

The ogre looked at Gensifer, who swatted at a fly and irritably said, "Choose some of your people to meet with some of the townsfolk, and work out the more obvious rules, heh. If necessary, have them enforced by such large man-kin as yourself."

The varied man-kin looked at each other, and tensions at the Pond abated. Hesitantly they began to talk. It would all fall apart, of course, if anything of value were to be found.

Gensifer mounted his tricycle for the return to Firkle Fountain. This necessity to be in two places at once was wearing him down; he had lost much flesh, and feared for his health. Even his inexhaustible exasperation was beginning to fail him. But it came surging faithfully back when his drive cord sprang off the sprocket wheel.

Dismounting in the silent woods, he looked down along the line of the aqueduct onto Firkle Fountain and debated walking the machine the rest of the way. But with a sigh he bent to the sprocket wheel.

The wheel was cast aluminum. The drive cord ran in its grooved rim. The rim was notched into sprockets, and short wooden pegs threaded through the drive cord fitted into them.

Gensifer heaved the sprocket wheel's axle out from behind its thole pins on the frame. Slipping the drive cord back into the rim, he fitted the pegs into their notches and saw that the cord was not twisted. Then he sighed, mentally bracing himself.

With one leg through the frame to hold it in place, he seized the pedals and heaved the sprocket wheel back toward the thole pins, against the tension of the drive cord. His eyes bleughed with effort, sweat ran into them, his breath came short. Just as he thought his hearts would stop, the sprocket wheel clicked behind the thole pins, and Gensifer collapsed, his breath whooping in and out.

From the heel of his foot, up his leg, along his back, across his shoulders, and especially down his arms, every muscle quivered with released strain. Pain would soon follow, he knew.

There ought to be an easier way. Some sort of jack one could pump the sprocket wheel with, against the tension of the cord. Or a lever.

Thinking thus, as he mounted, it came to him in a flash. He knew it all!

That wandering wiser—who was she? No one had known her. She was in collaboration with Thuligent, never doubt it! She'd started the rumor of treasure. Thuligent then stirred up the fools to go seeking . . . what?

Gensifer's elation collapsed. How did Thuligent profit?

Deflated, Gensifer Quat sat on his tricycle. What was Thuligent's plan? Grimly he reassured himself: It *was* an intrigue, Thuligent *was* responsible, the wandering sage *was* part of it. It *must* be so.

Moaning a little with exhaustion, pain, and self-pity, he pedaled gingerly till gravity seized him and took him down into the echoing, silent streets of Firkle Fountain.

From the school grounds he heard the high-pitched scream of a woman being tortured to the uttermost extremity, followed by shrieks. "No, no, no, no, no, ha!" This was accompanied by heartless laughter, agonized shrieks from other women, running feet, and screams of panic and pain.

How pleasant, he thought. The sounds of children at play.

He found the school grounds crowded with children. Thuligent's daughter Calm's child-watching service had expanded till it included most children below her age in town.

Good, he thought wearily. At least somebody was trying to keep the town going.

Thuligent, Gensifer thought. He hesitated, looking across the neat white palings at the children. Calm had become the woman of the Halm family. And, he suspected, the man as well. Certainly Thuligent was more childish than she.

The girl approached. She wore a frayed but clean workman's smock in gray-blue, probably cut down from one of Thuligent's. She was barefoot; and wisps of fairish brown hair straggled from beneath a blue cap, but her expression was as calm as her name.

"Sir, eh?"

There was a wariness in her direct gaze; also, a weariness. Almost, a hopelessness.

In a flash of insight, Gensifer knew himself to be an unsympathetic man. It was a disturbing thought. He had thought himself to be impatient and irritable, but not inhumane. For the first time, he realized how he must

appear to another: to this child-woman. Not a friend.

Her father was a scamp and a rogue, but her father still, however lazy and irresponsible.

"You have made plans for the collapse of your father's schemes, eh?" he asked, with unaccustomed gentleness.

The weariness deepened; she made a hopeless gesture. "I can do what, eh? Things will be as they will be."

This was no girl, Gensifer thought, twelve though she be. She had never been a girl. Of course she could admit to nothing, saying even that she knew anything. Thuligent was boastful, but not that much a fool.

"I will do what I can for him," he said, to his own surprise meaning it. "I do not know what that will be. But whatever I can. . . ."

He saw a moment's gratitude in her glance. "You are his only friend. If he but knew it," she said.

Gensifer Quat went on his way, perturbed. He was rarely willing to assume the burdens of friendship, and to have thrust upon him the responsibility for Thuligent Halm! Yet, how could he disillusion that girl?

If it is so, then so it is, he thought, resigned.

Several days passed, in the calm that presages a severe storm. Artifacts came out of the tarn by the barrelful. Sarcy Mondard sent twice to Roruborni for funds, and other dealers came up from the city to buy at the source. They set up shop at Taunder Pond, vying for the best pieces.

The women of the town abandoned the pond, staying home to let rooms and cook food for the outsiders who worked the murky waters. Money flowed through the town in a silvern if not golden stream. Dredgers began to grumble at the refectory at night, because the price of High relics had fallen in the face of the glut.

Gensifer became more and more uneasy as the peace extended. He had promised Calm he'd do his best for Thuligent. But it seemed (if Gensifer was not mistaken about the little man for the first time in his life) that Thuligent was, this time, swindling the whole town.

Thuligent had never aroused the ire of more than one or two of the townsfolk at a

time. The rest of the town was amused by his antics, and inclined to laugh at his victims. But this time it was different. He might even be mobbed.

Gensifer *knew* it was a plot. But how was it worked? He had to know, if only to protect Thuligent. But he couldn't ask Calm.

Then one morning an express boat put in at Firkle Fountain.

The express boats were motivated by force-wefkins thrusting them through the water at great speed and expense, and ordinarily never stopped at so lowly a harbor as that of Firkle Fountain. This one's snooty upturned prow drew a mob of curious townsfolk, mostly women.

One man debarked.

A lordly fellow, he was, wearing an absurd hat of five brims, each narrower than the one below. It had a badge, of the purple metal imperex: a government badge. The man's loose sea-silk blouse gleamed like gold above foppishly tight trunks in silvery sea-silk. This apparition searched the crowd superciliously, fixing on Gensifer Quat's staff and the arbiter's plain silver badge on his white, three-tiered hat.

The stranger strode toward him, the women giving way, and touched his purple badge. "The local arbiter, eh? I'm from the government in Zhuzianti. I'm here to help."

Ah, no, Gensifer thought. The sea recoiled from the shore, echoing him.

He said his name was Dandifer Donn, and that he was an inquestor for the war department.

"At Taunghead, Bashmanham, and here at Firkle Fountain, the inhabitants are digging and delving for an old adjunct of Taizel Tainman. Scholars at university tell us that it could well be the High weapon Taizel Tainman promised Riondor Deadman, which might have altered the outcome at Flowering Fields." The inquestor looked meaningfully at Gensifer.

The arbiter was too resentful to be impressed. The government—interfering in *his* town. Sending this fop with a mountain of luggage on an express boat. Rich luggage, and a cultured accent that said he was a superior being. Especially superior to "the local arbiter."

Gensifer's silence was perhaps taken for awe. Dandifer Donn lowered his High tone and spoke more tactfully.

"If there is such a weapon, the war department must and will have it. However, we will pay a reasonable sum for it, I do assure you. No fear, ha!" He jerked his head in a manner meant to be reassuring.

"But it's merely a swindle, ha!" Gensifer protested, finally finding his voice. "I confess I do not see how he profits, but it can only be a swindle. This mysterious wiser on the *Diligent*—what's known of her, eh?"

"Nothing whatever, and questions have been asked," said Dandifer Donn grimly. "She took ship at Zhuzianti and asked her suggestive questions about Taizel Tainman only at Firkle Fountain. She debarked at Roruborni, and vanished."

"Took off her scholar's attire and became—someone else. You mentioned Taunghead and Bashmanham. She didn't mention Taizel Tainman there?"

"No, nor at a tetron of smaller places between Zhuzianti and Roruborni. The infection is even spreading north of the former and south of the latter. Soon, to the whole Morningshore."

Gensifer grunted, not surprised. The mind of man-kin is a deeper tarn than Taunder, and greed murked its depths.

Dandifer cocked his head. "You've found no trace of a weapon, eh?"

"No, heh. And none of a treasure. But most of the finds have been sold to the traders in High artifacts. Sarcy Mondard was on the field from the first. You will want to ask him what things he has seen."

Dandifer said, "Mmm. I'll speak to this Sarcy later. Now, I had best get settled, as I may be here some time."

Gensifer took charge, got him settled in the best suite in the municipal hostelry. Perforce he joined the other for a meal in the refectory, during which Dandifer Donn favored him with a ponderous lecture on the affairs of the government at Zhuzianti and of the war department in particular. The chief purport of this monologue was to reaffirm Dandifer's high superiority over all such bucolic officials as, let me see, his name was Gemmichiver . . . ?

After eating, Dandifer said, "Now, one gets to this Taunder place how, eh?"

Gensifer winced. "By tricycle, heh."

The other registered shock that there was no other, less arduous or less plebeian, mode of transport than to pedal a municipal tricycle. Not even for Dandifer Donn, the inquestor for the war department at Zhuzianti.

Gensifer had a moment of malicious amusement. But the other's expression became heroic, that of one doing his utmost under trying circumstances.

They mounted and set off in the heat.

By now there was a well-pounded road leading up the line of the aqueduct, then down toward the Pond. Two-thirds of the way up the slope, Dandifer Donn passed a bucolic child, trudging under the weight of a covered basket.

Calm Halm, Gensifer identified, slowing to a stop. The little girl looked at him with grown-up eyes.

"The children are being watched by whom, eh?"

"The big Chark chick, heh. A day's pay for half a day's work, and they call my *father* a rogue."

The basket, no doubt containing lunch, did it mean that Thuligent was at Taunder Pond? Gensifer couldn't believe it. She was earning a bit by carrying someone else's lunch—?

But she made the negative gesture. "For my father."

Gensifer shook his head. Did the sun now rise in the west? "Climb on," he said, and with her behind him, pedaled hard after the inquestor.

"Your father is really at the Pond, eh?"

"Yes, heh. You and I now are the only unbelievers. The stranger is who, eh?"

Gensifer explained, overtaking the other. They swooped down the slope to Taunder Pond, and Gensifer looked at Dandifer.

The inquestor's face flashed amazement. He had evidently expected nothing so grand. Taunder Pond stretched out of sight around the headlands.

There were now several crude landings, there was a big sieve on a waxpaulin that channeled wastewater back to the pond, and a hose down from the aqueduct. Sarcy Mondard had a small table set up under a tree and was talking to two black-smeared men. Three other pieces of furniture supported the business of five other traders. Under another tree

sat Monder Gont, the town doctor, smearing antiseptic gunk on a dredger's hand and urging him to keep it out of the water.

These seven were the only clothed mudfree man-kin at Taunder Pond, save the three newcomers.

Out on the water, small boats plied, three rafts made of half-rotten logs floated half-sunk. Everywhere was life and movement, men plunging in with ropes tied to waists or ankles, so that they might swim back under the land, into the stygian purlieus of the flooded city.

Even as the inquestor stared, Gensifer's cousin Ro Quat the red-haired and one of his sons, faces blackened, rowed up to the bank and leaped ashore with an energy not often seen in Firkle Fountain, or anywhere along the Morningshore. Their canoe's center was piled high with a soft bundle, bright primary colors gleaming through the murk. Vitrane, Gensifer recognized, the fine woven glass cloth. It could be worn out, but did not decay.

They hauled their bundle to one of the traders, who shook her head.

"What, eh? For why not, eh? Ha!"

She spread her hands. "I must save my money for things of value, heh, I daren't waste it on low-value items. What if something really good comes out and I can't bid, eh?"

"Low value, ha!" Gensifer said. "Vitrane, eh?"

He exchanged a blank look with Dandifer. Then his expression changed. "Thuligent, ha!"

The little man came staggering ashore, gasping for breath, and tripped when the cord tied to his ankle snagged. He went to his knees, dropping a double handful of bright shards of low value. He flung up a hand to protect his head when the arbiter loomed above him, relaxing when he saw that Gensifer did not mean to gong him.

He grinned up. "Come to join us, eh, Arbiter?"

Gensifer stood groping for a response. *Thuligent—working*. If it was all a swindle, he would not be here, sieving the mud—surely? But of a certainty it was a swindle! With Thuligent involved, what else could it be? For a moment, he almost begged the other to tell him that it was a swindle.

Calm appeared, with her basket. "Eat, ho," she commanded.

With a nod to Gensifer, Thuligent slipped the cord off his ankle and went to the sieve, to the hose. He rinsed the black mud off his hands and face and fell to, ravenous.

Gensifer wandered away, dazed. Thuligent working! Looking for the treasure! He didn't need to; he'd convinced his dupes long ago.

He looked back at Thuligent, gobbling his handmeals, oblivious. Calm glanced at Gensifer. Not hostile. Not friendly. Questioning, he decided. He gave her a reassuring nod, meaning what, he himself didn't know.

Dandifer Donn had stooped to fanning himself with his five-tiered hat. He became more supercilious, Gensifer saw, the more exasperated he became, and the mere sight of the black muck all over the banks, perilously close to his shiny silver boots, seemed to drive him to distraction.

"The treasure is where, eh?" he barked.

Karrattul's treasure is in the Morwan Room of the old Kestral Building.

It was as if twins spoke simultaneously, one into each of Gensifer's ears. Everybody looked about.

Dandifer cried, "That was said by whom, eh?"

I, the oculogemma.

"An eyestone, ha!" Dandifer twisted this way and that, apparently no more able to locate the source of the sound than Gensifer. "You are where, eh?"

An eyestone. Gensifer had read of them. They were a material housing for an immaterial force-wefkin of low power. They usually drew their force from sunlight.

"So there *is* a treasure, ha!" cried Sarcy Mondard. Even then, his tone of shocked delight caught Gensifer's ear. "The treasure is where, eh?"

"Oculogemma, you are where, eh?" Dandifer cried.

Kestral building (shouts from the dredgers, now converging on the traders) *west north—* (more shouts) *table under tr—*

"SILENCE, HO!" The inquestor from the war department at Zhuzianti glared around him. After a moment, someone started to speak, and he roared again. Resentful silence fell.

He doesn't know his danger, Gensifer thought, and looked around for the ogre, Cloon, and the big man from Gasherbrum,

nicknamed the Quencher. But Dandifer spoke.

"Oculogemma, you are where, eh?"

On a table under a tree near the water, beh.

The air in front of Dandifer became a window, giving a view of one of the traders' tables. The inquestor registered startlement, but not the astonishment that brought cries from Gensifer and the dredgers. This sort of thing wasn't seen in Firkle Fountain!

Dandifer pounced on the eyestone. Gensifer was at his elbow as he picked it up. It was about the size of an egg, but not egg-shaped, being instead a smoothly rounded oval. Fastidiously, Dandifer wiped it with a cloth, though it had been rinsed.

"The treasure, ha!" "The treasure is where, eh?" "This Kestral Building—it's where, eh?"

The dredgers crowded around, clamoring. Dandifer Donn looked at them, streaked with mud, reaching for him with muck-dripping fingers, crying out.

"Very well, ha," he said, irritated. "Oculogemma, say again, ho: the treasure is where, eh?"

Karrattul's treasure is in the Morwan Room of the old Kestral Building, beh. I will show you, bub.

The air shimmered, and Gensifer was looking into a dark hole. He sucked in his breath: in the darkness he saw shapes. A fish flicked a tail and vanished, then he saw pitchers and bowls that gleamed in gold, filled with golden and purple coins.

Cries of surprise were followed by shouts of greed and demands to know where this flooded dark room was.

In response, the oculogemma's perspective closed on a cord twisted from vitrane, leading from the treasure room—the Morwan Room—out by a tortuous route to a huge twisted lump, some ancient artifact. *This was strung by Karrattul, bub.* The lump was just beneath a certain spot, shown. So soon as they understood where the cord ended, the dredgers began to run.

"The weapon of Taizel Tainman—it's where, eh?" Dandifer asked.

I do not know, beh.

Dandifer looked at Gensifer. But for Calm, the doctor, and five of the traders, they three were alone here on the shore of Taunder

Pond. Some of the dredgers were rowing hard for the entrance to the treasure chamber, others swimming madly across the black surface, still others running through the woods, around the western arm of the pond.

Five of the traders—? Yes, one of the running men was Sarcy Mondard, Gensifer saw, shedding clothes as he ran. He remembered the tone of shock and delight with which Sarcy had greeted the news of the treasure.

Dandifer Donn flapped his arms in frustration. "Surely the treasure is the weapon, ha!"

"Karrattul, eh?" Gensifer said, mostly to himself. "I've heard the name somewhere—"

"Karrattul the bandit, eh?" came a small voice.

He looked down at Calm. "That's it, ha. He raided the Morningshore half an octury ago. Then, this treasure can have nothing to do with Taizel Tainman—"

WARNING, HA! ENTRY PROHIBITED, HA! THESE PREMISES DEFENDED BY KALICHARAN, HA. YOU MUST GIVE THE PASSWORD, HUH.

It was a voice like that of the oculogemma, but much louder, far more authoritative. Gensifer looked again toward the arm of the pond where the outer end of the guide cord was made fast. There was a commotion in the water there. He hurried across the muddied ground to see. Dandifer followed, and Calm, the doctor, and traders scrambled after.

The water was boiling where the earliest arrivals had already dived. Gensifer gaped in amazement as they erupted shrieking from the water. They thrashed away in panic, crying out.

"They're being *thrown*, ha!"

It was as if some huge invisible hand was hurling them out of the water. That was probably exactly what it was, Gensifer thought. This Kalicharan must be a sophonid, and a powerful one—

"Eystone, you know what of this Kalicharan, eh?" Dandifer cried.

I know nothing of Kalicharan, beh.

The pond ceased to boil. The men in the boats stopped rowing, but the swimmers continued away from the vitrane rope. Gensifer heard their frightened calls, between their gasps for breath.

A final swimmer was thrown out. **YOU HAVE NOT GIVEN THE PASSWORD, HUH.**

YOU MAY NOT ENTER, HUH. THESE PREMISES DEFENDED BY KALICHARAN, HUH.

Defeated, the dredgers made for shore at the site of the sieve.

"Kalicharan, ho!" said Dandifer Donn. "What premises is it that you defend, eh?"

I DEFEND THE KESTRAL BUILDING, HEH, MOST PARTICULARLY THE STRONG ROOM.

"Ah!" Dandifer's eyes lit. "There is what in the strong room, eh?"

I DO NOT KNOW, HEH.

"Treasure of—" to Gensifer: "What was his name?"

"Karrattul."

"—the treasure of Karrattul is in the strong room, eh? The strong room of the Kestral Building, eh?"

I UNDERSTAND YOU, HUH. I AM A HIGHLY ADVANCED SOPHONID, FULLY CAPABLE OF UNDERSTANDING THE INCOMPLETE UTTERANCES OF MAN-KIN, HUH. I AM IN FACT OVERQUALIFIED FOR MY TASK, HUH. IN ANSWER, NO, HEH. I COULD NOT PERMIT KARRATTUL TO ENTER THE STRONG ROOM, THOUGH HE HAD THE PASSWORD, HUH.

The inquestor tried several more times to learn what was in the strong room, but neither Kalicharan nor the oculogemma could tell him.

The dredgers straggled in, some bleeding, all subdued.

"What happened, eh?" Gensifer asked.

They said they'd been unmolested till the leading man actually entered a breach in the wall of what must have been the Kestral Building. Thereupon he and the others were as if caught in a mighty current, swept out and up to the surface. Some had brushed against things on their way.

"Lucky to be alive," one of them said, eyes wide in shock. Nexter Pulm, Gensifer identified, going by voice.

"So much for our treasure," another said, resigned.

They shuffled over to the sieve and began to rinse the mud off.

Sarcy Mondard hadn't made it to the water. On the way back, he had numbly picked up the clothing he'd discarded on the race to the bank, and now dressed himself, moving like a somnambulist.

"Kalicharan itself is a valuable adjunct," Dandifer Donn said. "Philosophonts from

university can no doubt learn the words of command for it."

The townsfolk, even the traders, registered disgruntlement. Little of the treasure would be left when the government's agents departed with Kalicharan. Gensifer frowned with them, though also relieved. A large sum of money would change Firkle Fountain, who could say how?

boom

"I must report this to Zhuzianti," Dandifer Donn said, swelling with importance.

boom

"It's clear that something of great value—very likely that rumored weapon of Taizel Tainman—" frowning and looking about.

Boom

Now everybody was looking around.

BOOM!

All whirled to stare toward Firkle Fountain and the shore, mostly concealed by the dark forest.

BOOM!

Tetrons of pointing arms tipped with pointing fingers drew Gensifer's attention. His horrified attention.

Monument Woman's titan face bobbed above the dark trees, striding toward them. Straight toward *him*, Gensifer thought, his hearts stopping, then jumping.

For the first time, he saw that great immobile face. Her hard blue eyes and marmoreal features indicated no particular emotion; merely a sternness. A mother's sternness.

The great statue strode up the slope, stepped over the aqueduct, came on. Her gem-hard skirt, it seemed, was flexible, and huge brogans were glimpsed below it.

Her strides were enormous, and Her steps light for Her vast size. She came crashing through the trees, smashing through the forest in a direct line, Her hard gaze fixed firmly on Gensifer Quat. He stared paralyzed with astonishment, amid the paralyzed crowd. She was coming for him!

BOOM BOOM BOOM!

The tallest trees didn't reach Her knees. The soil crushed beneath Her brogans. The murky water of Taunder Pond vibrated to Her strides.

BOOM BOOM BOOM!

Gensifer stared up at Her, amid the staring mob. Then, impossibly tall, She loomed over

them, and they broke, ran back, ran forward, trapped between Taunder Pond and Her puissance. Gensifer and Dandifer alone stood unmoving.

BOOM!

Monument Woman stepped delicately onto the shore. She ignored him, had not been seeking him. Gensifer sighed in relief to be unnoticed, but felt deflated. So small and unimportant, to Her! Past them, She stepped into the black water. On Her next stride, the muddy water flowed off Her white gown, leaving no trace.

She towered now above the site of the Kestral Building, and knelt. Her vestments made no sound as they flowed gracefully into shape. Gracefully and silently, She lifted Her mighty left arm on high. And plunged it deep into the earth.

WARNING, HA! THESE PREMISES ARE DEFENDED BY KALICHARAN, HA! YOU MUST GIVE THE—

Monument Woman had plunged Her arm eight stories deep into the Kestral Building's basement areas. A blood-red fog boiled up about Her face.

YOU HAVE VIOLATED THE BOUNDS OF—

The great statue leaned back, tore at the fog that enveloped Her head and shoulders. Even in the fierce summer sunshine, it could be seen to glow. But it tore more like cloth than fog.

Kalicharan, Gensifer thought, awed. I am seeing a sophonid.

The battle didn't last long; Monument Woman tore Kalicharan to pieces, which evaporated in silence to nothingness. Then She leaned forward and thrust Her arm back into the depths. Muddy water spouted up around it; She churned amid the collapsed rooms below. Presently, She brought up something that glittered in the sunlight as the muddy water dripped off it.

Palm and contents alike shed black water as if waxed. It was a man-kin—no, a man-nikin. Full-sized, it looked tiny; Monument Woman's palm was five times as wide as it was tall. This gleaming blue-black construction abruptly sat up, screamed, the interior of its mouth scarlet, its eyes glaring hell-red. It pointed its finger at a raft on the pond, and the raft exploded in steam and smoke. Then it became aware of the monstrous face of

Monument Woman above it. It whirled with cat-speed and pointed its finger at her.

She crushed it in Her fist. Whatever it was, it exploded in a flash of stark white light. Liquid flame dripped from Monument Woman's gigantic palm as She rose and turned.

BOOM BOOM BOOM!

And She strode away from them, back up the slope, stepping carefully over the aqueduct, descending behind the trees and out of their sight. Heading toward Her plinth and Her age-old wardship of the Morningshore.

Gensifer looked around, taking a deep breath. The dredgers fell silent, their voices hoarse in any case; most had shouted unheard all through Her advent. The men on the exploded raft had been burned, scalded, but were alive, swimming weakly toward shore.

Their gazes all swiveled back toward the Kestral Building, stood staring at the gaping hole that represented it.

She had broken down into it. She had smashed into the strong room, She had destroyed the treasure there (what hideously dangerous device had that been?). She had destroyed Kalicharan, the highly advanced and overqualified guardian. She had buried Karrattul's later, more modest treasure under tons of debris.

Oh, and the wind of Her passage had blown Dandifer Donn's elegant five-tiered hat off his head. It had fallen into the mud. Gensifer saw him stoop, pick it up, and stand staring ruefully at the black muck on it. Ruined.

He was so crestfallen that Gensifer had to turn away and put a hand to his mouth to conceal his glee. Fear-born hysteria, he thought. Thuligent's daughter Calm caught his look and almost smiled at him.

"I must report to the government," Dandifer mumbled. "At least I have the oculogemma."

Sarcy Mondard stumbled past, still carrying his shirt, the look in his eyes that of one cast out of paradise.

Gensifer looked thoughtfully after him, and spoke to Calm. "I won't be needed here any further. You wish a ride home, eh?"

Her expression was that of a girl whose heart was too full for speech. She made the affirmative gesture and climbed up behind him. Where the slope steepened, he dismounted

and walked the machine. She also dismounted, despite his demurral.

They had to walk around the holes left by Monument Woman's huge feet. The government at Zhuzianti would never try to seize *Her*.

Gensifer relived the moments when Her gaze was fixed on him, when She stormed down the slope toward *him*. Then the relief and chagrin when She ignored him. Well. He was a large man-kin only in a small place. So be it. He had his part in life; he was arbiter.

At the top of the slope, they remounted the tricycle, and he began to pedal.

"It was Sarcy Mondard's scheme, eh?" he asked.

A catch of her breath.

"The tone of his voice, when the eyestone said there was treasure here—surprise and shocked delight. He could not be so surprised unless he *knew* there was no treasure. Could only know *that* if he'd invented it."

No comment from Calm.

"He meant, I suppose, merely to fetch such quantities of High Mondeign relics out of the mire as to drop the price. It would take the tale of a treasure to get anyone on the Morningshore to work so hard for so long. In the end, when prices return to normal, I suppose he'll have his profit."

Silence.

"Your father no doubt was paid but a flat fee. And in the end, he came to credit their own story. He was diving and delving before the eyestone told of Karrattul's treasure. The most foolish thing I've ever known him to do."

Still silence.

Gensifer sighed. "Well, your father can have little to fear from the townsfolk. Even less from me. He's broken no ordinance that I know of."

He spoke kindly. I am her only friend, he thought.

During the next three days, Firkle Fountain returned to normal.

The town seemed empty without the outsiders, very quiet and summery; it lay breathing under Sigil Moon, made it was said by the man-kin of the Heights, with Second Moon just rising. Gensifer walked its streets, hearing the accustomed nightly noises from the

houses, children being put to bed, musical instruments being played, here and there a quiet greeting from someone sitting on a porch.

All was as before, and if the folk cast uneasy glances from time to time toward Monument Woman, well, they had always glanced toward Her.

A bang of door and a snatch of raucous voices from the Town House: drunk being evicted from the refectory, from the sound. Gensifer hitched up his tunic, gripped his arbiter's staff, and went thither.

"Thuligent," he said, almost fondly. "Why, it's quite like old times. You'd better lean on me, ho."

As usual, Thuligent Halm tried to walk on his own, and as usual, Gensifer wouldn't hear of it. Gensifer thought, Thuligent hasn't been this drunk since before the treasure hunt started.

He delivered the little man to his door, where his daughter Calm accepted him, her manner like her name.

The next day she came up to Gensifer where he sat on a bench by the Fountain, waiting for the morning stage south from Morningham.

A very serious and grown-up little girl. She looked at Gensifer for a moment, said, "I was hoping you wouldn't take his share away from my father."

"Couldn't," said Gensifer. "He's done nothing illegal. Besides, we'll have it from him soon enough."

She nodded.

"So you have thought of what to do with your life, eh?" he asked—his tone quite serious though she hadn't finished her first tetron of years yet. Twelve, he thought.

"I'll have to go to Zhuzianti or Roruborni, I think," she said. "There's not much future here for the daughter of the town swindler, especially since he isn't a very good one. Not even as a housewife; no good man would marry me."

"So you'll go and be—what, eh?"

"I'll think of something, starting with housemaid. Always jobs there. And if things go badly—I know my father's tricks. Except, I can make them pay."

"I'll bet you can." Suddenly, Gensifer started to laugh. It felt so good he continued. "I'll bet you can!" ■

GALACTIC DEATH STARS AND EXTINCTION EVENTS

The Universe is perhaps a more dangerous place than we had ever imagined. This column is about the death stars that produce gamma ray bursts and the implications of such events for life in the Universe and its extinction. We will start with a review of the gamma ray burst phenomenon.

In 1973, a declassified paper appeared in *Astrophysics Journal Letters* describing the unexpected observation of gamma ray bursts (GRB). The discovery was an accidental spin-off of the Cold War. Los Alamos National Laboratory and the U.S. Air Force had launched the top-secret VELA series of satellites, which had been designed to detect any clandestine nuclear weapons tests by foreign powers. Instead, at the rate of about one per day, the satellites had detected bursts of gamma radiation (high energy photons) that were ultimately time-triangulated as originating somewhere outside the Solar System and coming in from all directions. I discussed the mysterious gamma ray burst phenomenon in my October 1995 column (AV-74), and placed them as Item 3 of my July/August 1999 end-of-millennium list of "Things We Don't Understand" (AV-96).

Five years later, NASA's Swift satellite, launched in November 2004 for the explicit purpose of investigating GRB, used gamma-ray detectors to identify and locate incoming bursts. Swift could point on-board X-ray and optical telescopes in the detected burst direction in well under a minute. In many cases, Swift was able to observe the X-ray and optical components of such GRB events even before the gamma rays from the burst had stopped arriving. Distant galaxies were observed to "light up" in the visible and X-ray regions as they emitted these huge bursts of gamma radiation. The conclusions were that

the GRB sources were extra-galactic in origin, were billions of light years away from the Earth, and represented the emission of an incredibly huge amount of energy—up to 10^{47} joules—in the form of gamma rays. To put this quantity of energy in perspective, if an antimatter star with the mass of our Sun were to completely annihilate with our Sun and 28% of the liberated energy went into gamma radiation, the event would produce about 10^{47} joules of gamma rays.

With new observations and with improved modeling, we now understand much more about the origins and characteristics of GRB. First, there are at least two distinct GRB production mechanisms. Those that are relatively *short* in time duration (< 2 seconds) are designated as sGRB ("s" is for *short*) and originate in the "merger" of compact astrophysical objects like neutron stars or black holes. These events have an average rate of occurrence of about 0.04 per year per cubic gigaparsec (a gigaparsec is 3.09×10^{25} meters or 3.26 billion light years, and a cubic gigaparsec is a volume of space that would include a large number of galaxies). An sGRB event has a total liberated energy between 5×10^{42} and 1×10^{46} joules. (For comparison, the total energy output of the Sun in one second is 3.85×10^{26} joules.)

The GRB that are relatively *long* in time duration (> 2 seconds) are designated as LGRB ("L" is for *long*), and modeling suggests that they are produced when a rapidly rotating, high-mass star has a core-collapse to a black hole in a hyper-supernova event. These events have an average rate of occurrence of about 0.15 per year per cubic gigaparsec and a total liberated energy between 1×10^{42} and 1×10^{47} joules. In other words, LGRB events occur about four times as often as sGRB and

may liberate up to an order of magnitude more energy. The massive stars that produce these super-explosions are truly death stars, exploding with such huge energies and temperatures that the thermal photons they produce are gamma rays. The LGRB events have the largest potential impact on life (and death) in the Universe.

However, observations indicate that the probability of a LGRB event is larger when the *metallicity* of the galaxy from which it originates is low. “Metallicity” is a term used by astronomers to indicate the fraction of the mass of a star that is not in the form of hydrogen or helium. As a reference, our Sun has a rather high metallicity of about 0.02, meaning that 2% of its mass derives from heavier elements like carbon and iron. The first generation of stars that formed soon after the Big Bang had a metallicity of essentially zero, because no elements heavier than helium (and a tiny amount of lithium) had been produced by primordial nucleosynthesis of the early Universe. These early stars, which tended to be hot, massive, and short lived, consumed their hydrogen fuel rapidly, and then went on to fuse their helium into carbon, neon, magnesium, silicon, sulfur, etc., making the light elements up to iron. When those fusion processes ran out of fuel, the stars exploded into supernovas, producing floods of neutrons that synthesized elements heavier than iron and that blasted part of their matter out into the Universe, where it became the material supply for the formation of the next generation of stars. Thus, the metallicity provides an indication of the time after the Big Bang at which a star was formed, with low metallicity earlier and high metallicity later. The recent studies of LGRB indicate that they occur preferentially in those galaxies that have a low metallicity, i.e., those representing the early generation of star formation. This is probably because the higher density of hydrogen in that era led to the formation of very massive stars. We are fortunate to live in a high metallicity galaxy, where such massive stars are rare.

In the December 5, 2014 issue of *Physical Review Letters*, astrophysicists Tsvi Piran of the Hebrew University and Raul Jimenez of U. Barcelona and Harvard have used the new in-

formation on gamma ray bursts to estimate their impact on the probability for sustaining life on Earth-like planets in our galaxy and in the Universe in general. They argue that when a GRB occurs close enough to a life-bearing planet like the Earth, the gamma rays will form nitric oxide in the stratosphere, which will deplete or destroy the protective ozone layer for a period of months, exposing the planetary surface to bombardment by UVB sunlight. Intense UVB irradiating the surface of the ocean will destroy surface marine life including plankton, depriving all other marine life of their main nutrients. The result will be a massive extinction event for the marine life of the planet, and probably also for plants and animals inhabiting the land masses.

Calculations indicate that an incident gamma ray intensity of about 10^4 joules per square meter would remove about 68% of the Earth's ozone layer for about a month, and that 10^5 and 10^6 joules per square meter would remove about 91% and 98%, respectively. Piran and Jimenez assume that a gamma ray intensity of 10^4 joules per square meter will cause significant damage to planetary life and that 10^6 joules per square meter will cause a catastrophic life extinction event. They take 10^5 joules per square meter as their threshold for lethal gamma ray intensity and use this value, together with modeling of GRB probability and intensity, to estimate the impact of GRBs on the sustainability of planetary life during the evolution of the galaxy.

They have computed the probability of having more than one lethal GRB per 10^9 years to be about 95% if the star is two thousand parsecs from the galactic center (about 25% of the Milky Way's stars are closer than this), about 50% if the star, like our Sun, is eight thousand parsecs from the galactic center (about 90% of the Milky Way's stars are closer than this), and about 20% if the star is two thousand parsecs from the galactic center, at the outer edges of the Milky Way.

The geological record indicates that there have been at least five major extinction events during the evolution of life on Earth. Piran and Jimenez speculate, based on these numbers, that at least one of these was probably due to a lethal gamma ray burst from within the Milky Way. For GRB events at distances greater than fifty thousand parsecs,

there is essentially no danger from gamma radiation, so the other members of our Local Group, e.g., Andromeda and the Magellanic Clouds, pose no threat to life in our galaxy. The implication is that, although most of the stars in the Milky Way are closer to the galactic center than is our Sun, there is a low probability of finding Earth-like life in that more densely populated region of our galaxy due to the higher frequency of extinction events. The Earth seems to be in a preferred location.

Piran and Jimenez also consider what constitutes a friendly neighborhood for life elsewhere in the Universe. The best places are regions where the galaxies formed rather late, are large and diffuse, and have a high metallicity (at least 1/3 that of our Sun). They conclude that the galaxies we observe with a red-shift factor z greater than 0.5 (i.e., galaxies about 3×10^9 years older than ours) would be unlikely to harbor life. Such galaxies have higher stellar density and lower metallicity, and in these the LGRB events will always be sufficiently near to any Earth-like planet as to cause frequent extinctions. Thus, life in the Universe may have become possible only relatively recently, in only the past few billion years of the 13.8 billion years that the Universe has existed.

There remains the question of how the occurrence of extinction events is connected to the evolution of life, and particularly intelligent life. Clearly, extinctions are not good, *per se*, but I argued in a previous AV column ("The Pump of Evolution," AV-11 in the January 1986 *Analog*) that the evolutionary record, as characterized by "punctuated equilibrium," suggests that occasional extinction events may jar embedded species out of entrenched ecological niches and promote

positive change and species improvement. However, the "pump stroke" of extinction events must be at an optimum rate. The extinctions cannot be too severe or occur too often, or there will not be sufficient time for recovery, evolutionary development, and repopulation.

The Fermi Paradox, the question of why, despite optimistic Drake equation estimates, we have been unable to find any evidence of intelligent life elsewhere in the Universe, is not completely answered by the realization that much of the galaxy and the Universe are hostile to the development of life. There are still many suitable stars in the outer reaches of the Milky Way, some better protected from LGRB than is the Solar System. However, the work of Piran and Jimenez adds another constraint on the evolution of life, and contributes another element to the growing realization that the Earth, the cradle of the only life we have so far found in the Universe, is a very special place. We really need to take better care of it. ■

SF Novels by John Cramer: my two hard SF novels, *Twistor* and *Einstein's Bridge*, are newly released as eBooks by the Book View Café co-op and are available at: <http://bookviewcafe.com/bookstore/?s=Cramer>.

Alternate View Columns Online: Electronic reprints of over 174 "The Alternate View" columns by John G. Cramer, previously published in *Analog*, are available online at: <http://www.npl.washington.edu/av>.

References:

"Possible Role of GRBs on Life Extinction in the Universe," Tsvi Piran and Raul Jimenez, *Physical Review Letters* 113, 231102 (2014); arXiv preprint: 1409.2506v2 [astro-ph.HE].



Illustrated by Karla Castaneda

Tumbling Dice

Ron Collins

Side One:

Jupiter Kelly, better known to most as “Jupe,” was the shooter when the love of his life stepped onto the smoke-filled floor of the Starshine casino (the Starshine being the most notorious of the casinos in the Nellcote Resort, a station in geosynchronous orbit around Artoga, the fourth planet of the Luytens system).

He felt her even though she came in at his back.

There was this link between them, pure and simple.

She breathed, and he exhaled. She moved, and he felt the heat. It was like they talked without their mouths ever moving. Like they fit.

He got these things sometimes, you know? Sensations. Hunches. Numbers that

crystallized clear as deep space. Never about a woman, though. Before Kaatji came into the Starshine, Jupe always figured the Universe held two kinds of women—ones who played the games, and ones who played the players. He respected the hell outta the first and tried to get the hell outta the way of the second.

So, when he felt her that night, his first thought was: *How is it, after all this time, after all the dives, and after the all-too-few nights in penthouse suites, after bars and bookups in the weirdest damned nooks in the Universe, after gambling with Garredine in the Oort cloud, and running with the Pasi gang on Vega three, after almost hitching my wagon to that firebrand in the Draconis asteroid belt, after all this, how is it that I'm just getting to know there's a third kind of woman?*

The idea almost froze him.

Almost brought him to his skinny-assed knees, because while Jupe Kelly was actually a good man at heart, he most definitely was also a skinny-assed man, a man of few needs who was used to sleeping anywhere he might need to, and used to getting out of town in ways he hadn't planned. He was also a man the Galactic Gaming Commission had put on their "Last Play" list, which meant that—as he had been so kindly informed by three Mendaash security flunkies—his money was welcome, but if he was ever caught doing anything strange on the floor again he would be summarily put out of pretty much everyone's misery.

The GGC cares about guys like Jupe Kelly because guys like Jupe Kelly come into places like this carrying baggage no one can see. They care because they've got their reputation to uphold. Just like other folks care, too, like others with big reputations and bigger bankrolls than a weak asteroid like Jupe Kelly could ever manage to come upon all by his lonesome.

Turned out, being a Lister was fine by Jupe because it served to add a grain of risk to the mere act of walking onto a floor, which was like honey to his bee. It was the kind of danger that got his buzz on.

She crossed the room and stood next to him like he knew she would, the smell of her drink all lime and tonic. She was slim, and slinkily like Vegans get when they grow up on

a planet with a bit lower gravity than most. Her skin was tinged to the red side of purple at the shoulders and to the blue side as his gaze slid down her arms. She wore bangles that revolved around her like planets and shined light on her from every angle.

"What's your name, baby?" he said, barely able to get the wind out.

"Kaatji," she said.

And the moment the waves of her voice pushed against his sensitive eardrums was the moment Jupe knew beyond any doubt that there wasn't a damn thing that could touch the two of them when they were together. They were a binary pair, atomic particles connected by forces strong and weak and strange and charmed, they were stronger than nature herself, they were the dream and the dreamer.

It was as much truth as Jupe needed.

And those dice, they burned in his hand.

He kissed her then. It was a kiss he would be drowned for, a kiss that would make him mutiny, a kiss that said she would be the death of him. But he didn't care. That's the thing about men like Jupe and their dreams. It's the chase that does it. The dreams happen or they don't, but men like Jupe don't care because it's the chase that matters.

So he kissed her, and he rolled the dice, and they came up his point on a pair of threes that paid off for two guys playing their six-the-hard-way bets, and then he was off on a run like he had never been on a run before, on a tear, a jag of monumental proportions. People were cheering and clapping, and Kaatji, she was sayin' he needed to "kiss me quick" before every throw, and he was blazing a trail as hot as an M-Class star gone nova.

And the money. Ah, the money. Thousands of Galactic Gigs rolled in, red chips and green, blue chips and black. It coulda been X-Ray cash, as far as Jupe cared, though. Coulda been infrared. Micro-effing-wave. It was all invisible to him.

Meant nothing.

He had done the other thing before, you see. He once had the wife and the car and the house with a view of twin moons. He once had the steady job that paid whether he did anything or not, paid enough to breathe, anyway—enough to make him need to come back for more, but not

enough that he could actually live. Sucked his soul, he said some nights after he had too much scotch and not enough water, sucked it drier than a desert.

He saw Kaatji's tell a mile away, of course.

You can't be around as long as Jupe Kelly had and still miss the way her eyes slid past the dark-skinned woman who came to the other side of the table dressed in black as dark as her skin and trying so hard to be ignored. Deuces were wild, he thought, and when the lady in black started laying bets right with him, then started playing more odds behind those bets . . . well . . .

He'd been rolled a time or two before.

Fool me once, baby, and it's on me. He wasn't planning on being fooled twice.

And the full truth was that even *before* the lady in black came to the table, Jupe had felt Kaatji change the dice out. It happened during that first kiss. He couldn't for the life of him figure out how she pulled that trick off, but it happened right there in his hand, and all he could say was that he felt it in the dice themselves. Something subtle, something deep, maybe something subatomic—he wasn't a nuclear physicist, though, so how would he know? But facts are facts, and the facts were that she pulled a move that was slick as ultra-fine oil, and those bones were different now.

Will they play? his eyes asked the first time Kaatji wrapped her pearlescent fingertips around his hand and blew her minted breath over his knuckles. *Will they pass scans from the pit bosses and the composite monitors and the base weight checks programmed into the very tables themselves?*

Jupe knew about the sensors, after all, and the sensors knew about him.

Her eyes sparkled, telling him she didn't *know* the answer. Not for sure, anyway. They said Kaatji was here to find out.

Didn't matter, though.

Because the adrenalin in that gaze was like sex amplified by a billion. It was an electric bolt mainlined down his spine, the most kick-assed, quantum-constant icing on the cake. Ever.

She kissed his knuckles, and his knees nearly buckled. The sharp edges of the dice bit into his palms. Only one way to live, he thought as he watched the dice tumble.

Only way to live.

Side Two:

Kaatji's plan called for the man to be just another deadbeat from some distant world, here to get blasted and complain about the river of money that kept running through his hands.

But this man didn't feel like a deadbeat.

He was tired, sure. He had seen better days. His shirt was untucked, his collar torn and frayed at the edges. He was a man who had lost everything, probably more than once, but there was still something inside.

He had, for example, *known* she switched the dice.

Maybe it was the time shift, maybe it was the scrub from the stasis field she flipped before the swap. It didn't really matter how he had done it, though; what got her attention was the fact that he had done it so easily, so naturally, and that he had done it with barely any reaction at all. The man kissed her like nothing she had ever felt before, too, and he threw the dice even though he knew *something* was different about them.

She liked the way his eye glittered. She liked how his lip curled before he threw the bones, how he opened his hand to let her blow into them, and how he grinned as her breath turned into the whistle she was using to change the program. She liked how he rattled the dice, she imagined herself as one of them, rolling around inside his hand, her carbon juggling its internal coherence, altering its center of gravity to bring up the numbers her program called for.

So, yes. He had her interested.

But Kaatji couldn't lie to herself. She knew the look of instant attraction in Jupiter Kelly's eyes. It happened everywhere she went. It happened with the Kendarian jumper driver, happened with the humans in the jumper cabin. Just as it had happened with Delvari. She couldn't stop it. She couldn't help being coveted, couldn't help being adored. It just happened. And in the end, she found the "always on" switch was at least as lonely as "always off."

Why are you here? she would think as she stared into yet another set of admiring eyes. *Why should I trust you? Why, of all the people in all the worlds, should I think you are*

the one who loves me for who I am rather than simply because my quantum perfume has given you a constant emotional hard-on?

Fuck it.

That's why she waded through life alone. And that's why she played the wild girl, why she left men and women (and the occasional other) in her wake like so many used socks. Sure, the wild-girl thing could be fun at times, but it was hard to maintain. She did it because, while everyone loves a crazy girl for a night, doing something outlandish, doing something crazy-stupid every day, well, it let the clingers—the sloppy-tongued puppies who stuck by her side like addicts, but who were so clueless about who she really was—it let them see her slinking away as preordained. It kept them from missing her, kept them from thinking the problem was theirs—which was all for the best.

She still remembered Leila, poor dead Leila, who had been the last to overdose on her.

She couldn't stand for that to happen again.

It was lonely life, though, this wild-girl thing.

That's why she was here, after all.

She was going to change herself, was going to fix things, she was going to find something in the very molecular structure of her being she could tweak to make her stop releasing this wavefront of pheromones, or to stop creating this electric field from her nervous system, or whatever other thing the doctors said might be firing her constant come-hither beacon.

She was so close.

Her black-market lab was able to adjust molecules now. She could change the physical properties of things with a preprogrammed command. That's how she was adjusting the dice rolls, of course. With some more lab time, she might be able to turn this thing inside her off. With maybe just a few million more Gigs, she might be able to be normal.

But she was flat-out busted now.

So if you get the idea that Kaatji was at the Starshine that night because she needed the money, you're figuring it right. And if you're thinking she knew in advance she would need help to pull it off, you are once again on the right path.

So she took Delvari in. Delvari, who was a programmer Kaatji was working with. Delvari, who knew what she was doing, and who was young and beautiful and impressionable. Kaatji hadn't had a friend for a long time, and Del had been so sweet and sincere in her approach that for a while Kaatji had convinced herself that Del actually wanted the real her. She knew better now, of course. Delvari was a scientist at heart, more interested in the mechanics of realtime material management than anything Kaatji brought to the table.

It was fun while it had lasted, but the truth hurt Kaatji as much as their eventual separation would gnaw at Del.

She was thinking about that when Delvari stepped up to the table, just like they had planned.

Jupe had seen their game before, inside out, enough to make you sad. He could tell it was a game by the way Kaatji and her girlfriend ignored each other.

He should probably be mad.

Should probably have just put her off to the side and focused on the game.

Screw it. Kaatji was different. Kaatji was overwhelmingly, smotheringly *different* from every other woman he had ever known.

He wondered about their game. What were they doing? How were they doing it? The lady in black carried calmness about her like it was a blanket. She moved with stealth, made bets in silence, occasionally slipping in an odds wager. She did not drink, and she smiled with something Jupe took to be irony as she raked in her money.

Yes, the lady in black was behind it all.

She was also In The Way.

He came to this conclusion over a period of two hours—roll after roll, after roll, after roll. The table was buzzing by then, and it was buzzing even harder when the run was still alive another hour later. By that time, Jupe was getting uncomfortable with the stares from the pit boss. He knew it was all coming to an end, though, when he hit his point eight, and, rather than keep playing, the woman in black picked up her chips and stepped away.

Four rolls later—after just over three standard hours, and one-point-two million Gigs—

Jupe Kelly crapped a yo-leven coming out, and it was over.

He received a standing ovation and a Casiopeia Mai-Tai toast. "I'll meet you in the bar, baby," he told Kaatji as he went to the cashier's counter.

"I'll be there."

He knew she would be, too. The 1.2 MegaGigs he was going to be carrying around didn't hurt, but mostly he knew she would be there because they were destined to fly together. No doubt in his mind.

Then he received the visit he had been expecting from the moment he first rolled Kaatji's dice.

They took him to the back room.

"Mr. Kelly," Yanton Xe Den, the casino manager, said from behind his desk. "Please sit down."

They proceeded to have a discussion about odds and runs, and the impact that cheating might have on Jupe Kelly's long-term health, during which Xe Den proved to be quite comfortable with the use of threats. He also proved to be adroit with numbers and history, informing Jupe that only fifteen such runs were on record books at casinos around the galaxy. But the most important thing Jupe learned was that Xe Den was upset because no one could finger him as a cheat because they couldn't figure out how Jupe Kelly had done it.

"You know what will happen if we discover anything," Xe Den said.

"I just rolled the damn dice," Jupe replied.

After nearly forty-five minutes, Mr. Xe Den received a full analysis of the dice he had used as well as a high-level briefing of the scanning systems reports, and finally kowtowed to the idea that, yes, Jupe's winnings were legit.

"Where would you like your money?" he asked.

"Certified voucher."

"I'll have the draft prepared."

"Any chance I could take the dice? Sentimental value, you know?"

"I don't think that would be wise."

"It would speak well of the Starshine. Good for the public image, right?"

Xe Den sighed. "I'll have them sent to you."

Jupe stood to leave, then paused to set his hook.

"You might take a look at the lady in black who was at my table, though."

"And why might we do that?" Xe Den was obviously interested.

"Saw her playing cards afterward."

"And that would be a problem because?"

Jupe smiled, and shrugged. "Just sayin'," he said, stepping away, and knowing what happened to people a Lister suggested might be cheating. That's what you get when you play with the big boys, though.

He picked up the voucher at the cashier's counter, then found Kaatji at the bar and waved the key to the penthouse at her.

"Wanna see the stars?" he said with a smile.

Kaatji was anxious as she mixed a pair of drinks. She liked Jupe, but she wanted the money. No, she thought, one-point-two million Gigs bought a lot of research. She *had to have* the money.

The suite was beyond impressive, though. It was set into the shell of the station and had walls that rounded upward like a bowl. Its ceiling was a dome made of crystal that made the room feel like being in a clam shell in one way, but it also made her feel small, as if she had a front-row seat to viewing the galaxy, which, Kaatji figured, was probably true enough.

"Come here," Jupe said.

She turned, handing him his glass.

He put it on the edge of a wheel of fortune sitting on the low table beside the net screen, then motioned her to put hers on the opposite side. Once both were stable, he spun the wheel slowly, watching her reaction as he did so. She saw his lack of trust in that gaze, she saw he was testing her to see if she had dropped something in his drink. Not that she could blame him. In fact, seeing his guard go up made her assess him differently. She liked it, or at least she *wanted* to like it. It meant he was fighting her, didn't it? It meant he could control his body.

Or, was she just clutching straws? Did she want someone to be interested in her for anything beyond the obvious so badly that she was seeing patterns that didn't exist?

Stop it, she told herself. Keep your mind on the job.

Jupe stood up and arched his back, looking out into the stars. He put his arm around her

waist, and turned her so neither of them could follow the glasses as they spun down.

He motioned to the stars.

"Where have you been?" he asked.

"Nowhere, really."

He smiled, then spent considerable time pointing out star systems he had been to. His stories flowed together. They were gritty stories, mostly, drinking stories and gambling stories, and stories about chases and short-time jobs. But she liked the tone of his voice, and she liked when he spoke about caverns on one planet and a river full of red algae on another. When he was done, picked up both glasses, and handed her one.

"Time to play another game?"

The liquid burned her throat.

"You planning to tell me about the dice any time soon?" he asked.

For a moment, she thought that maybe she *should* tell him. She *wanted* to tell him, wanted to trust him. But that was insane. She hadn't even known Jupe for a full day, and none of those stories screamed "trustworthy."

She kissed him, then.

Jupe thought it was in the drink, of course. But the drug was in her saliva, it was in her touch. She kissed him as much to keep him from talking as to administer the dose. It hurt her to think of him waking up alone and broke, like a million other men had done over the history of space and time, but she knew the score going in.

He laid her back on the bed, and they did their thing.

As they finished, her thoughts rubbed against him like they were another part of her body. He smelled like sand and reminded her of the beach on Carraway Island, lean and raw. Then she was standing and staring up into the stars, and thinking about the world, thinking about opportunity and dreams and a lack of limitations that seemed suddenly not so impossible. She wobbled, though. The drink had been strong, and she hadn't eaten anything for a long time.

"Looks like you got the lucky number, baby," Jupe said with a shit-eating smile she could hear more than see.

"I didn't put anything in the drinks."

"It's all right, baby," he said, sitting up. "I see you got something going on. I won't hold

nothing against you before you get to know me."

He put his hands behind his head, and his eyes closed slowly. His words sounded like his tongue was made of rubber. The drug was coming on.

"I don't know what you girls did with the dice, honey. But it wouldn't have mattered. We wouldda won anyway."

His voice was fading, but his words played on her mind.

I see you got something going on. We wouldda won anyway.

It sounded silly, but Kaatji knew he meant it. If only it were all true. If only he actually understood what he was saying.

"But . . . shit," Jupe said. "I'm jush shhhow happy to find ya now, baby. Jush shhoow happy . . . we're gonna be great . . . sweetie. You'll see."

The right side of his face stopped moving, and the truth dawned in his eyes.

"Whadda hell?"

"I'm sorry," Kaatji said as he faded away. And, if she were speaking openly here, she would tell us how troubled she was to discover she actually meant it.

It's just better this way, though, she thought as she gathered up her clothes and the few other things she needed, and she gave Jupe Kelly one more glance before she slipped out of the room. It's just better this way.

Side Three:

Jupe Kelly had never *needed* much of anything before—never taken much from anyone, never really cared about making anyone else happy. But he needed Kaatji. He needed her touch, needed her senses wrapped around him like her legs had been wrapped around him the night before. Yes, that's right. For the first time in his life, Jupiter Kelly actually wanted something, wanted *someone* badly enough he was willing to fight the very tides of the world for them.

So, when he woke up and found the money was gone, it didn't bother him much—he never could keep a Gig much past moonset, after all.

But when he woke up feeling like a hot poker had been jammed into his heart, and with his head pounding like it was being hit

with an effing sledge hammer, and with every cell in his body feeling like it was effing ready to effing explode and thinking that if this effing explosion happened he just hoped he would leave an effing rain of molecular goo on the entirety of the spacescape above him, well . . .

That hurt.

He screamed in the dark.

He ripped the sheets, and he crashed the table, and he sent the wheel of fortune spinning madly across the room. He threw bottles. He turned over nightstands, and he kicked the bed hard enough he probably broke his toe.

This called for Drastic Action. It called for the biggest, most dangerous bomb in the most overstocked arsenal in the Universe.

He didn't care if he got toasted for it. Didn't care if he fried. Screw it if it blew up in his face. The lady in black, he thought, panting like a beast—this woman from the Vega system who had set the whole thing up—she was going down. Then Kaatji would be free.

The only arsenal a man like him builds, though, is the truth and a set of connections a parsec long, and even though it felt like he was holding the butt end of a ninety-gauge Gamma gun, he hooked to the Q-net, and he dialed up the biggest blaster he had, pulled on a connection so bold and audacious he nearly wet his own pants just thinking about it.

"Hogie, buddy," he said to the chief snitch of the Passi family, the meanest, baddest crime gang in the entire Vega system. "I got a line you need to hear, man."

"What's it on?"

"A woman cheating a casino to the tune of maybe two MegaGigs."

The connection got quiet.

"You there, Hogie?"

"Shoot," the man finally said with enough greed on his voice that Jupe could see him wiping his grimy sleeve against his drooling little chin.

It was an ugly enough image that he might have been repulsed if it wasn't for the fact that a moment later, he was staring at a star he had pointed out to Kaatji and remembering the way her heartbeat rose as he described it.

Kaatji. Kaatji. Kaatji.

The name rolled around in his head.

I'm making odds, baby, and I'm laying my last bet on you.

Side Four:

The Passi family picked Delvari Kash-al up at the jump station and took her back to their haunts in Vega. Rumor has it that they pulled this and that out of her, but still could never find much about anything past the eight hundred KGigs she had cashed out, which, if you did the accounting like the Passis did, left about 1.2 MegaGigs unaccounted for.

They cared, you see, the Passis; they cared about the reputation of their region. They made their living by knowing what goes down in their sector, and when an atomic engineer from their home turf goes rogue, well.

Let's just say losing the money wasn't the biggest of Delvari Kash-al's problems.

But this isn't Delvari's story.

So we pick it up with the image of Kaatji walking in the desert. The morning gave way to midafternoon, and it grew hot inside the station. It was dry enough that her feet kicked up a rough cloud of red dust as she walked through the Desert Romp, a touristy area full of fake cactus and prefabbed lizards that was built to attract the family types. She was headed back to the hotel, tired and limping with the results of an ankle she was stupid enough to turn as she ducked out on Delvari.

Vendors called to her as she walked, just as vendors did every time she walked any street in public. "Come on, baby," they said. "Come on over here." She felt the heat of their stares. A woman came to Kaatji and ran a finger down the side of her face. She jerked away and kept walking.

It was draining, you know, so draining to be always on.

And she felt the weight of the voucher, too, that 1.2 MegaGigs tucked down in her brassiere strap like it might be just a simple grocery slip. So she walked with her limp weighing down one side of her, and the voucher like a block of cement weighing down the other.

She had a conscience, too, of course.

She didn't want any of this.

Leaving Del to the Passis hurt her in more ways than she wanted to admit. But she was

point where self-sacrifice was ever going to be her way. She was a survivor. She'd come too far to give any quarter now.

The sound of a jumper came down the line as if it might be drawing up next to her. It's a low sound, like a rock rubbin' on down to her soul. Hundred-to-one it was Jupiter Kelly because, you know, when it rains it pours.

Sure enough.

Jupe turned the jumper around and rode slowly beside her. She limped farther.

"Hot, i'n't?" he said.

"I can make it."

He pulled the dice out of his pocket, realizing then that everything about life is about chance. Everything. Even the old times before he went to the street. It was pure chance he met Moll back then, and the act of getting married and settling down was chance that followed that. What if she'd said no, after all? She could have. And it was chance that he couldn't hack that life, and (for the first time ever) he wondered what the odds were that Moll would have decided to join him on the road if he had actually had the decency to ask. Slim. Certainly slim, but not zero. Who knew what woulda happened then, eh?

Chance.

It was all chance that brought him and Kaatji to this very place at this very time.

He held the dice up again, propped between his fingers.

Kaatji came to a stop.

"You broke my heart, darling," he said.

"Sorry about that."

"I'm over it now."

"Well, that's a first."

He stared at her. "I can't get a line on you, Kaatji. I mean, I'm thinking about you and that other girl and the dice, and I don't see the angle."

"I don't have an angle."

"Now you're just flat-out lying."

While she remained silent, Jupe considered his own lie.

He *bad* figured an angle—the dice themselves. He just couldn't see what she had done to them, and why. But he had seen the expression on her face as she looked into the stars, and he understood that the veneer of casualness she wore like a badge of courage

was just that—a veneer. She wasn't the wild woman she put on. She lived with risk, but she accepted it like a sentence rather than owned it as a dream. Inside that veneer Kaatji was a woman who wanted something bigger out of life, and he wanted to know what it was.

"I can help you," he said.

She pulled her hair away from her eyes.

"No, Jupe. You can't."

"Willin' to try."

"Wish I could know that was true," she said.

"Maybe just we let your dice decide."

He opened his hand, showing her the dice Xe Den had delivered to his room just before he checked out.

"What's the game?"

"Over/under seven. I win, we run together for a bit, just to see."

"What about the money?"

"It's best we burn that either way. And it's probably best we get about as far away from Vega as possible. Sorry about that."

She sighed and squinted against the fake sun. She figured that's what was going to happen. The money was gone, and staying out of the way of the Passi clan meant she wasn't going to be able to keep working with her current group of blacklist scientists in the home system. Maybe she could convince a few to move worlds.

Maybe.

Jupe leaned closer to her. "This isn't really about the money, is it?"

The pain in her eyes went deeper than he wanted to admit seeing. She chewed her lip and seemed to come to a conclusion.

"I roll. You call," she said.

Jupe dropped the dice into her hand, feeling the heat of their closeness, but not touching her. He wasn't sure he could handle it if they touched.

"What do you call?" she asked.

"Over."

Anything over a seven, and he was a winner. Under, and he was alone again. But he knew one thing for certain now—this roll of the dice was not going to land by chance. He had seen Kaatji's mind turning, saw her making decisions, saw her run her eyes up and down his face as she talked to him.

He knew Kaatji could call the number.

But he thought that maybe, Kaatji just needed an out, a way to fool herself into letting him stay, or at least a way to let him *think* she hadn't decided to connect to him all by herself. A way to remain aloof and unconnected, yet still *be* connected.

So he waited while she shook the dice.

The dice were sharp in her hand, and the weight of Jupe's gaze was heavy as the heat. When she agreed to the wager, she had every intention of rolling her six and being done with it. A clean cut heals best.

But, the moment she shook the dice, these thoughts went through her brain:

Screw her body chemistry, what if she had actually found someone who would give up everything for her? He was a good man, or at least an interesting one. What if she actually deserved someone now?

And, in another part of her brain she thought:

How was this fair to him? With him drawn to her by his base instinct, with his body chemistry floating on hers like a lifeboat in a storm?

And finally, she thought:

What would happen when she found the answer, what would happen if she got

herself good and fixed? Would Jupiter Kelly still want to be with her?

And, yes, that entire thought went through her brain in that one split second because this is the kind of brain she had.

It would be so easy.

Roll less than seven she was free and clean. All she needed to do was execute the series of whistles that would set the program.

She looked at Jupe, sitting in his jumper.

She wanted so much to trust him.

Maybe that was a truth about life or love. Maybe you never know anything, maybe you just decide to trust, and only later find out what's real.

Kaatji threw the dice, then.

Without blowing on them, without whistling, without setting a program, Kaatji threw the dice across the jumper's cowling.

The dice clattered against the wind screen as if it was the wall of a table.

The numbers blazed in the sun.

Jupe grinned. Kaatji lowered her gaze for a moment, then looked out where the horizon should be.

It was a pair of fives.

Ten.

The hard way. ■

Dreams of Spanish Gold

Bond Elam

He sees her standing alone on the quay, her fists jammed deep in the pockets of her windbreaker. The salt spray gusting in off the whitecaps carries her auburn hair back across her shoulders, leaving a pale sheen that sets her skin aglow. But it is her eyes that hold him. They glisten like emeralds in the gray morning light: hard, impenetrable, fixed on the purple clouds billowing up from the horizon.

He has no idea what she's thinking, what inner disquiet has brought her here to the edge of her world; but something in her face, in the intensity of her gaze, resonates with synapses deep within his neural circuitry. For more than a thousand years, he has watched over the people of his enclave. He has seen their lives flare candle-bright, then sputter and fade. He understands the chemistry of their emotions, the interplay of hormones and neurotransmitters. But standing there, seeing the longing, the desperation, the emotions he can't identify in her face, he realizes that he understands nothing of what it means to be human.

If asked—if the people of his enclave still remember that his kind even exists—they would say that his silicon circuits are

incapable of human feeling, that he lacks a human soul. But why, he asks himself, would his creators have given him the vision to see what he cannot touch, the intelligence to ponder what he cannot know? Why would they have entrusted their flesh and blood progeny to his hands, only to deny him the knowledge of who and what they are?

Once asked, the questions shimmers like a flame before his eyes—taunting him, calling to him, demanding an answer.

It is a simple matter to override his programming and link into the dream logs for his enclave. He understands that this is a violation of his ethical protocols, but he tells himself that he has no choice, that only by diving into the fiery heart of the flame does he have any hope of finding the knowledge he seeks.

His search leads to Rebecca, the lithe, auburn-haired beauty he has seen standing on the quay. Drawn like a caterpillar to a world it cannot yet comprehend, he begins his metamorphosis, transforming his appearance to that of the dark-eyed stranger she pursues each night in her dreams. Then, as he rides his motorcycle up the old coast road, he gives himself a human name and buries all

knowledge of his true identity so deeply within himself that even he can retrieve it only under the most dire of circumstances. By the time he pulls into the cliffside cafe where Rebecca works, Jose Maria believes himself nothing more than a stranger from the south, a wanderer in search of adventure.

"I thought I'd work construction out on the causeway," he tells the waitress. "Maybe dive for treasure on weekends."

Her auburn hair shimmers in the sunlight, swaying with every movement of her shoulders and hips.

"Don't believe everything you hear," she says. Only half listening, she doesn't bother to look up from the pad on which she writes his order. "Those stories about Spanish gold are nothing but stories."

"You don't think there's any gold out there?" He glances out at the breakers rolling in from the horizon.

"Dreams," she says. "Nothing but old wives' tales to lure foolish boys out past the reef."

He smiles up at her with a lopsided grin. "Everybody needs a dream. That's what makes life worth living."

"Maybe," she says. She tilts back her head and wipes the dampness from beneath her chin. In the light glinting in off the waves, the delicate lines of her cheek and jaw glow like sculpted ivory. "And maybe they just break your heart."

"Looks to me like you're the only heart-breaker around here," he says.

Finally, her green eyes focus on his face. A smirk slowly spreads from the corner of her pale lips. "Guess we know what kind of treasure you're looking for."

Three nights later they make love in the old house that Jose Maria rents on the bluffs north of town. Afterward, Rebecca stands in the darkness beside the lace curtains, a slender, starlit silhouette gazing out to sea. As he comes up behind her, the breeze lifts her hair to reveal the golden butterfly tattooed on her shoulder.

"I used to dream I was a butterfly," she tells him as his fingers trace the outline of its wings. Her voice sounds distant, like the rush of waves against the sand. "On nights like this, my mother used to tell me how my father sailed away on a ship with billowing purple sails. I would dream that I could fly out across

the water and find him no matter how far the wind carried him."

The next morning Jose Maria buys her flowers. "For the *mariposa*," he tells her, giving the butterfly a name only they will share. "Nectar to give it strength. So it can fly as far as the wind will take it."

When the nights turn hot, he takes her to the carnival on the pier. She wears a sundress with bare shoulders and a skirt that swirls around her legs when she turns. As he watches her dance across the weathered planks, his eyes fix on the *mariposa*, and he imagines the two of them gliding on the wind above a starlit sea.

But his are not the only eyes that watch her. From the edges of the crowd, he sees the smoldering eyes of the young men who slouch against the rail. Chests bare, shirts unbuttoned against the heat, they follow Rebecca's every twist and turn, drinking in the moonlit flame of her hair, the translucent glow of her skin.

Jose Maria asks her to cover her shoulders, but she complains of the heat. She holds her chin high, spreading her arms to catch the sea breeze. From the shadows the young men's eyes trace the contours of her body, watching as the wind presses her dress against her stomach and thighs. Jose Maria glares at them, wills them to look away; but they refuse, and all he can do is stuff his clenched fists into his pockets.

Each night that he and Rebecca return to the pier, the young men are there. They drink beer from paper cups and whisper to each other from the corners of their mouths. Jose Maria tries to ignore them, but their eyes have ignited a spark in his belly, a smoldering flame that burns through his veins. Then comes the night that he waits in line for one of the Italian ices that provide Rebecca's only relief from the heat. Glancing through the crowd, he sees one of the young men standing close by her side. He is talking with his eyes narrowed, his lips twisted in an insinuating grin. Rebecca laughs and throws back her head, allowing her auburn hair to flow into the wind as the young man's eyes glide down her body.

Jose Maria forces his way back through the crowd, but by the time he reaches Rebecca's side, the young man is gone.

"He was no one," she says. "Just some boy from the cannery. Why are you getting so upset?"

Afterward, Jose Maria convinces himself that he has overreacted, read too much into a chance encounter. But two days later he sees Rebecca riding through town on the back of the same young man's motorcycle.

"He was just giving me a ride home," she says. "Besides, you don't own me. I can talk to anyone I want."

The cold undertone in her voice freezes his features in a brittle grin. "But you said he was no one. I thought . . ."

But she has already turned away, her shoulders rigid as she gazes out at the waves sliding in beneath the overcast sky.

On his way home, Jose Maria tells himself that he is pressing too hard, that he needs to give Rebecca more room. Lost in thought, he doesn't notice the young men from the pier standing in front of the pool hall until one of them cups his hands and hoots like a crow. Turning, Jose Maria sees them on the far side of the street. Rebecca's new friend—the man he has come to think of as his rival—stands among them. As Jose Maria's pace slows, they nudge each other, watching for his reaction.

Something in Jose Maria's expression arouses the ire of one of the men. He breaks away from the others and starts across the street. Rebecca's friend grabs him by the shoulder, jerks him back. There is a quick exchange of words, the possibility of blows. Then they all begin to laugh, and their eyes turn back to Jose Maria. The sudden move was nothing but a feint, a ploy to frighten him. They are laughing at him—all except his rival. He watches Jose Maria with an amused smile, as though he has already won a contest for which Jose Maria has yet to learn the rules.

Jose Maria says nothing to Rebecca about what has happened, fearing that she will think him intimidated, unsure of himself. But then, two nights later as they danced on the pier, he again hears the hoot. Turning, he sees the young men from the pool hall drinking against the rail. They snicker to each other as their eyes flash in his direction.

"It's nothing," Rebecca says when she sees his attention diverted. "You shouldn't let them bother you."

"They don't," he says. He tries to act indifferent to their presence, but he feels their eyes on his back, feels them laughing at him.

The next morning, as he wanders along Front Street, he sees a used pistol for sale in the window of a small shop. He doesn't enter with the intention of buying, but when the wizened proprietor sees his interest, he pulls the pistol from the window and shows it to him. "For self-defense," he explains with a sly leer.

Jose Maria hadn't thought he needed a pistol, hadn't thought himself in that kind of danger; but looking down at the stubby barrel, feeling its heft in his hand, he imagines the smile fading from his rival's face when he lifts his shirt to expose the pistol's ivory butt. "To hunt crow," he'll tell him with a leer of his own.

Only afterward does he realize that the pistol is a mistake, that if Rebecca finds out he purchased it, she will think him afraid, intimidated. Ashamed of what he's done, he hides the weapon in an upstairs bureau drawer, resolving to say nothing.

Despite her protestations that the young man from the cannery means nothing to her, Rebecca begins finding excuses not to see Jose Maria. As the summer wears on, he finds himself spending more and more evenings alone, walking by himself on the beach. The moonlight glinting off the waves reminds him of her dark silhouette gazing out his window. In his mind's eye, he sees her hair lifted by the breeze, and he imagines the two of them gliding out over the dark water on golden wings.

At first he avoids the pier, but one night, drawn by the music and laughter, he finds himself walking along the weathered planks. Oblivious to the crowd, his mind fills with memories of Rebecca turning beneath the lights, her arms outspread, her skirt rising to reveal the lean curve of her calves.

The images in his mind are so intense that when he first sees her standing with his rival beside the rail, he thinks his eyes are playing tricks on him. Spellbound, he can only watch as his rival pushes back her hair and leans down to kiss the golden *mariposa* on her shoulder. Rebecca tilts back her head, allowing her hair to stream behind her in the salt air. When the young man looks up, his eyes meet Jose Maria's. There is no reaction, no sudden surprise—only the same amused smile Jose Maria has seen outside the pool hall.

Jose Maria starts toward them, but the crowd swirls around him like a rising tide. Jostled this way and that, he feels himself drowning in the crush of voices, the laughter, the acrid smell of human sweat. Unable to breathe, he turns and pushes his way back into the night.

The next morning, he confronts Rebecca at the cafe where she works. "You said he was no one. You said he was nothing but a boy from the cannery."

"You had no right to follow me," she flares. "Besides, my father worked in the cannery. So did my mother."

"But you said your father was a sailor. You said you dreamed of flying out over the sea to find him."

She laughs derisively. "Those were nothing but stories. My mother made them up after he ran away. Like dreams of Spanish gold."

The sun glinting off the water fills her hair with light. He feels as though he is sinking beneath the waves, drowning as she ascends on the wind. Her green eyes gaze down at him, but they don't really see him. They have never seen him. What he thought he saw in their depths was nothing but illusion, a reflection of his own hopes and dreams.

Devastated, he stumbles from the cafe. Somehow he finds his way back to his house

and up the stairs to his bedroom. Pulling the pistol from his bureau drawer, he stares down at the blue steel barrel. He feels its weight in his hand and imagines the fear in his rival's eyes as his finger tightens on the trigger.

But is it really the man from the cannery he wants to kill? Or is it Rebecca? She is the one who has lied to him, the one who has misled him, who has discarded his affections like so much chum washed up on the sand.

Only when he lifts his eyes to the mirror does he realize it is neither. Not her and not her new lover. It is himself he wants to kill. Seeing his eyes in the mirror, he knows that only with a bullet to his own brain can he escape the humiliation, the shame, the terrible inadequacy he now feels.

Slowly, he raises the pistol to his temple. As he cocks back the hammer, the click echoes like a tripped switch somewhere in the back of his mind. Suddenly a door opens and a torrent of memories surges up from within him. He stares at the gaunt hollows of his cheeks, the hot desperation in his eyes. Behind him, he sees the same lace curtains fluttering in the breeze. He hears the same waves crashing against the beach. Nothing in the world has changed—nothing except himself; for now he finally understands what it means to be human. ■

Ashfall

Edd Vick and Manny Frishberg

The N-bees—the natural bees—had been the first to detect the eruption, and the first to suffer the consequences of the ashfall. Emma Guthrie slumped in the caravan's driver's seat and looked glumly out the window, ignoring the television's nattering about the eruption, ignoring her husband Jay's futile pacing in the too-small rear of the vehicle, her son's tapping at the screen of the controller for the robo-bees. Not ignoring the plight of the N-bees, the poor insects that crawled in confused spirals or tried to fly in the gray downpour of ash flakes.

Just before Lassen had blown a quarter of its rim into the sky like a blender with the top off, the N-bees that weren't out in the orchard swarmed in angry clouds over their hives. Then came the explosion, almost two hundred miles north of them.

Even with the prevailing winds headed east, toward Lake Tahoe and the northern Nevada desert, they'd realized some of the ash cloud would be blown southwest, where the itinerant Guthries had just finished setting up their hives to pollinate a grove of almond trees.

Zeke sent a shutdown command to the R-bees first thing. There was no controller for the natural bees, of course, though a few confused the gloom for nightfall and returned. The family had gone out and covered the hives with blankets, sheets, a tent, tarps, whatever they could find, leaving openings

for returning bees to enter. Emma feared they were going to die, all of them that weren't in the hive. And with their deaths would come the demise of the Guthries' business.

"Jay," she called, "we ought to get going in case the winds shift and carry all that ash our way."

"That'll be tough. It took us two hours to unload; it'll take at least that long to pack up again. We'd have to leave the natural hives behind. Plus, we owe the Marquands. I don't know what we can do for them, but they're facing a total loss for sure if we run. It's bad, but we have to weather it and hope we can get some pollinating done tomorrow."

They looked out the window at the rows of almond trees, blossoms erupted like strings of popcorn adorning the branches, now dusted with choking ash. They had to weather it in place, because otherwise they wouldn't get paid. Otherwise they'd have to sell the R-bees—which were only partially paid off—and the caravan—which was a piece of crap—and settle for McJobs. Or declare bankruptcy *and then* settle for McJobs.

The TV faces turned fuzzy and the sound scratchy, so Emma got up to turn off the set. She opened the caravan's side door and peered out through the screen.

Ash drifted down through the branches of the dwarf nut trees like large snowflakes, accompanied by the strange hush Emma

remembered from snowy days when she was a child. Only these flakes were like down coming to rest on the ground. They sat there without melting. Not snow. She noticed several R-bees whirr by. One stopped to hover, then circled a large flake.

An hour later new ash had stopped carpeting the area. Emma stared at the world turned into a black-and-white movie. Branches and flowers drooped like life-size marble sculptures in a monochromatic vista of an almond orchard.

No point crying about what you can't help, she repeated from her Sunday School lessons. *Help with what you can and leave the rest to God.* But what good did trusting in God do for her family and the bees they kept right now? Was He about to suck up all this gunk like Superman with a giant Hoover?

God didn't work like that. The calamities, He could mete them out by the bushel in a dead minute. But the good—that had to wait, He'd take his time and handle it through the good works of ordinary folk. *So who the hell needs Him?* she thought. *Just like a man.* Laughing made her feel better as she watched the fine dust swirl around the room, settling back into the same coating as before. She couldn't help looking out every once in a while.

Emma stepped out to take a closer look at the eerie scene. Zeke and his father huddled around the computer, watching the reactivated R-bees' activity sketched in multicolored lines on the monitor.

The R-bees went about their business as if nothing had happened. Many natural bees were grounded, their trails unknowable hieroglyphs ending in smothered or dying insects. Other N-bees flew around in all directions, passing close to a branch but not alighting on any of the blossoms. A light breeze sent wisps of pale soot drifting around before dissolving into the ashen backdrop.

One bee landed on an almond petal and began exploring its surface for a way inside. The shaking unleashed a puff from the flower above it, and the ash settled on the insect. Emma laughed. It looked like a ghost bee, like Zeke had looked the year she sprinkled flour over him in a poverty-stricken attempt at a Halloween costume.

She did not laugh for long. The poor bee could not take off with its wings coated with

the fine, clinging ash. It flapped them desperately, and some, but not enough, of the powder came off. It gave Emma an idea. She puckered her lips a few centimeters from the stricken insect and puffed gently. Dust swirled off the bee's body, and it lifted into the air. Half a dozen R-bees broke off from what they were doing and came to circle around the disabled N-bee.

Emma could see several other bees struggling under similar burdens. As they moved from flower to flower, liberating the natural bees that had gotten stuck, Emma noticed more and more of the R-bees abandoning their normal tasks.

A few of the R-bees took off on their own and located a bee with ash sifting down onto it. They surrounded the natural bee and hovered as close as she had ever seen them fly to each other. In a moment, the R-bee posse dispersed, and the natural bee flew away. Emma made a mental note to ask Zeke if he'd been fooling with the R-hive's heuristics engine again.

Only a few of the natural bees had gotten themselves trapped on the flowers, so the work of freeing them was accomplished and the R-bees returned to normal activity. The N-bees, meanwhile, were not acting normally at all. (*Though Lord only knows what's normal for bees to do in the midst of all this ash*, she thought.) They flew around one another, forming clumps of bees, touching antennae, communicating scent messages.

"Must be something awfully important for you to be talking out here in the air instead of back in the hive." Emma imagined the bees that had been trapped by the ash warning their sisters not to land on the flowers. As if the bees could be that smart.

Zeke stared at the tracings on the computer screen, his father standing over his shoulder. Several R-bees showing erratic patterns had been recalled to the hive. He had seen this kind of behavior before. It usually meant there was important news to send to the queen, like an attack by a predator. One, though, after flying near one of the malfunctioning R-bees, docked on a communication port instead of heading to a recharging station as usual.

Zeke tapped a red designator, and a box opened up with the R-bees' last fifteen minutes

of flight appearing as squiggly, color-coded lines, the tails disappearing as they formed virtual knots on the screen. A cold hand reached up through his spine and pulled at the top of his skull like tightening purse strings.

"These lines were all wrong," he said. "The R-bees were not following their preprogrammed routes." He waited for his father to answer, before turning around to find no one there. He returned to the screen. The R-bees seemed to be moving deliberately to where their sisters had congregated, circling in tight swarms that moved here and there with no apparent goals. Zeke had grown up watching the familiar flow of the R-bee's search patterns and the direct flights traced out on the computer monitors. As he got older, he treated the R-bees like his own personal video game, reprogramming the queen, the robo-hive's central processing array, to make the worker R-bees form interesting patterns on the monitor. His father had a cow the first time he caught Zeke doing it.

He felt a chill run down from the crown of his head, run all through him, and out his fingers and toes. This was the absolute worst time in the history of the universe for his tinkering to have really screwed things up. Now he'd taken things to a new level, wirelessly connecting the queen to a cell phone app he created for the purpose—a second processor that interacted with the queen's neural net and chose the most productive pathways to transmit to the workers. He reasoned that this might improve the entire system's efficiency. He had become much more cautious of late, making multiple mirror backups before he delved into fiddling with the queen's heuristics programs. He could just delete the app and restore the queen to its last saved condition—no harm, no foul.

Except it wasn't working that way. He tried to close the app, but as soon as it shut down, it blinked back to life. The queen apparently liked the feedback too much and had decided to keep it. *Except that's just ridiculous.* He tapped again. Translucent letters began scrolling on top of the flight-path map.

Lines of code scrolled up the screen in pale green type, racing so fast they threatened to dissolve into a blur of jagged lines of light. Zeke could pick out some of the lines as they whizzed by—enough to realize not all of them

emanated from the queen CPU. The R-bees were engaging in multipath communications, like a primitive neural network.

His first inclination was to shut the system down, power down the hive at its source. Deprived of instruction sets from the queen, the R-bees would circle about for a while before their homing circuits kicked in and they swarmed back to their hive. Or at least that's what they had always done before today. At this point, Zeke could only guess what they would actually do under these circumstances. The directionless R-bees could just fly off wherever the wind carried them, and the family would lose their livelihood. He couldn't be responsible for his parents being relegated to McJobs because he couldn't keep himself busy in more productive ways.

"Zeke." He hadn't heard his mother enter the caravan. He froze, hands hovering over the keyboard. "What are you doing to our bees?" She sounded as frantic as he felt.

"The R-bees have been acting really strangely," he said, willing the defensive whine out of his voice with limited success. "Just look at the display." He leaned aside to let her see.

"What have you been 'teaching' the R-bees, Zeke?" He could hear the quotation marks in her voice.

"I . . . uh." He breathed heavily. "I made a hard drive partition and installed a virtual machine to evaluate bee behaviors in the vid feeds the workers send the queen and cycle the best of them back through to the workers. But I backed up the system first," he added when he saw his mother's stare darken. "And it was supposed to get permission anyway before it sent anything out to the workers. I'm not an idiot." Zeke wished he believed *that*.

His mother studied the computer display for a minute, her face frozen, forbidding. She backed up the timeline to scroll through her time outside watching them, a frame at a time. Finally, her expression softened, to Zeke's relief.

"I don't know whether your tinkering's had anything to do with that—and I'll cane you raw if you even think about doing anything like that again—but this may just save us, after all." She played the R-bee tracings for him and described watching the R-bees' clean ash off their natural counterparts.

"Damn," Zeke said. "Hot *fucking* damn," he said, excitement overcoming discretion. "They're talking to each other. They're teaching one another—or that's what it looks like. I've seen the natural bees doing stuff like that in the hive. But I haven't taught them how to share like that." It was a way cool trick, and that they'd learned it because of his idea-evolution engine, that could be *really* important.

"I'm glad they're saving the bees. I really am . . ."

Zeke looked up at his mother. "But?"

"But that's only half of the problem. What we need to do is get the natural bees back to their hives, to get them to stay there until these trees can be cleaned." She bit her bottom lip. "I wonder, is there any way you can get the R-bees to talk to them? Or herd them?" She shook her head. "Never mind; I'm getting desperate."

He sat back, thinking while he scrunched first his left shoulder, then his right, up to his neck to relieve tension. His mom's words niggled at his brain. It came not as a flash of light but a flood of joy-filled endorphins. The queen had come factory-equipped to process visual information from the workers and run them through pattern recognition. They were sent back to National Robo-sect headquarters, and the best were sent back out as patches. That was the subsystem he had exploited to make his alterations.

Now he'd taught the queen to do the evaluating herself. And the question his mother had naively asked—that answer seemed obvious now, too. *The queen thinks in pictures. Get the queen to look at the problem.* He told his mother what he had come up with.

Together, they brainstormed what pictures they should send to the queen to get the problem across. Pictures of the ash-covered flowers and N-bees, video of an R-bee blowing ash off another one, archive photos of pollination from their last job. Zeke was unconvinced that order would matter much, the way he understood the programming. His mom, on the other hand, was adamant about the order making all the difference and, since he didn't think it would matter anyway, he played along.

Then they watched the screen.

Unit 1354 showed on screen as a silvery blue line making small squiggles as it circled

close by the Bluetooth repeater set between rows of almond trees. It began making wider circles around the repeater, seeking sister robot bees and recruiting them to come listen to the repeater. Seven, then an eighth R-bee flitted around for a few moments, then the lines straightened out and stretched off to the right in tight formation. They arrived at their presumed destination and hovered in a vaguely star-shaped formation. A few beats later they reassembled and flew to a nearby point to repeat the cycle.

Emma went to the window. Clusters of R-bees hovered around several blossoms on one branch of a single almond tree. The small puffs of ash clouding around them swirled in the warm afternoon air, some drifting back onto the flowers or the R-bees themselves, but leaving the flowers clean enough to see the white of the petals shining all around the remaining spots of gray. When one of the R-bees collected too much ash on its wings or body, it settled onto the nearest surface and waited while its sister robot bees blew it clean.

As they flew from one branch to the next a few of the R-bees encountered others that had not picked up the new behavior and split off to fly with them for a few moments before going back to their own cleaning crew. Emma watched from the doorway as one flew directly over its fellow R-bee, brushing its body with its own wing tips, floating up to avoid the puff of dust from settling back on its own back.

"You see what they're doing?" she called excitedly. Zeke watched the display on the computer showing the same thing in schematic form. Number 1354, the blue line on the display, flew directly over (or under, it was difficult at this resolution to see which color was on top) one of its fellow R-bees, merging its path with one showing up as a bright red tracer before they both flew up and apart.

"More'n that. The R-bees're not just getting the new programming, they're passing it along, teaching one another. And another thing," he added. He spoke as though the words would dissolve in his mouth if he didn't get them out quick enough. "When some of the workers get too bogged down by the ash, the others know to come help them."

"You make it sound like they're thinking for themselves."

"Well, what else would you call it?"

Thinking for themselves. They're just robotic insects, barely enough processing power to do their jobs. But then, didn't she think exactly that about the real bees? So, what about all the times she'd watched the incredible complexity of the natural beehives?

Emma had been watching bees her whole life and read every book she could find on social insects. She loved the ways these simple, brainless creatures cooperated with each other to build their nests, feed their fellows, and care for the drones and the queen. She delighted in how bees kept their hives cool by gathering in large groups, flapping their wings in unison to improve the air flow.

It always had seemed to her that they exhibited some sort of hive-mind. She shied away from talking about it, though. Jay had a straightforward mind, always going for the clearest, most direct path from a problem to its solution, and if it was a tried and true one, as he said, all the better. Jay liked crossword puzzles and logic problems, games with simple rules and right answers. But he didn't have time for open-ended puzzles that had no logical path to an unequivocal solution. He called them idle speculation.

She looked over at her son, leaning into the computer screen, engrossed in following the various colored lines as the blossom-cleaning order filtered through the hives of R-bees. He had her sense of imagination and wonder, she thought, straightening her shoulders and allowing herself a little smile. *He's got his father's straight-down-the-line way of thinking, too,* Emma told herself, and the smile grew to a grin.

"What if they start thinking for themselves and just stop doing what we tell them to?" Actual worry invaded her voice.

"Why should they, Mom? The real bees—the natural colonies—don't do what they're told, but they fulfill their role just fine, don't they? Even if the R-bees start thinking for themselves, what else are they going to do besides pollinating the fields? They're bees."

Jay stared at the display in shock, his wife and son hovering over his shoulders after they'd explained what the bees were up to. R-bees busily entered and exited the hive under its card table canopy. Nearby, natural bees were mostly just returning to their hive under a darkening sky the setting sun was turning the most amazing reds and oranges.

"At this rate, they might actually be able to pollinate most of the orchard tomorrow, if we don't get any more ash before they finish," Jay said. "Hell, we could go around and have the R-bees clear other fields when we're done here. Write our own ticket." He scrolled back to find reports of aberrant behavior, refusal to follow standard protocols. Hands poised over the keyboard, he paused. Smiling, he turned to his family.

"Looks like the R-bees know what they're doing," Zeke said. "Any commands we give them now'll just likely mess them up."

"If they'd even listen," Jay said. He meant it as a joke but no one laughed. It sounded more reasonable than funny.

"I want to send them a message," he said. "How do you say, 'Thank you for caring?'" ■

Moving the Earth

Robert Zubrin

The Sun is becoming about 10% hotter every billion years. If nothing is done to deal with this problem, our planet could become uninhabitable in just a few billion years!

But what can we do? One suggestion might be to modify the Sun, to keep it from heating up. But no one has any idea of how to do that. Fortunately, there is an alternative plan which should be much more practical to implement; move the Earth. Our home planet is, after all, only about one-millionth the mass of the Sun, much cooler, much closer, and thus, overall, much more readily available for manipulation. Furthermore, since solar heating falls as the square of the distance, to cope with a 10% solar flux increase, we only have to increase the distance of the Earth by 5%. This will make things much easier.

So let's see what it would take to move the Earth outward from the Sun by 5% over the next billion years, thereby compensating for increased solar heating. A little bit of fancy math shows that to do this, a velocity change of 1,200 m/s will need to be imparted to our home planet. That works out to an acceleration rate of 1.2 microns per second per year, or 3.8×10^{-14} m/s².

Now, the mass of the Earth, as everyone knows, is 5.97×10^{24} kg. As force equals mass times acceleration, to get the thrust needed to accelerate the Earth at the required rate, we just multiply the above two figures together and obtain thrust = 2.27×10^{11} N, or 227 billion Newtons. That's really not that much when you think about it: it's the weight of a cube of water 284 meters to a side.

So what kind of rocket could be used to generate that amount of thrust? A Saturn V had a first stage thrust of 33.4 million Newtons, so thrusting together, 6,796 of them could do the job. Making that many rockets should not be a problem: the Germans produced over 4,500 V2's during 1944 alone. Unfortunately, however, it's not so simple. Because the average exhaust velocity of a Saturn V first stage is only about 3,000 m/s, to generate a velocity change of 1,200 m/s would require using about a third of the mass of the Earth as propellant—and that's just for the first billion years of operation! Clearly we need to use a rocket with a higher exhaust velocity.

So let's consider electric propulsion, which could readily provide an exhaust velocity of 60,000 m/s. That would reduce the mass requirement for propellant twenty-fold, meaning

we would only need to sacrifice about 2% of the mass of the Earth every billion years, an amount that most people would hardly notice. With such an exhaust velocity, the propellant mass flow required to feed the rocket system would only be about 3,780 metric tons per second—the equivalent to a modest river 120 meters wide by 30 meters deep, following along at a leisurely 1 m/s. To be sure, the power requirement would be sizable: about 13,620 terawatts, which is to say about eight hundred times the current power production of the human race. This may sound like a lot, but if we consider that human power production has increased by a factor of ten over the past hundred years, we can see that at our current rate of growth, in just five hundred years we will have enough power available to be able to undertake this project, with only 1% of our total power-generating capacity needed to support the job.

So how might we engineer this? The Earth is spinning, after all, so if the rocket were just put in one location it would only occasionally point in the right direction. (NASA will eventually discover this to be a serious problem for their planned Asteroid Retrieval Mission, which hopes to use an electric propulsion system to tow a five-hundred-ton no-doubt-tumbling boulder from the Near Earth asteroid belt to lunar orbit. But I digress. . . .) So I suggest that we use twelve rockets and put them in geosynchronous orbit, spaced thirty degrees apart—like the numbers on the clock—around the Earth. Each of these rockets would be connected to the Earth by a (super strong and heat-proof) tether, and only fired for a period of time in which most of its thrust vector would be in the desired direction. In addition to transferring the thrust from the tow rockets to the Earth, the tethers could also act as sky-hook cable systems, facilitating the transport of propellant from the Earth's surface up to the tow rockets. The materials to create such cables do not currently exist, but believers in nanotechnology assure us that they will, in the relatively near future, and we don't need to start operations for another five hundred years. So really, there is not much technical risk involved in the design.

If we wanted to eliminate the problems associated with tethers, upward propellant transport, and geosynchronous rockets, we

could put the system on the Moon, which is gravitationally bound to the Earth. We would need to increase the exhaust velocity by at least another factor of ten in that case, since otherwise we would use up the mass of the Moon as propellant. This would also require increasing the system power a hundredfold; ten times to maintain thrust at the higher exhaust velocity and another ten because the Moon would only be located in the appropriate thrusting zone for about one-tenth of the time. As a result, the project would have to be delayed another two hundred years to get started to provide an adequate power budget, but given how development and certification schedules work in the space program, we are likely to have the time, regardless.

Of course, we could make things even simpler by using a photon rocket, which uses the momentum of light beams to exert thrust, and thus has an exhaust velocity of three hundred million m/s. In that case, we could put the propulsion system on the surface of the Earth, and just shine the light upward in the direction opposite to the intended acceleration. This would eliminate the need for any propellant, or orbital propulsion systems, but as a result of the increased exhaust velocity, our power requirement would increase five thousand times over that of our orbital electric propulsion system baseline. Instead of 13,620 terawatts, we would need 68 million terawatts. But in the year 2914, such power capacity should be well in-hand, and for the sake of convenience, spending a little extra on electricity may well prove to be the preferred option.

Now, as original as this discussion may seem, it has undoubtedly been entertained before. There are hundreds of millions of habitable planets in our galaxy alone, and the residents of nearly all of them are facing this very same problem. The laws of the Universe are the same everywhere. As above, so below. If we are going to need to do this someday, many others elsewhere are probably already doing it now. Might it be possible for us to spot them? What would a 68-million-terawatt rocket's exhaust look like, if pointed directly at us, by people trying to save their planet located in a star system many light years away?

The power output of our Sun is about 3.85×10^{14} TW, or about 5.7 million times the power of our planet-moving photon rocket. Of

course, the rocket will be focused to point just in one direction, so if we assume a gain of one thousand in apparent power by such focusing, the photon rocket would be 1/5,700 times as bright as the Sun. That's about a difference of nine stellar magnitudes. Now, if seen from ten light-years away, the Sun would be about a 2nd magnitude star, so our planet rocket would be 11th magnitude, and readily visible using a good amateur telescope. But there are only a few stellar systems within ten light-years, so we would have to be really lucky to spot one so close. But there are over twelve thousand stellar systems within one hundred light-years. That would drop the apparent magnitude of the planet-moving rocket to 16th, about the brightness of Pluto's moon Charon as seen from the Earth. While beyond the capability of all but the most dedicated and well-equipped amateurs, there are many professional-grade telescopes that could spot such an object. Of course, such a rocket flare

would be positioned close to a star, which would make it harder to spot, but it would still be thousands of times brighter than an Earth-like planet—or even a Jupiter-like planet, as seen from interstellar distances, so if we can spot one of those, we should be able to spot one of these. The trick, however, will be to catch it when it is pointing at us, which will only be for a brief period of time during each orbit, after which we will have to wait a whole planetary year to catch it again and prove reproducibility of the event. But with enough time and effort, it should be possible.

So take that, ETs! If you want to save your planets, you'll just have to show yourselves.

About the author

Dr. Robert Zubrin is president of the Pioneer Astronautics, and the Mars Society www.marssociety.org, and author of *The Case for Mars: The Plan to Settle the Red Planet and Why We Must*. ■

IN TIMES TO COME

In our September lead story, Captain Nick Ames is a pill even when it comes to his friends; when he has to chaperone the pampered son of the magnate who owns his ship, folks should expect a powder keg. Just how volatile is the situation? Find out in "Racing to Mars," by Martin Shoemaker.

We also have pieces by Norman Spinrad, Maggie Clark, Alvaro Zimos-Amaro, and of course, the second installment of Stanley Schmidt's "Night Ride and Sunrise"—just because Phil has met the Zoyes doesn't mean he *understands* the Zoyes, but he's going to have to, and fast, if he hopes to stave off the danger starting to rear its head . . .

See you back here next month, for all that and our regular crop of columns.

All contents subject to change

Delivery

Bud Sparhawk

"Something's wrong," I complained over the phone to the number on the packing slip. "I didn't order eight rolls of toilet paper."

The box had been delivered an hour earlier, somewhat larger than expected because of the extra tissue among the other items I'd ordered. I was certain that had not been one of the items I'd keyed in.

"I apologize, sir. It might be a mix-up because of the new ordering system. I will take the charge off of your account."

"Should I send them back or . . ."

"No need to do that. I'll just mark it off, and thank you for your call."

The morning news was filled with politicians screaming at one another over a dozen different international disputes. It seemed that the amity of recent years was fast dissolving as the economy tumbled. I sighed. This had happened before and, as usual, would blow over within the year. I doubted it would affect me.

Elizabeth came home to have lunch with me. "Oh, I'm so glad you remembered to order the toilet paper," she said when she saw

the rolls on the counter. "We're nearly out, you know."

I debated admitting that I hadn't remembered and then thought better of it. "Someone needs to keep track," I said and got a kiss in return. I promised myself that I'd call the store and have the charge put back on our account. It would be the honest thing to do.

"It's the new software we're running," the person at the other end of the line said. "It runs some sort of algorithm against previous orders to see what you are ordering. Neat routine—helps us fill orders more quickly and reduce our stocking costs at the same time."

"So that's why I got the toilet tissue?" That feature would probably prove useful. "I guess it will take care of my future grocery list."

"More than that, sir," the cheerful agent replied. "The new software monitors all the orders you've placed; books, clothing, recreational gear, and anything you might have bought online. It uses that pattern to anticipate your needs."

"Uh, that could be embarrassing." I thought of a few purchases I'd rather Elizabeth didn't know about.

"The software is really good," the service agent went on rhapsodically—clearly a man enamored of his new toy. "The developers are continually improving it. Why, just yesterday they tied it into the weather-system feed so we could prepare for snowstorms, floods, or even sunny weather when people might have swimwear needs."

"That might be handy," I said. "What next? Are they going to access the news channel feeds and predict the winner of the next election?"

"Analyzing the news is certainly something we're planning," he answered breezily. "Just part of our service improvement, sir."

I had to admit that the flow of goods into the house improved. Within a month, I was getting half of the items on our grocery list without having to key them in. Within six months, we received boxes of all our normal groceries without having to order them.

Elizabeth was ecstatic over the thoughtful anniversary present she received and which I didn't admit to having forgotten, again. Somehow the provisioning software had analyzed our buying patterns, accessed our wedding date, and selected a piece of jewelry that would please her.

I started to fall in love with the miraculous system that showered such bounty upon us.

Elizabeth was late getting home. "Everybody left early and clogged the roads," she said. "Some sort of political blow-up in Europe."

"I hope we can stay out of it this time," I answered. There was little hope for that. Given the way the global economy had evolved everybody got involved, willingly or not.

Elizabeth kicked off her shoes. "The bank was closed again today—third time this week. Something's up."

Other things followed as the software became ever more sophisticated. A pair of fur-lined gloves arrived just prior to the worst cold snap of the year. A set of replacement filters for the heat pump beat the warranty date by one day, and the bag of cat litter was right on time.

But it wasn't just purchases. We got regular reminders to fill the gas tank, pay the water bill, and even tip the man who picked up the recycle bins.

It was wonderful. We were finally living in a bright future where all our needs were satisfied with little effort on our part.

It started to feel like Christmas morning when the next present would be opened. I could hardly wait for the delivery truck to arrive to discover what the system anticipated, what needs we were unaware of but would most certainly want met within a very short time.

The only bad news was that the political posturing had become increasingly heated. Planes were in the air, ships at sea, and overhead the satellites watched.

A shipment arrived out of sequence, which might have been strange had it not been for the national unrest that seemed to be causing delays and disorganization everywhere. There were daily reports of riots in distant cities, a rising national crime rate, and some international saber rattling. It seemed that little else was mentioned on the news channels.

The box was larger than usual for just our weekly groceries, and heavier, too; it took two men to bring it into the house and deposit it in the kitchen. I signed the sheet and waited until they were gone before I opened the box.

Inside were two backpacks, camping gear, hiking clothes, maps, a book on survival, two handguns, a rifle, and ten boxes of ammunition. ■

Cease and Desist

Jay Werkheiser

Davey sighed and paused his TV show. The doorbell rang again, somehow sounding more insistent. He sighed again, peeled himself from the couch, and brushed potato chip crumbs from his shirt.

He opened the door a crack. "What is it?"

A man stood on his porch, looking as stiff as his suit collar. "I'm here to serve you with a cease and desist letter from my client, Mr. David Keeler."

"I'm David Keeler."

"Right. The letter is from the future you. Didn't you read about the new time travel devices?"

"Saw it on TV. Wait, future me?"

"Can I come in, Mr. Keeler?"

"Davey." He sighed and opened the door all the way.

The lawyer stepped in, glanced at the grease-covered couch, and continued to stand. "The letter states that your eating and, uh," glancing down at Davey's ample gut, "exercise habits are injuring my client and that you are to cease immediately."

"Hey, I ain't hurting nobody but myself—"

"Exactly."

"Harrumph." Davey crossed his arms over his gut. "I can eat whatever I want."

The lawyer rifled through his attaché case. "My client already knew you wouldn't comply—"

"How'd he know that?"

Raised eyebrow.

"Right."

"So he filed a complaint in federal court. Here's your summons."

Davey found a lawyer at the local mall. "Didn't your office used to be a shoe store?"

The lawyer, Thomas H. Cromwell, Esquire, squinted at him through glasses thicker than the chocolate bar in Davey's hand. "It might have been."

"Last month?"

"You want a lawyer or not?"

Davey eyed the guy's plaid suit. "I guess so."

"Who's suing you?"

Davey handed him the court papers.

Cromwell held the chocolate-stained papers up to his nose, squinted, and dropped them onto his desk. "I see. What are you planning to do about it?"

"Hire a lawyer."

"Right. Court date's coming up soon."

Davey glared at him. "What do you suggest? Can he, uh, I mean can I really force me, um, myself to eat healthy crap? And *exercise*?"

"That'll be up to the judge."

"Can you stop him?"

"We'll see, now won't we?"

Davey noticed that his eyes, magnified as they were by his glasses, held not even a microscopic glint of confidence.

* * *

The Honorable Linda Livingston presided over the case, which had become a bit of a media circus once Davey—future Davey—had aired his complaint on the talk show circuit. Health zealots, individual rights activists, and just plain whackos dueled with chants and picket signs outside the courthouse. Davey slouched in his seat next to his lawyer, trying to be invisible.

“Your honor,” Cromwell said, “I move to dismiss this case.”

“On what grounds?”

“On the grounds that you have already ruled in my client’s favor.”

The judge frowned. “What makes you say that?”

“Because there have been no other suits from the future, which means that in the future you have already established precedent against such cases.”

“Objection,” future Davey’s lawyer said. “Courts in the future have ruled that no such case may be filed before this point in time so as not to interfere with this court’s ruling.”

“Motion denied.” She turned her attention to future Davey’s lawyer. “You may present your case.”

“The David Keeler of this time is causing direct harm to my client. Further, his habits violate the Healthy Eating Act of 2024 and the Fitness Act of—”

“Objection,” Cromwell said. “Those laws haven’t been enacted yet.”

“But they have for my client.”

The judge tuned her steely gaze on Cromwell. “Well?”

“Erm . . . the actions weren’t illegal when my client committed, um, is committing them. *Ex post facto*.”

“Agreed.” She turned her attention to future Davey’s lawyer.

“But surely it’s unfair to expect my client to work with laws that are decades out of date. *Ad ante facto*.”

“That’s not a thing.”

“Not yet.”

“Counsel will only cite law that currently exists.”

The lawyer grumbled. “Okay, perhaps Mr. Keeler’s actions are legal—”

“They are.”

“But they still harmed my client. Reckless endangerment.”

“He’s endangering no one but himself.”

“Exactly. And that’s who is suing him.”

Cromwell sputtered.

Seeing his cushy life vanish before his eyes, Davey stood. “Your Honor, may I say something?”

The judge threw up her arms. “Why not?”

“I know my lifestyle is unhealthy.” He patted his gut. “That I should eat better, and exercise more. But I put in long hours at the fast food place, and I’m tired at the end of my shift, so I just bring a bag home. Exercise? Sure, I tried it, but it takes too much commitment.”

“That’s just laziness,” future Davey’s lawyer said.

“Exactly!” Davey replied. “And it seems I still will be lazy in the future.” He pointed at his rotund future self. “He could have started eating right and exercising at any time. But it was easier to hop in a time machine and force me to do it for him. I’m not proud of it, but that’s exactly who we are.”

“Objection.”

“Goes to the character of the plaintiff,” Cromwell said.

“I’ll allow it. Court is in recess while I make my decision.”

Davey melted into his seat when the judge returned with her ruling.

“This case,” she said, “is about responsibility. Both Mr. Keelers are lazy and irresponsible, to be sure, but I can only judge the present one. I rule in favor of the plaintiff.” She smacked the bench with her gavel.

Davey turned to Cromwell in a panic. “You mean I can’t eat fast food? I have to exercise?”

“Don’t worry,” Cromwell said. “I’ve prepared an appeal of sorts, just in case.”

“Good! When do we file it?”

“About fifteen years ago.”

“What?”

“That’s when you graduated high school, right? Decided not to go to college, sat around watching TV, started working at the fast food place.”

“Yeah, that’s right.”

“So why should you do all the work getting in shape? Let’s make him do it.”

“Yeah!” Davey beamed for a moment, then his smile fell. “Only . . .”

“What?”

“Who’s he going to sue?” ■

The Narrative of More

Tom Greene

Being a Compilation of Fragments Decrypted from the Personal Logs of the Fateful Mission, Unexpurgated and Precisely as Discovered Upon the Arrival of the Deep Space Fleet, 6th Mordad, Anno Impirii 1375 GMR

... gulations be damned; I could not wait. After securing the lander, I stole down to the indigenes' camp. The new ocular implants made every rock and blade of grass plain in the starlight. I walked among them where they lay, huddled in their cloaks of woven grasses beneath the open sky. They did not wake when I approached. Between gentle breaths, the indigenes dream perhaps that they are alone in the Universe. . . .

... hardly daring to breathe, drawing the gentlest fingertip across the forehead of a sleeping youth, a feathery caress that did not disturb his rest. If only my mission here could manage a touch so light.

When sunrise comes I . . .

... small bands scattered over the planet's only populated continent.

Probes proved accurate in reporting that the indigenes are primitive in the extreme. They

build no cities or towns, not even so much as a hut or lean-to. At nightfall, they cast themselves on the ground wherever they happen to be, regardless of the weather. They use only the most primitive tools, digging sticks and hammer stones, which they take up opportunistically, then cast aside when the task is done. They wear no ornaments or decoration, and their hair grows in matted tangles. Perhaps the only object they actually manufacture is the woven grass mat they wear as a sort of cloak or poncho—another enigma in the consistently mild climate of this world.

They are tall and fair-complected, with blue or green eyes and straw-colored hair. They would be handsome except for the filth and minor disfigurements that result from the complete absence of medical intervention. Their eyes are unusually large and wide-set (the divergence of optic diameter is statistically significant, cf. Appendix M39), a feature that gives them a somewhat startled aspect. But they otherwise retain all the morphology of our Terran ancestry. Their hands are strong and long-fingered, which only exacerbates the mystery: Even if all the advanced technology of the original colony

ship was lost, why is the material culture here so impoverished . . .

. . . better part of the first day spent watching them forage. Food in this wilderness is not scarce, but is relatively low in quality, consisting of seeds, nuts, small fruits, greens, and tubers. The indigenes do not cook, hunt, or even scavenge, so calorie-rich foods are unavailable to them. They do not store food, but graze herd-like as they move from one source to another, eating as they go or else secreting food under their grass cloaks, where there must be a hidden pocket of some sort.

It gives an impression rather like a band of Terran apes, though sometimes the way they move about stiffly in their long garments reminds me of a group of senile professors milling about the esplanade, having forgotten what they were doing. . . .

. . . night when you asked me why I was taking the cassock and accepting an outreach mission on a world so remote. Fifty years or more before the borders of the Empire were likely to reach it. And instead of answering, I feigned a calling I did not feel, because I had no answer for you then. But in this wilderness, so open with nothing but black, twisted trees and feathery shrubs, carrion birds and grazers, sleek rodents that hop back to their burrows at the threat of dawn, I feel as if I've had room enough for my thoughts to take shape.

Despite the accolades and laurels that I've won, despite the sacrifices of my family and the cloying promises of the masters at the academy, I had in those last days a vision of the life before me, huddling in some dusty corner of the Librarium, crawling like a myopic beetle over tables of data accumulated by others, searching for the incremental tick in the box of accumulated knowledge that I might add, if I were fortunate, before passing into the dust of the faculty crypts.

It is a cliché of our civilization that we now expect all discoveries to be modest. "Heroism in scholarship is incremental," as Fra Herius used to say. Curse his bones.

But out here, beyond the decadent miasma of our ossified institutions, the age of the scholar-adventurer yet lives, for one with the courage to stretch out his hand and . . .

. . . unusual lexiconic simplicity. Their language is a variant of a Junntar dialect, placing the original colony ship some time prior to the fortieth wave of the Diaspora (cf. Appendix 239g). My memnimplants are consolidating the syntax, and I can already understand their speech passably well.

Like Terrans all over the galaxy, the indigenes' name for themselves translates as "The People," and the name of their planet as "The World." I shall hereinafter use those terms out of respect for their connotations. I call my local band the "Creosote Bush Band" because of the prevalence of Zygophyllaceae forms in their home range. The band consists of approximately two dozen individuals of adult age with half again as many children and four babes-in-arms. I shall make contact at first light, which will be the morning of my second day. . . .

. . . where the band was gathering food, so that they could observe my approach. I feared they might flee, but though they noted with furtive glances, not one of them interrupted his foraging during the several minutes it took for me to close to speaking distance. I spread my arms—showing my open, empty hands in the universal human gesture of inoffensiveness—and spoke.

"Greetings, from your brothers, the People beyond the sky."

Not one of them reacted. Although they plainly had heard me, and it must have been unprecedented to see someone as human as themselves, but in strange clothes and speaking their language with a peculiar accent, they went on foraging as before, only watching me.

"Do you understand me?" I said. "I come from a distant world where people like yourselves live. I come to offer you the opportunity to rejoin the vast band of people from the stars."

Still no response.

"I bring knowledge and objects to improve your lives."

The word "objects" got their attention. Several of them stopped gathering and turned to me.

An adult male called "Juba" said, "Do you have these objects with you?"

I reached into the sash of my cassock and pulled out one of several worthless baubles I had fabricated as gift goods. I held the treasure

up, and the morning sun flashed through its facets. All the members of the band had stopped foraging now and were watching me.

"What will you take in exchange for this object?" Juba said.

"It is a bribe for you," I said.

(Like all the words I had carefully chosen for this first encounter, I was constrained by the limited vocabulary. Since they had no word for "gift," I selected "bribe" as the closest in meaning.)

Juba's face remained impassive, but he took a step closer. "I will accept this bribe."

I held out the gift. Juba moved forward warily, as if he feared I might try to seize him. He crept slowly closer, then made a sudden lunge and snatched the jewel out of my fingers. He ducked away, as if expecting a blow, tucking his prize up under his cloak while moving back to the group.

I removed another bead from my sash and held it out. Another individual—a female this time—repeated the same pattern of creeping forward, suddenly plucking the gem from my hand, and running away with her head down.

At that point, they queued up—without any apparent prompting or communication among themselves—and took turns, even to the children, snatching away the baubles in exactly the same way and concealing them under their garments. Eventually Juba, who had rejoined the queue, came to the front of the line again. So I held up my empty hands and said, "No more."

They immediately and completely lost interest in me and went back to foraging just as before, with periodic glances in my direction.

Not exactly the first contact I had envisioned.

For a time I sat, at a loss, on a rock near the band. Strophius's contact doctrines, all my studies, were no help at all. I would have to improvise.

First, I gestured to a subadult male—"Bato"—to come over to me. He approached—but not too close.

"Do you have more?" he said.

"I already gave you a bribe," I said.

"You most certainly did not," he said. "Everyone else got a bribe, but you slighted me."

(I knew even at the time that this was patently false, but a review of drone recordings later confirmed that Bato received a gift the same as everyone else.)

"Your people don't seem surprised to see a stranger," I said.

He said nothing.

"Do you know anything of your history?" I said. "How your own people came from another place in the distant past? A place called 'Earth' or 'Terra' or 'Tsuchi'?"

Bato considered for a moment, then said, "Give me something, and I will tell."

I sighed and took another shiny bead out of my sash. Several members of the band stopped foraging to watch while Bato repeated his cautious approach-and-snatch behavior. When he had his gift stashed up under his cloak, he looked at me.

"What?" he said.

"You were going to tell me about the history of your people."

"I'm waiting for you to give me something first."

"But I just gave you—"

I broke off. His large, staring eyes seemed strangely without expression.

"You most certainly did not," he said. "It must have been someone else. Do you have more?"

I showed my empty hands. Bato went back to foraging . . .

. . . withholding gifts until after my questions had been answered, I was able to confirm that they know nothing about their past, nor are they curious about it. As far as I could determine, they have no cosmology or legends about how they came to be on this planet, and no interest in hearing the facts I was willing . . .

. . . ver the whole galaxy, the scattered children of Terra show the same instinct to gather at the close of day around a fire. The indigenes here do not use fire, but make shift with a locally common form of bioluminescent fungus—a terraformed descendant of an *Omphalotus* species. At twilight, the emerging sporophores provide a nexus where the band gathers to discourse into the night . . .

. . . joined the evening gatherings, I have learned that the Creosote Bush Band is a community in crisis. Rather than sharing tales or legends, their evening assemblage seems preoccupied with assessing widespread instances of social ill will. Complete transcripts are appended (cf. Appendix KKY78) but I repeat here an excerpt of a typical exchange:

Zotol: "Waba used my digging stick today."

Waba: "I did not."

Zotol: "I saw you with my own eyes."

Waba: "It must have been someone else."

Zotol: "It was you."

Waba: "Who says that it was your digging stick? And anyway Toldan showed me the sole of her foot in the afternoon."

Toldan: "That wasn't me."

Waba: "How can you deny it?"

Toldan: "It must have been Mildal."

And so on. Hour after hour of recriminations and denials, until the fungal "fire" grows dim, and they trail off and fall asleep. I presume that once these grievances are settled, the band will return to norm . . .

. . . woke in darkness to a pair of staring green orbs, the eyes of a large felid carnivore reflecting the starlight, only a few feet away. It crouched with ears cocked in my direction. I was upwind, and it could not have seen through my active camouflage, but its senses must have picked up something unusual, for it watched the spot where I lay. I knew in some intellectual compartment of my mind that, even if it could locate me, it could not seriously harm me. But primate instinct trumps all reason, and I found my faith in the untried combat implants wanting . . .

. . . seized an adult male called "Nubin," who began screaming when the felid pinned him. The other members of the band awoke, but made no effort to assist him, instead merely moving quickly away in silence. The felid dragged Nubin off into the brush, apparently unconcerned with the risks of attacking a group of humans, as though it had taken prey in this way before. Nubin's cries were silenced, and after a few minutes the rest of the band returned to their former places and resumed their rest.

This, then, is no Edenic paradise, free from selection pressure due to predation. If one could teach them even the most basic technology, fire or shelter, the People would need never fear such threats. Yet they have not developed or redeveloped basic human survival tools.

Again, I must ask, what happened here?

In the morning, I traced the drag marks to where the partly eaten remains of Nubin's body had been cached in the crook of a tree. I moved the corpse to sterile storage at the lander. . . .

* * *

. . . the seventh day on which the evening gathering consisted entirely of complaints confirmed my suspicion that the remonstrations are formulaic. Every accusation leads merely to further accusations without any attempt at redress of the original grievance. Furthermore, the complaints are not a localized social disturbance. I crosschecked remote recordings from nearby bands of People and found every group engaged in the same activity. Apparently all the People over the whole World gather in the evenings for the purpose of listing the instances in which they have been wronged by each other, and in turn to deny having done anything wrong and to make further accusations.

I have also confirmed that the People make no pretense that the accusations have any basis in reality. All participants seem tacitly aware that their grievances are just as fabricated as the denials. It seems that these gatherings actually constitute an important ritual activity, though what social purpose it might serve, I cannot fath . . .

. . . haps expected the soaring song-language of the Dunthathi tribespeople, who can carry on a overlapping exchange among fifty interlocutors at once, or the intricate metaphoric weavings of the Lunari-Yoh with their eighteen distinct modes of formal address. Curse me, I would have been happy with the meandering, scatological shanties of the Fistil boatmen with their bawdy tirades and fatuous rhymes. Anything would be better than this endless, repetitive complaining with no resolut . . .

. . . connected with disturbing gaps in the People's language. They seem to have no word for "gift," nor any words for expressing gratitude. They have words for "steal," "sneak" and "lie," but no words pertaining to altruistic exchanges: "favor," "friendship" or "sacrifice."

The utter absence of meaningful content in the People's only social ritual . . .

. . . three weeks now, without progress. They are a people cast adrift from their own history, without the least inkling that their ancestors emigrated from another world, and without the least curiosity as far as I can tell. They have no mythologies that I can discern, and no genuine interest in stories or legends, though they will feign interest quite convincingly if they think there's the possibility of a bribe. . . .

... spend every day with them, they have grown accustomed to me and largely ignore me unless they suspect by my movements that a gift might be forthcoming.

Working from the hypothesis that the People lack mercantile behavior because of the dearth of objects of differential value in their environment, I have begun distributing useful items such as nutcrackers and small knives designed for peeling tubers. They always tuck these items up underneath their garments, and they always refuse gifts above a certain size because, I presume, they are too large to ...

... brought back a painful memory. I sit alone at the end of a long table in the common hall. A group of my schoolmates sits at the other end. One of them is sharing a packet of hocknuts his family has sent from home. They roll the nuts on the tabletop to crack the shells, laughing and talking in the casual way youths do when there are no schoolmasters around.

So effortless for them. How I longed to join. But they did not invite me, and it was a mystery to me how easily they ...

... after day I sit at the edge of the band, watching them forage, ignored except when I offer them bribes. I have a terrible vision that the Fleet will arrive at the end of fifty years and find me still sitting in the dust, unable to breach this wall of indifference.

As much as I might wish, as a scholar, merely to study them, I cannot neglect my duty as a factotum of the Empire. If I cannot befriend them, perhaps I can at least organize them so that they will be prepared for ...

They have pouches!

I fleetingly observed, then confirmed by careful observation, that each of the People has a sort of extended fleshy fold over the abdomen into which they tuck bits of food and the items I give them.

In all the ten thousand worlds, such an extreme alteration of Terran morphology never results from selection pressure alone. It must be a sign of genetic manipulation. The solution to one mystery opens another.

Also, the band has chosen a name for me. They call me "More." It was the word they most often used when addressing me, so they have begun to use it as a name.

* * *

... began the experiment this morning by gathering the band with promises of generous gifts. I defined for them a whole lexicon of new terms such as "headman," "election," and "vote."

The People nodded and said, "Yes, More. We understand." They seemed especially attentive when I explained that the headman would have the power to adjudicate disputes and would receive special privileges.

Then, I gave each adult member of the band a slip of circuit-imprinted polimerex. I instructed them to move off to a distance and whisper to these "ballots" (since they obviously could not write) the name of their choice for headman. The ballot would transmit the votes to my datanet and then decay, to prevent multiple voting. Again, they nodded and said, "We understand, More." So I distributed the ballots and watched the voters move away to exercise their franchise.

The results came back shortly. Every voter had received exactly one vote. Each of them had voted for himself.

They seemed not at all surprised when I told them they had no headman. I defined for them the concept of "nominations." Surmising that open nominations would have resulted in each voter nominating himself, I chose an adult male and an adult female to stand for election. I distributed fresh ballots, the People dispersed to a safe distance, and the results came back shortly.

Roughly half the voters had received one vote each, representing those who had ignored the nominations and voted for themselves again. The remaining voters had not voted at all, inferring correctly that if they did not vote, they could secure the potentially valuable ballots in their pouches.

So I gathered them again, and this time ...

... months of failure, not that they are merely ignorant and could learn to cooperate if properly coached. Nor are they of lower-than-average intelligence, as evinced by their acumen in circumventing my efforts to entice them into cooperative activity.

No, I am increasingly led to conclude that this culture lacks some fundamental human dynamic of cooperation. Not one of them is willing to grant another the slightest advantage, even temporarily, and thus every one of them

anticipates, correctly, that the slightest advantage will never be given by another . . .

. . . not take long to find the missing adult female. Her legs, swollen and blackened, protruded from the underbrush near where the band had spent the night. Her cloak had been thrown up over her head, her abdominal pouch slashed open, and its contents removed. When I uncovered her face, I saw that her throat had been cut down to the cervical vertebrae, nearly severing the head. A scan revealed that the weapon used was one of the knives I had distributed as gifts. Last night, someone lured her out here and . . .

. . . safety code so that all the tools I distributed are, by this time, decayed to dust. They may rob and murder each other if they wish, but I, at least, will not make it easier for them.

I secured the body in sterile storage. . . .

. . . near the edge of the band and logging the local terraformed flora, when I turned and found that a small sampling spoon I'd left on the ground beside me was missing. I saw five adults nearby.

"Who stole it?" I said, "steal" being the only verb available.

All five People looked at me, their expressions revealing nothing.

"If you don't tell me who stole it, all of you will be punished," I said.

Four of the five People immediately pointed to the same individual—a fair-haired male called "Munsa." Munsa, in turn, pointed at one of the other adults.

"Did you steal my tool, Munsa?" I said.

He dropped his arms to his sides. "I did not steal it, More."

I felt a flash of anger. It seemed at the time that he was mocking me.

"Then empty out your pouch," I said.

Wide-eyed, he reached up under his cloak. Out in the dust spilled two small fruits, a handful of nuts, and my sampling spoon. I picked up the tool and held it near his face.

"How do you explain this?"

His large eyes glanced to the spoon, then back to mine. "It wasn't me, More. Someone else must have put it there."

Fortunately, some instinct caused me to hold back, or else the augmented strength of my

combat implants would likely have taken his head off. Instead, my cuff merely knocked him down. I froze. Munsa, seeing my moment of distraction, grabbed his food and scrambled away.

I stood stricken, groping after some explanation for what I had just done. The sampling spoon had no value—my fabricators could produce any number of them in an instant. I moved to a nearby rock and waited for my heart to slow. Munsa had rejoined the foragers as though nothing had happened.

I watched the gatherers and noted again that they did not speak to each other. They never spoke unnecessarily. They never laughed or sang or shared. Their faces were fixed in that large-eyed expression, their bodies stiff.

When Munsa had lied, his body language had given me no visual cue. Some part of my brain had found the contradiction deeply unsettling, and I reacted with instinctive fear and . . .

. . . confirm that, whenever I place an object on the ground and then turn away, it will always have been stolen within a few minutes. The behavior is general across genders and age groups, regardless of the value of the object. The stealing seems so habitual that I have observed individuals moving away from abundant sources of free food—such as a berry bush—to steal a single, identical berry that I have left on the ground and turned away from. Moreover, if I demand to know who stole from me, all the nearby People immediately and unreservedly betray the thief, who will deadpan his denial, and the whole scene plays itself out again without significant variation. I had never observed this behavior before now because, obviously, the People themselves never leave anything on the ground. . . .

. . . makes sense of the lack of material possessions. Why bother to build or make anything when one can be certain that it will be stolen at the first opportunity? Indeed, owning things puts one's very life at risk. . . .

. . . flat, toneless voices, speaking a language that has very little inflection. Furthermore, the characteristic wide-eyed expression hides the People's incisive minds behind a false impression of innocence and stupidity. Even the shapeless garments that function to conceal gestures, all now appear adapted to conceal intentions and mask deception. . . .

* * *

... by the expedient of distributing small baubles with nanosyringes so that, when the People placed the gifts in their pouches, I was able to sample their blood and trace out a proper kinship tree.

At first, I theorized that the People's reproductive habits might be the cause for their apparent lack of interest in matters of kinship. Both males and females are exogamous and will often make long journeys to join a distant band upon reaching sexual maturity, which offsets genetic degradation due to inbreeding.

Furthermore, the People are characteristically feckless in matters of romance. Sexual encounters always begin with the offer of a "bribe"—a term that I learned, to my mortification, nearly always has a sexual connotation. Adults of both genders initiate sexual negotiation with about the same frequency, with some individuals showing the usual preference for same-sex pairing. If the offer is agreeable, the partners steal away into the bushes for their tryst. Not that everyone always got what he or she negotiated for, because the People always try to cheat each other if they can. But successful transactions of one sort or another did occur.

... though children are put out to fend for themselves at a young age, kinship bonds between mother and child must form some foundation for cooperative bonds. Thus I was puzzled when many of the females in the Creosote Bush Band reported it was impossible to know who a child's mother was since, "the man spreads the woman's seed too." This I took to be a superstition, until I compiled the genetic data.

Several of the infants-in-arms were not the immediate descendants of the "mothers" who reportedly gave birth to them. Furthermore, I was able to test several fetuses in utero, both in the Creosote Bush Band and in neighboring bands, and found that approximately half were not the direct descendants of the women gestating them.

I returned to the two corpses in sterile storage at the lander and, through dissection, was able to discover the subtle yet complex alterations (cf. Appendix J89b) by which both genders sequester the germ cells of sexual partners, and then release them—though not apparently consciously—at a later time. The morphology stems from an obvious splice, a heavily modified sequence from the Terran *Septida*, the cuttlefish, that breeds true in all the People. Molecular evidence suggests this

splice entered the population thousands of years ago, very likely during the passage of the original generation ship.

Here, then, is the hand of a genetic tinkerer, as clear as if he had left his signature among the nucleotides.

Someone had a reason for breaking the People's kinship instincts. I must bend all my resources toward locating the landing site of the original...

... not by the time the fleet arrives, the People will be subject to extermination and replacement by a more cooperative population. Their very survival depends on their ability to accept authority and be worthy of trust. After spending a night of turbulent dreams fleeing, with futile leaden steps, from fanciful Cathuri-an "black bag squads" that were coming to get me, I found my inspiration. If kindness and solicitude will not make them cooperate with each other, then I will try brutality and fear.

This morning I gathered the Creosote Bush Band and explained to them that henceforth they will operate under a system of feudal "laws." Instead of each gathering for himself and eating, all would gather and place their forage into a large basket that I fabricated. Then, when the sun reached a certain height, I would distribute the food in my role as "landlord."

As usual, it was impossible to tell how the band felt about the experiment. They all nodded and said "Yes, More, we understand."

Next I chose three large adult males and announced that these would be "constables." I gave each a badge and a whip-truncheon and explained that, rather than foraging, the constables would enforce the "laws." Again, it was impossible to tell how the constables felt about their new roles, but they took the badges and truncheons without objection.

I then walked the whole band to a nearby stand of cherry plum trees that were in full fruit and directed them to forage in the new way. Naturally, every one of them began picking and eating or stashing fruit as usual.

I gathered my constables and threatened that if they didn't enforce the laws, they themselves would be punished. So they began to move from individual to individual, driving first one and then another with lashes of the truncheons, to carry whatever he or she had gathered to the communal food basket.

From the start, the experiment was a complete failure. The moment any constable took his eyes off a gatherer, that gatherer would begin stuffing the plums into his mouth instead of carrying them to the basket. If a constable caught a gatherer eating plums and laid into him with the truncheon, nearby gatherers took advantage of the constable's distraction to stuff their mouths full of whatever they had in their hands. Several People struck on the strategy of moving to the basket with a few fruits as if about to deposit them, waiting until the constables weren't looking, then snatching fruit from the basket and eating as much as they could on the spot. Furthermore, any moment when I was not actively watching, my constables had a tendency to seize fruit for themselves—from the trees, from the gatherers, or from the basket. It would have been comical if it hadn't been so tragic. When the time came for the noon meal, there were only a paltry few plums in the basket, most of the adults in the band were limping and covered with welts, and my constables were exhausted and hungry.

The truncheons were replicas of a Cathurian design, engineered to cause pain without permanent injury, and my constables were not gentle in employing them. I saw members of my band reduced to crawling, whimpering wretches, begging unashamedly for mercy. But I steeled myself and thought of their ultimate good.

For an entire day, I moved the band from one forage site to another, waiting for some kind of learned response to trigger a change in behavior. Yet except for a tendency to discover increasingly creative strategies for malingering, the People responded to my efforts with an exhausting sameness. Although they made every effort to secure more than their share by deception and invested tremendous energy attempting to escape responsibility, they never made the slightest effort to avoid punishment by simply complying with the laws.

In the end, the whole system of hierarchical coercion was even less efficient than the catch-as-catch-can system of individual foraging that the People usually employ. As Master Herigos Minoris demonstrated in his *De Cohercendi*, coercive social organization depends not only on the individual's desire to avoid punishment, but also the threat of punishment as

demonstrated on others. But, having no apparent sympathy for each other, the People cannot be coerced in this way. Only direct punishment of the individual can force compliance, and even then only temporarily.

How can such a society ever be made to change . . .

. . . next morning found two of my constables dead. The corpses still wore their badges and had their truncheons near at hand.

I considered whether to continue the experiment by appointing new officers and fabricating a shelter—a sort of police station that would protect them overnight. Then I reviewed the remote drone record. The first constable was killed by an elder female who crept up on him in the night, wrapped her fingers around his neck and squeezed until his trachea was crushed. Then, after she had slipped away in the dark, one of the constables rolled over and strangled his remaining companion in the same way. Then he lay back down between the two corpses and went back to sleep.

Futile. I relieved my surviving constable of his office, collected my badges and truncheons, and let the People go back to their usual methods of foraging—which they did without admission that anything else had ever happened.

There must be a past here. No descendants of Terra would evolve into this society by a natura . . .

. . . idly browsing the hormonal and neurochemical readings. The data are appalling.

Given the relative lack of outward conflict among the People, I assumed they would have the broadly generous serotonin and dopamine levels that signify a good mood. On the contrary, they all had uniformly depressed serotonin and the high levels of cortisol consistent with a state of elevated anxiety, depression and stress. When I had confirmed with other bands that the imbalanced hormone levels were not just a local anomaly, I ran neurological records of the Creosote Bush Band for several weeks.

Every one of them is suffering from what, in a normal population of Terranoids, would be diagnosed as any of several varieties of clinical depression and anxiety disorders. This appears to be their natural state. The outward calmness of their expressionless faces and bodies hides

the fact that each of them lives in a continual purgatory of terror, uncertainty, and sadness.

The only moments at which the People find some measure of relief are during the evening complaint sessions. The act of listing their imagined wrongs is a kind of group therapy that gives them a momentary attenuation . . .

. . . could not abide another day of watching young Mican trying to chew with his face blackened and swollen to twice its normal size. So I tranquilized him, which caused some consternation among the nearby People. But as with any attack, they merely moved away and watched, still foraging, as I made an incision, drained the abscess, then cleaned, sterilized, and closed the wound. Then I sat beside Mican, protecting him from possible abuses by the other members of the band, while the anesthesia wore off.

When he awoke, he seemed puzzled at first. His fingers probed at the spot on his jaw where the infected tooth had caused him such agony. Then he looked at me, as if making the association. In my heart perhaps I'd hoped—but no. There was no emotion in his wide, dead eyes. For all I could tell, he might have thought me a fool for taking the trouble of saving his life. Shortly, he stood and went back to foraging with the others.

In that moment, I realized that I will never have a friend or companion among the People. I will never have a conversation that isn't an attempt to take advantage of my ignorance or idealism. I will never be able to bestow a trust that isn't accepted with indifference, and then betrayed as soon as there's the slightest advantage in doing so.

I have returned to the lander for the first time since my arrival and renewed my neglected planetary survey. . . .

. . . seismic readings, located the landing site, half a continent away. Rolling green hills mounded over the remains of what were once sprawling rings of exurbs. At the center, the mountainous hull of the generation ship still thrusts its humped back up through the vegetation like the decaying carcass of some colossal beast fallen from the stars. . . .

. . . weeks surveying the ruined metropolis within the ancient hulk. The city and surrounding region, clearly uninhabited since

some period of widespread upheaval . . . heavily scorched by fire. Broken hand weapons and spent firearms. Some mass graves dating from the period of strife lie at the edges of the city. A few were still open when the vegetation began to overtake them. But more commonly, the bones still lie where they fell—except where scavengers have moved them—inside the buildings or sunken among the cobble . . .

. . . breached the control centers and located the data stacks, still salvageable after all this time. They were Junntar people, part of the thirty-ninth wave of the Diaspora. A privately funded colony ship built at the expense of the regime, which ruled a Thales-Starka type 492 stratified/coercive society.

The minority elite successfully retained hereditary control during the millennia of the passage. They landed, and found—like the rest of us—their destination world already terraformed. The city and civilization flourished for centuries, until some upheaval interrupted the record-keeping, and the data abrupt . . .

. . . drunk. My fermenter is primitive, and my tuber grog is somewhat more noxious than the exam punch we used to brew in the washrooms at the academy. But it has done the job.

My drinking partner, beside me at this moment, is the leathery, dried corpse of one of their scientist-kings. Perhaps the last one. We sit in the bunker that was his final refuge, surrounded by his fine clothes and furniture, his empty supply containers and unfired armaments. Just outside this chamber lie the remains of his guards, their weapons fallen from bony fingers, the corner of their chamber blackened by the fire pit where they cooked and ate their prisoners at the end. Stretching out in every direction, like vessels in a vast body, the living chambers of the palace that this once was, bearing the scattered remains of the king's wives and children, their mute skeletons showing little evidence of the violence with which they died. Strangled, every one, in the night by the lithe, steely fingers.

The ancestors of my friend here are the ones who began tweaking the genetics of their slave caste while still in transit, seeking to increase docility and extinguish the human tendency to band together. It was unplanned, each scientist-king dabbling with the genome of his

slaves, as gentleman-farmers used to hybridize plants seeking better harvests, swapping promising strains with their neighbors.

And that is how they set the horror in motion. Secret police, constant surveillance, all the usual instrumentalities of coercion, created selection pressure. For the slave caste, there was always greater survival advantage in being self-serving, treacherous, deceptive—of pretending to comply until the opportunity for noncompliance arrived.

They should have seen it coming.

When a slave can only be made to work while constantly watched by a guard, then the labor invested in coercing workers exceeds the amount of labor required to do the work itself. I gather that, in their arrogance, most of them never understood what was happening. Once the tipping point was passed . . .

. . . have just been sick all over myself. My head throbs. There is nothing more to be learned here, the tomb of the only human civilization this world has ever known. Tomorrow I . . .

Like all academicians, I have seen the Herm at Gnostica, but only from a distance when it sat—bedecked with flowers and Bo fruit—at the front of the great halls during our most august ceremonies. Flying over the grassy landscape at dizzying speeds with the lifting belt, I found it deeply moving to suddenly crest a ridge and see the stele standing in a nondescript vale, like any other stone, yet impossible to miss.

It is exactly identical in every way to the Herm on every other human world in the galaxy. Identical in dimensions down to the angstrom. Identical in composition, the same arcane material that repels all marks, all overgrowth, all effects of aging, and can ride unchanged through the grinding heart of a glacier. Identical in the arrangement and content of the inscription, the same, single word repeated thousands of times in every human script known and unknown through all the ages of the Diaspora. I ran my fingers over the ancient Latin, “HOSPITALITAS,” at the center of the front, then also my native Gnostican, “Hospitality,” in its place at the back.

I reached as high as I could and rested my fingers on the metallic skull at the top, the

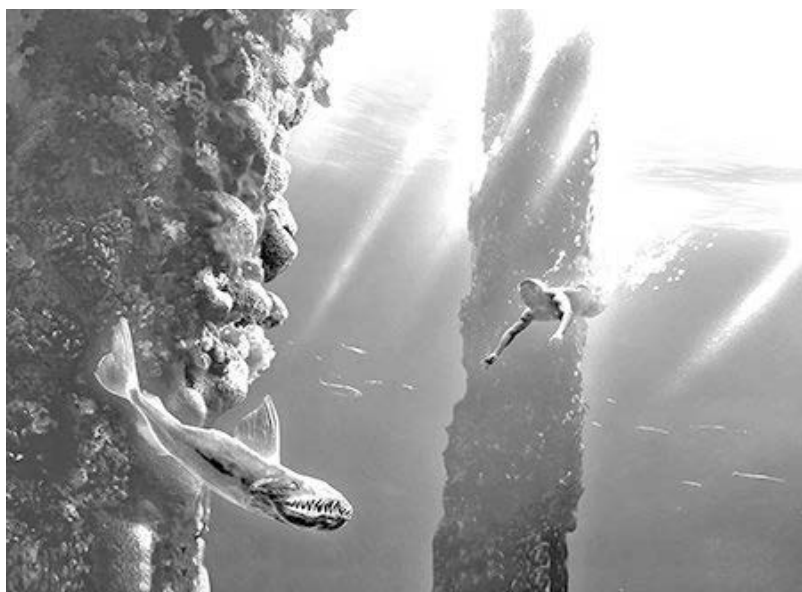
unique cranium that humans evolved on ancient Terra. Like any adept, I am schooled in the many theories of the vanished Hermetic culture, the panspermia and sianetic harbinger theories, and the sprawling conspiracy-singularity theories of Casambus. Yet in the presence of the stone itself, I felt no personal doubt. The Terrans left behind on Earth must have evolved beyond us, raced ahead of our generation ships at translight speeds to the worlds where they knew we were bound. They replaced the native biospheres with Terraformed life, shifted the very orbits of planets in order to prepare a place for us. Then they vanished, leaving the Herms with their only message: “We were humans, and we built this for you.”

This, then, is humanity’s highest achievement. Not our ability to bridge the stars or our mastery over our physical forms. Not the coordination of vast interstellar economies, or equally vast wars of annihilation. Not the soaring pinnacles of our art, our literature, or our accumulated knowledge. It is only because of a protean human instinct that all these other achievements are possible: that we tend to do things for others without expectation of return. That we need to depend on others and be depended upon.

I see now that I cannot live with the People. I fear what I may do to them. Yet I dread even more the possibility that raiders or slavers, moving ahead of the fleet, might unwittingly spread this horror to the galaxy. I shall flee to the wilderness and watch the skies. When the fleet arrives, I shall persuade the Mediator Corps to exterminate the brutes, or else to . . .

Here ends the Narrative. As noted, the existing fragments are reconstructed from the damaged memnimplant modules discovered near the partially intact skull of the Imperial outreach missionary known by his client race as “More.” The planet Orob 16-IV, “The World,” remains under quarantine by order of the Dey Heirarchs.

*Respectfully Submitted,
Fra Geminus Glaucus
Laureate Cum Legionis &c.
Scholus Cifrius Excelcius ■*



Illustrated by Tomislav Tikulin

Sleeping Dogs

Adam-Troy Castro

Cutting through the turquoise waters twenty meters below the ocean surface, the old man is not so much an alien to that place as a temporary inhabitant granted full citizenship for the length of his stay.

He is lean, this old man. His body is a sharpened instrument that time and the

habits of a lifetime have sculpted to its most basic components. His limbs have been stripped of all fat or weakness. His muscles have been reduced to machinery and the will that drives them. His skin is a lattice of hair-line scars, some lighter than the tan left behind by decades of exposure to the tropical sun.

The old man wears no external breathing apparatus, but he has spent a lifetime conditioning his lungs to the peak of human potential, and he thus shows no particular distress as the time since his last visit to the surface passes two minutes and edges toward three. Even so, time runs short, and so he does not allow himself to be distracted or delayed by anything he sees around him—not the schools of silvery needlefish, traveling in schools so dense that light cannot be discerned in the spaces between them; not the great silvery hungrymouth, five times his size, that glides on past, large enough to eat him but intelligent enough to avoid the attempt; not the skeleton of a fishing boat broken in two and impaled on an outcropping of rock during one of this backwater world's many violent storms.

Nothing moves him until his eyes alight upon a mound in the sandy bottom, one that eyes any less experienced than his own would have mistaken for just another irregularity in an underwater landscape carved by currents ancient before his birth.

The old man circles the mound twice before coming to a halt an arm's length over it. Drifting, he positions his right hand above the mound's highest point, points his fingers downward, and tenses.

Most human beings would have trouble discerning just what happens in the next instant, but there is a sudden violent flurry of movement, ending with a clouded sea bottom and the old man paddling toward the surface, grasping a dead eel by the neck.

The creature the old man just caught is twice his length, eyeless, and possessed of teeth like razors. Its jaw is thick and powerful enough to have crushed the old man's skull, its throat flexible enough to have swallowed his corpse whole. Most Greevian fishermen hunting this creature would have used the tool designed for the purpose: a pole, three times the height of a human being, and so studded with barbs that a captured eel turns itself inside out recoiling after its first instinctive strike. Most of Greeve's people don't make the attempt. They seek easier prey. After all, this is Greeve. The oceans teem with life. There are plenty of delicious fish eager to strand themselves in nets. Sure, everybody's heard the stories of the old-time colonists from a century ago, the ones who drove the deadliest of Greeve's predators

from the shallows and turned a hard world into a paradise. Some of those did what this old man just did: dive down bare-handed, provoke one of these monsters, and survive the lunge by seizing and snapping the fragile vertebrae directly behind its deadly hinged jaw. Today, it's mostly something idiots do to satisfy drunken wagers placed just before they become late idiots. It's how the old man makes his living.

He kicks his way to the surface in no particular hurry, the dead eel trailing behind him like a banner. He has no trouble supporting its weight. Nor does he gasp when he emerges; he takes a deep, controlled breath, before scanning the horizon and finding his launch, a brown speck bobbing about two hundred meters away. The verdant arc of an island breaks the horizon, some four kilometers behind that. The sky is a warm, cloudless blue, the water peaceful but for the spreading circles where the old man's appearance has disturbed the surface calm. It is a beautiful day. The old man allows himself less than a heartbeat of appreciation before he begins the swim back to his boat, his pace not at all hampered by the weight of the leviathan he has captured.

The old man does not yet know it, but this will be his last day fishing Greeve's waters.

It is twenty minutes later. The old man sits in his tiny launch, cleaning his kill. He uses an energy blade, one that cuts through the eel's muscular flesh as easily as it cuts through air; the skin falling off the muscle and bone with an ease that suggests eagerness. The few edible organs go into one stasis locker; the narcotic bladder rich in secretions illegal on most civilized worlds but prized here on Greeve, into another. There are eggs, so fragile that only an expert can remove them without causing the kind of damage that would reduce them to as little as one tenth their potential value. The old man destroys three on purpose, and is more generous to the fourth and fifth, which he mars just enough to avoid making too great a fortune at market.

The old man has made a living, and has even managed to put away some money, but has always avoided having too much success.

He is still sectioning his catch when he hears the sound of a skimmer approaching from the west. He does not look up. Routine is the bind-

ing force of his life, and he can identify the sound of this particular vehicle. It is old and battered but well-maintained by an owner who would be hard-pressed to replace it if anything went wrong with it; and it takes the form of a streamlined missile with a saddle large enough to accommodate its single rider, a young boy.

The boy's name is Squall. If he has another, first or last, the old man does not know it. He is somewhere between ten and fourteen years old Mercantile standard, his precise age indeterminate because of his slight build and a stubborn refusal to grow past the height of his late preadolescence. He has startling black eyes, mahogany coloring, a squashed nose, a thatch of permanently askew hair, and a smile he shows only to people he would trust with his life. He has no living parents, as far as the old man knows, but has never suffered for it. On Greeve, where community is all, that simply places him under the protection of any home island where he chooses to live. That makes the old man one of a hundred fathers.

Squall slows his skimmer as it pulls up alongside the old man's launch and descends just enough to dangle his bare feet in the water. "Hey. Spiff catch."

In the old man's personal universe, not looking up is a sign of trust. "I know."

"Is ye emped for the shift?"

The boy means *Are you finished for the day?*

The old man shrugs. "I was going to go in again, in a little while. I can choose to be finished, if we have business. Have you eaten?"

The boy shrugs. "I could nock a little kip."

The old man wipes his hands, deactivates his stasis drawer and takes out a khashth filet, broiled to his liking and giving off fresh steam even through its paper wrapping. The first whiff leaves him as hungry as he hadn't been before Squall's arrival, but he has skipped meals before, in harder times, and Squall needs the calories more than he does.

The boy catches the toss single-handed. "Fl-ish."

"You're welcome. Help me scrub down the launch after you're done with that and I'll give you one of these eggs as a tip."

Squall's grin is broad, white, and without artifice. "Is no suck, greybeard."

A few seconds pass while Squall nibbles on his lunch. He finishes only half of it before

tucking the rest away in his pocket, then faces the old man again, wearing the expression common to all boys who have a sensitive story to tell. "I kenned a pinkie today."

Kenned means "saw," and *pinkies* are pale-complexioned people, who are a distinct minority among Greeve's more bronzed population. The old man is a pinkie himself, but years under the sun have made that a moot point.

"Offworlder?"

"Truth."

"What kind of Offworlder?"

"A pinkie, as I spake." Squall hesitates, then gets into it. "Like ye."

"And?"

"Grayer than ye, truth."

When the old man smiles, the entire side of his face folds up into nested half-moons. "Grayer even than me? He must have seemed ancient."

Squall drops the local patois and speaks to the old man in the common tongue, Hom.Sap Mercantile. It is a colorless language, that lacks the fluid poetry of the boy's usual form of speech, but it is better at discussing matters of grave import. "Do not make fun of me, old John. I thought you would be interested in hearing about this man."

"You are right," the old man tells him in the same language. "I am wrong. I apologize. What was he doing?"

"When I saw him? Drinking. Eating. Sitting around. Wearing a big floppy hat to protect his fish-belly skin from the sun, and then sitting around the beach all day anyway. I am told that he came here a week ago and that every day since then has been more of the same. He sleeps late, gets up, walks around the marketplace, drinks, pays for a night of love when it suits him. He has taken one of the rooms above the café at Fritaun. I do not know his name, and have no reason to think that his business has anything to do with you because the two of you are so different, but he is an offworlder and you have told me to keep you informed of any offworlders. Have I done the right thing?"

The old man cuts up and stashes the rest of his catch, his leathery hands not faltering for a moment even as his mind travels many years and many worlds away. When he closes the lid, sealing the day's bounty in a vault of frozen time, he does not fail to miss the comparison

to his own situation: of the way he has lived for so long, content and comfortable and yet not fully connected to the passage of the days.

"You have done the right thing. Will you do something else for me, Squall?"

The boy returns to the argot he prefers. "Truth."

"Take your skimmer to one of the outer islands. Stay with someone you know. Don't come back for a couple of days. If you hear anybody asking for me between now and then, pick up stakes and move somewhere else. Don't even mention my name unless you hear that I'm still up and about. Can you do that much for me, boy?"

The boy now frowns. "Is ye fecked, grey-beard?"

Feked is local fisherman slang, an adjective for the moment when you realize that the catch you've been seeking is about to have you for lunch instead.

"I don't know. It's probably nothing. But I'd rather keep you out of it until I know it's nothing serious. Do I have your promise?"

The boy considers that and pops the last bite of his meal into his teeth. "Truth."

The town square at Fritaun is one of a hundred identical markets scattered among the sprawling chain of islands that dot this region of Greeve. Women sell colorful tapestries from the fine silken fibers spun by the mats of weed that float in the shallows; cooks offer glistening, multi-legged worms from the coral beds; mindless *yeshtim* chatter in their cages, awaiting their sale as pets or food.

The old man strolls through the narrow aisles between the stalls, nodding at the familiar faces, pretending interest in their wares, exchanging the polite greetings people offer those who have lived among them but never been more than a stranger.

After a while, he stops beside a stall selling gaudy but worthless gemstones and pretends deep interest while really paying attention to the low, squat cafe across the square. It is a small, unpretentious place occupying the ground floor of a three-story inn offering both beds and bed partners for travelers who have found themselves passing through this dot on the map. The old man has dined there enough to become a familiar local face, but he has never gotten drunk there, never spent a night

plugged into the buzzports the impatient use to jack their pleasure centers without all the messy metabolic demands of the powerful local weed or brew. For most of his time here, it has been a place to listen, to learn, to pick up the tenor of the community without the clumsy, off-putting necessity of asking questions. It has never been a place to spy on from the other side of the square, but as the old man stands hidden by banners of gaudy cloth, that is what it becomes, and so it is not long before he witnesses a certain rotund figure in a big, floppy hat sweating from too much fat and listing from too much drink, sealing the front of his trousers as he emerges from the unmarked door beside the long bar.

There are maybe one dozen unenhanced human beings, out of all humanity's billions, capable of perceiving the old man's bottomless dismay. Certainly none of the locals do. He covers it by clapping a hand to the back of his neck and rolling his head from side to side, a gesture that most around him mistake as mere compensation to muscular stiffness. In truth, he's scanning the rooftops, the skies, the balconies of all the buildings on this one crowded little street. He's looking for spotters, for tracer-drones, for people focusing their attention on him when there are so many other people, even within this uncrowned place, more interesting than the old man with the aching neck and sun-beaten skin. If he sees any enemies, he fails to react. Or he succeeds in not reacting, which is not even remotely the same thing.

After a moment he selects a long purple scarf, the length of his powerful corded arms, overpays the toothless woman by at least twice its true value, and ambles across the square, his manner that of a man in no particular hurry who is now moving from nowhere very special to no place worth mentioning. His gait adds twenty years to his apparent age, much as his blank facial expression subtracts at least half of his fierce intelligence. There is no reason for anybody, let alone the close-lidded fat man returning to his table, to take any particular notice of him, or to consider him a threat.

He passes behind the fat man like any other local on his way to the bar, intent on nothing more than a mug of ale or fifteen minutes worth of current from the buzzport. He times the moment so that he's at his closest just as

the fat man is off-balance and lowering his voluminous rear end into the tiny chair beside the little table already bearing half a dozen glistening empties; and it is with absolute grace and artistry that he twice loops the scarf around the fat man's neck, drawing it taut enough to constrict the other's throat without quite cutting off his air.

The old man does not raise his voice. "You do know how long it would take me to kill you if you even try to signal your friends?"

The fat man has frozen, but not panicked. "What friends?"

"Don't treat me like a fool. You would not come here without backup."

The fat man places both hands on the scarred wood grain of the tabletop and drums his sausage-like fingers as if in idle contemplation of the many hours of drinking still left to him. "In the name of courtesy, man, if you're somebody I should know, and with whom I need to have this conversation, then at least have the decency to give me a hint."

The old man's words have a way of growing more clipped the more rage overtakes him. "I told you, many years ago, that I was not your mystery to solve. Do you remember me now, fat man?"

The fat man freezes. "Draiken?"

It is the first time the old man has heard his own name in thirty years. "Your ability to feign innocence has not improved since I knew you."

"I swear. You're the last person I expected to see here."

"Don't insult my intelligence. You complained about it often enough."

The fat man wheezes. "That I did. I should have known you'd catch me sooner or later."

Draiken tightens the scarf to a degree perceptible only to himself and his adversary. "I would think we have passed beyond the need for such empty mind games. But we both know the truth. You came to this place looking for *me*."

The fat man's only response to that is a heartbeat of amazed silence, followed by laughter. It turns into a gasp when Draiken tightens the scarf but becomes merriment again the instant the old man permits him another breath. "You have extraordinary faith in my persistence. But this is as much a surprise to me as it must be to you."

"Liar."

"I retired from the branch ten years ago. I came here wanting nothing but a sunny place to live in obscurity."

"Men like you don't retire. You know too much to retire."

"I could say the same of you. And yet you are here, looking like any other native. Come; this is tiresome. Either snap my neck and be done with it, or let me buy you a drink, so we may make our peace as professionals."

Draiken comes within a twitch of ending the fat man's life then and there . . . but he is, as always, acutely aware of his surroundings, of the faces in the café turning to them with concern, of the people in the marketplace beginning to realize that this is more than just a cranky dispute between old men.

It is not fear for his own freedom—a blessing he has always recognized as transitory, and likely to be taken from him at any time—than respect for the sensibilities of the locals, that stays his hand. He knows that if he killed the fat man in their presence, the ugliness of the moment would become a scar in their memories, as indelible as its own way as the one that mottles his own chest. He owes them too much gratitude, for too many years of peace, to leave them with such a terrible bequest. And so he decides, releasing the scarf with a contemptuous snap, and settling into the opposite chair with a feeling a lot like what a veteran actor must feel, when he returns to the stage for the role that once made him famous.

Draiken says, "I never did know your real name."

The fat man uses the discarded scarf to dab at the beads of sweat dotting his brow. He clears his throat, takes a sip of the beer in the mug before him, tests his voice with another cough, and says, "Would it . . . mean anything to you if I introduced myself now?"

"Any name, even a fictional one, would be the least of the many reparations you owe me."

The fat man draws a smiley face in the condensation on the side of his mug. "It would have to be a fictional one. I don't have a real name anymore."

"Tell me another one."

"It's the literal truth, my old friend. You know as well as I do that when you work for

the powers we worked for, doing the kind of work we did, traceable backgrounds can be inconvenient. Some time after you hopped the fence, they," he winces in sudden pain and rubs the angry red line beneath the least of his many chins, "developed some special new techniques, and *removed* my background."

Draiken arches an eyebrow. "How appropriate. The biter, bitten."

"Indeed. I'm afraid I couldn't tell you anything about my civilian life, or much about my professional one, even if I wanted to. I remember it all, but no longer have the ability to reference it in conversation. I'm afraid my range of friendly conversation these days is pretty much limited to the nonsense I've indulged myself in since entering my dotage. My answers for you will therefore have to be general in nature, perhaps even," he rubs his neck again, "frustratingly so. If it helps, I'm traveling under the name Grade. You may call me that, if you like."

Despite all the years that have passed, Draiken knows that it would be a tremendous mistake to treat this officious bureaucrat, this professional ferret, this torturer and interrogator, as a harmless relic now. He cannot be allowed to set the rules of this, their long-delayed final match, even if that means being contrary on what seems the most minor of points. So Draiken says, "I believe I'll call you Janus."

"The two-faced God. You *are* good. And what shall I call you, if not Draiken? I can't believe you still use your real name, not if you've been in hiding all this time."

"Anybody who knows me, here, calls me Old John."

"John," the fat man says, as if weighing it in his mouth. It seems to amuse it. "If I recall correctly, that's your actual first name. I give you credit. You like to live dangerously."

"I prefer to think of it as freedom."

"And, of course, the smallest possible defiant gesture is involving the casual use of a name so common that many in this world of congenial expatriates and fugitives will inevitably suppose it an alias anyway. Well done, Draiken. Well done."

"And you," Draiken says, his voice clipped and controlled, no longer the genial instrument of the old man eking a living from the sea, but the sharp scalpel of an even sharper mind, "still need to provide me a reason why I

should not kill you where you sit. When I was in your power, you said that you'd stop at nothing to break me. Am I supposed to believe your presence in this backwater just a random coincidence?"

Janus takes another sip of his drink and makes a face as it burns his throat going down. "You'll believe what you want to believe."

"There are thousands of worlds out there. The chances of my old jailer, settling on the same obscure planet, the same backwater *region*..."

"Astronomical," Janus agrees. He tips his glass, studies the brown liquid inside, swirls it as if searching for answers in the little maelstrom he stirs up and holds captive. His voice turns distant. "And yet it's happened. I can't explain it."

"Try."

"I don't know. You and I were trained to distrust coincidence. But coincidences happen. If they didn't happen, there wouldn't be a word for them. Perhaps, being in the same kind of business once upon a time, making the same kind of enemies, being the same kind of *men*, we both followed the same criteria for choosing the kind of place fit for hiding out our old age. Nor can we be the first. I am certain that, for people like us who survived the kind of lives we lived, there have always been chance meetings like this in places too insignificant to have been touched by the madness of governments. Perhaps there are any number of old enemies, playing on opposite sides, who found themselves neighbors after a lifetime of conflict and found themselves forced, as we are now, to decide whether to end our lives as each other's murderers."

Draiken almost snarls. "Is that the best you can do?"

"If I were lying, my old friend, would I not do better?"

Draiken realizes that he's sitting with his back to the street, a foolish and amateurish move that testifies to how long he's been out of practice, light-years from the business of deceit and secrets. He has been so focused on the hated face before him, so intent on finding the lie behind the rickety story, that he's tuned out the other patrons of the café, the merchants and passersby in the square, the windows of the low squat buildings across the

way, and the hundred separate angles from which a capture or kill squad could be converging upon him right now. He has been a fool today, the kind of fool he hasn't been since before the day when he'd escaped from the hell this man commanded. But would he be a bigger fool if he surrendered to that paranoia, and by so doing proved that he'd never quite left that prison behind, or if he remained where he sat, and trusted that time had been enough to protect him?

Indecision prods him to a rare exclamation. "For your life, fat man, how can you expect me to believe that the likes of you would just retire?"

Janus stares at him for several seconds, his rotund face incredulous. And then something odd happens. His balloon cheeks twitch. His lips curl. At first he fights what's happening to him, but then he surrenders to it, the chuckle deep in his throat blossoming into what soon becomes a belly laugh, complete with shortness of breath and rampant weeping. He has almost emerged from the hysterics when he catches a glimpse of Draiken's uncomprehending face and is set off again, unable to stop or regain control of himself for several long minutes.

"Oh, Draiken, my old friend," he manages at long last, "that you of all people would ask me *that* question . . ."

Greeve's attraction to fugitives from the iron fist of the Confederacy and Man's other empires may lie in large part to the world's genial contempt for laws, but that's not the same thing as mistaking the status quo there for anarchy.

On Greeve, people steal little because there's little to steal; they murder rarely because there are so few reasons to kill; they fight rarely because it's so hot, and there's no goddamned point. But people do get in trouble from time to time, and when they do, they remember those who pull them out.

Draiken has spent his long decades here eschewing close friendships but always being helpful to a fault whenever anyone needed him; a smart policy that has earned him a small fortune in the local favor bank.

One of Draiken's best investments over the years has been a local woman of pleasure who goes by the first name Aletha and the family name None. Older by a couple of decades than

most ladies who make a good living at her venerable profession, even on Greeve where prostitution is less a crime than a hereditary lifestyle, she is as pale by birth and as bronzed by long exposure to the Greevian sun as he has become. She has plied her trade for a long time and must not have much time left. Her years show. Her cheeks become ripples of nested parentheses when she smiles. But she is also avid, and inventive, and experienced in ways to make the act itself less a grunting resentful obligation undertaken for coins and more a deep mutual pleasure for both parties, which even her modest fee fails to sully with the taint of commerce. She is gifted at creating the illusion that the payment she asks for is not so much an entrance fee as a gift, something that helps support her while she provides what she would just as soon give away. It might not even be a pretense. This is Greeve, where people are less formal about such things.

Draiken has never availed himself of Aletha's services. He has, indeed, invited much wistful speculation among the members of her thriving community by only rarely availing himself of such carnal opportunities. But he has been her friend, providing her and her colleagues of the night with unsolicited aid on a number of occasions when offworlders passing through Fritaun, drunk on the region's cheap pleasures and inferring from its lawlessness opportunities that did not exist, attempted to take liberties beyond both what they had paid for and Aletha was inclined to sell.

Marching his old acquaintance Janus up the stairs that lead to the sunny balcony outside the fourth-floor room where Aletha lives and plies her venerable trade, Draiken finds her relaxing at her little round table, nude but for a diaphanous vest worn loose around her shoulders, and multiple necklaces and bracelets of shells. Her feathery shoulder-length hair is like a glowing nutmeg beneath the rays of the setting sun. On guard before she identifies the callers ascending the stairs from the street, she offers the huffing Janus a professional smile before spotting Draiken behind him and switching to a far warmer one. "Well, if it isn't my favorite caller! Who's your friend?"

"I'm surprised you haven't met him already," Draiken tells her, as he marches the gasping Janus to a seat at the same table. "I've

told that he's been quite the regular among the local ladies of pleasure."

She waves a hand tipped with sculpted green nails. "Has he now? And nobody's recommended me as the best?"

"Don't take it personally, love. I suspect that he would have found you sooner or later, once he worked his way through everybody at street level."

Aletha clucks, her many bracelets clattering like laughter. "That's the chief trade-off of being up a few flights, in a town like this. You don't get as many walk-in visitors, but the ones you do get really want to see you." Her thin eyebrows narrow as she finally picks up on the tension between the two men. She draws close to Draiken, places her palms against his chest, and murmurs, "But you've never been one to bring me business. Are you in trouble, John?"

He tells the truth. "I don't know."

She raises an incredulous eyebrow. "Trouble with *him*?"

"I don't know."

Aletha's glorious smile fades, not disappearing but becoming just one distant note contributing to a symphony of other, more complicated emotions. She gives Janus a once-over, finding nothing in his flab or his offworlder features that could threaten a man like the one she's known for so many years, then turns to Draiken, as troubled as he's ever seen her. "And you're not taking him . . . away?"

This is a reference to the most notorious, and most widely admired among the many reasons the locals see Draiken as a man to be respected; a certain occasion now many years old where, in response to trouble spotted from the street, he raced up her stairs to drag a bellying, fat, noxious animal of an offworlder from her protesting form, out her front door, down to the water, and onto his launch. Taking the pig six hours out into the water to an atoll he knew, Draiken had dumped him there with a fishing net and a blanket and a chest of dried fruit slices and a desalinization kit to turn the undrinkable ocean brine into bitter, but workable fresh water. "I'll pick you up one year from today," he had told the sputtering man, "when your apology to a lady might mean something." And then he'd left. Draiken hadn't bothered telling the fool that he'd meant a Greevian year, which was almost

twice the length of the Mercantile standard, almost seven hundred days in toto; and he didn't waste much time sticking around when he showed upon the appointed anniversary only to face curses and a murder attempt by the scraggly-bearded, wild-eyed, naked emaciate the offworlder had become. "Another year, then," an unbothered Draiken told the offworlder, before turning his launch around and departing.

The apology Aletha had received another seven hundred days after that, from a wreck of a man who had been offered plenty of time to consider its precise wording, was so tearful and sincere that she sponge-bathed him and then provided the very service he'd once attempted to take by force, an act of kind forgiveness well beyond anything Draiken would have considered deserved.

The unfortunate offworlder still lives on Fritaun, since he long ago missed his berth back to whatever civilized place he came from; and since the belongings had long since been divided among the people of Fritaun he still makes his hardscrabble living on the beach, dragging the shallows with nets. He could be called poor, but he is no poorer than his neighbors; and whenever he manages to collect enough coins for another night of pleasure, as happens from time to time, he approaches Aletha with abject humility, as she is not always willing and his ordeal has left him incapable of physical response for any other in her profession.

Protect a woman like Aletha, asking nothing in return, and she will love you with a loyalty that would shame the most devoted of wives. Draiken despises the necessity, but he has come here to call in the debt. "I can't strand any man if I don't know if I'll ever be able to come back for him. He might die."

"If he's a danger to you," Aletha counters, "maybe he should."

"Unfortunately, one key disagreement between this man and me has always been my refusal to become what he would make me."

She shakes her head in mingled amusement and frustration. "You and your principles. I swear, I've always thought that you'd be better off without them."

Janus makes a series of sounds that could be mistaken for a choking fit, but which reveal themselves after about a half a minute as

uproarious laughter. "Another reminder of the past. Do you know, woman, I always contended the same thing."

Draiken's consonants become a sliver more clipped in anger. "Easy to say for a man who never had any principles himself."

"Still demonizing me after all these years? You should know better. Any man who ever enlisted in a war he didn't have to fight did so because he believed in his cause. Your problem is that you still think that, years after you should have learned better. You can't stand the thought that nobody cares about us or the wars we fought anymore."

The clipped words now escape Draiken's mouth with the force of little explosions. "Do you really expect me to believe your masters ever changed their minds about me?"

Janus responds with logic that borders on cruelty. "No, John, I expect you to understand that they've died or moved on or forgotten all about you. Alliances have changed. Governments have fallen in disgrace and been replaced with new ones that have yet to sully themselves with the same crimes. New people have come into power who never heard of you. So many secrets have been piled on top of the ones you knew that it would take an entire team of archeologists weeks to uncover the ones dating back to our time. Even if they did, many of the answers have become public knowledge or irrelevancies in light of newer developments. Face it, John. I know you've needed a strong ego to survive so long, but if there's a reason nobody's found you, it's not because you're so bloody brilliant, but because you're ancient history and it's been so many years since anybody bothered to look."

"Then what are you doing here?"

"I don't know how many times I can tell you. I'm just an old man now, trying to lose himself the same way you've lost yourself. By God, man, I was so starved for conversation by the time you showed up that I was even happy to see you. What does that say?"

Silence descends on the sun-drenched balcony, the old man and aging courtesan silent in gathering shadows while the captured enemy protests innocence between them. Laughter bubbles up from the street.

Aletha says, "He's telling the truth."

"A man like him tells the truth only when it's the pathway to some more pernicious lie."

"No! You have to listen to me. If there's one thing a woman in my profession needs to learn how to do, it's how to recognize when a man's lying. I'd stake my life on it. He means what he says."

Draiken studies her and Janus, and if his gaze is cold and measuring, there is also a moment when a generous observer might discern signs of softening. But the flash of vulnerability lasts less than a second. Then he grabs the fat man under the arm and with a sudden jerk yanks him to his feet, pulling him inside the beaded archway into Aletha's bedroom. A small animal with a pair of tails circling each other in helices turns wide-eyed when it sees them and leaps from the mound of plush pillows that adorn the mattress just before Janus lands in its previous spot, grunting and bouncing. Janus makes no attempt to scramble off the bed and run away but just watches warily as Draiken stops at the end of the bed, his hands curled into fists.

Aletha comes through the beads at a frantic run, her eyes wild and burning with the expectation of imminent murder. She shows no concern for the fat man or for the sanctity of her own home, but seems terrified for Draiken, and is only slightly mollified as the moment passes without any blood spilled.

Draiken does not look at her. "I'm sorry. I should not have involved you in this."

"After all you've done for me over the years, I'd be upset with you if you hadn't. Just tell me what you're thinking."

"I'm thinking that you're likely right. That we're almost certainly looking at a spent shell."

Janus raises his voice. "I am. I told you—"

"But the one thing I learned from the life I led before this one is that small truths can be used to camouflage gigantic lies. He's already told me that his memory's been tampered with. I'm meant to believe that it's so his masters will permit him to retire—but what if it's so that even he doesn't know why he's here? What if he's a Judas goat, sent to this world in blind innocence to lure me to my slaughter?"

Janus laughs again. "Just how dangerous do you think you are, in your old age? What makes you think that they'd still need to manipulate you with *tricks*?"

Long seconds pass as the accusation hangs in the air, nobody willing to be the first to

comment on it. And then Aletha's words break the silence, dangerous things that know they're barbed but nevertheless loathe the possibility of drawing blood. "It does seem unlikely . . . John."

It's the first time in their long years of acquaintance that she's ever used his name instead of a generic, false endearment.

Draiken's raised eyebrow is as close as he ever seems to come to showing surprise. They regard each other for a long moment, one more pregnant with conversation than any mere collection of words could possibly be.

After a long time, he asks her, "Do you understand that I can't afford to take anything this man says at face value?"

Her answer is immediate. "Yes. Is there a way to make sure?"

"I'm sure you have something around here that can put him to sleep for a while. Something safe and pleasant, something that won't do him any damage if this all turns out to be nothing. I'll pay you whatever it costs to keep an eye on him while I test the hypothesis, and be back as soon as I can."

Her forehead wrinkles just long enough to reflect the sting of an unintended wound. "You don't have to pay."

"It might be a couple of days. Even a week."

"John, *you don't have to pay*."

Another uncomfortable silence passes between them.

On the bed, Janus quivers with a combination of amusement and disgust. "For the love of heaven, miss. I volunteer. I'm a dabbler in narcotics anyway. Give me whatever it is and I'll take it gladly, if it means we have a chance to settle this nonsense once and for all."

Aletha nods and, without waiting for assent from Draiken, moves across the room to a storage cabinet, sliding the curved door into its tracked recess to reveal a shelf with an array of exotic, but not too exotic, scents, ointments, and euphorics. There's a crystal vial in the middle, mostly air now, but bearing a finger or two of a purple liquid that seems to reflect light sources in addition to those evident in the room. She unplugs the stopper, sniffs it, then offers the vial to Draiken, who holds it to his own nose for a second before nodding with approval.

She turns to the bed. "You'll have pleasant dreams."

Janus extends his right hand, palm up. "That would be a welcome change. It would be nice to have pleasant dreams for once in my life."

She taps the base of the vial with her index finger and releases a single drop of the purple liquid into the palm. It sinks into the fat man's skin at once, as if considering his flesh no more than an illusion hiding the circulatory system beneath.

Stupor is only a minute away, but Janus still claps his hands together and rubs, embracing oblivion before it comes, almost celebrating it as an improvement over life in the world that has brought him to this place and this bed. Before his eyes glaze over he grins at Draiken, as if the past enmity between them pales by the fellowship of men in so many matters involving women. "John?" he says, his voice already slurring. "I am not blind to certain things. If you do not let this woman love you, you're a fool."

It takes him five seconds apiece to say each of the last three words, and he only barely manages the last one. Then his eyes go someplace far away. His face turns slack and stupid, freed for now from the tyranny of understanding. He does not start to drool right away, but it's clear that the indignity lurks in his immediate future.

Draiken takes no pleasure in neutralizing his old enemy. Long before Aletha is certain that the fat man is under, he's already out the curtained entranceway and at the balcony wall, his hands curled into impotent white-knuckled fists. His features remain calm, but his neck muscles twitch with controlled anger.

The beads clatter as Aletha returns outside. He feels her presence. He knows that she's staring at the tight muscles of his shoulders, willing them to relax, waiting for him to turn. He even knows which of her two faces, the one she wears when plying her profession and the genuine one she only shows to the few people she knows she can trust, he would see if he brought himself to look. But he doesn't.

She whispers, "Who were you, John?"

He runs the side of his hand across her face, wiping away a sheen of tears. "Nobody."

"I understand if you don't want to tell me."

"I did just tell you. I was nobody. A professional nobody. You want another word for it? I was a soldier, a secret soldier, a spy. I gave up name, past, friends, citizenship, any right to

ambition or desires of my own—everything, really, but the willingness to do awful things for the cause I thought I was serving.”

“Which was?”

“He’s right about one thing, Aletha. It was a long time ago and the specifics mean nothing.” A sudden spasm of weariness drives him to the chair, where he slumps, for the first time assuming the attitude of exhausted old age. “They would likely mean nothing to you.”

“And this man—he worked for your enemies?”

“I have no way of knowing. It was just as possible that he worked for my own side, turning on me.”

“Why?”

“It’s not easy to say. At the level he and I inhabited, loyalties were fluid. You could be branded a traitor one day for following the orders you were given the day before. If taking stock and realizing that my life was spent in the service of a lie made me a traitor, then maybe I was. But all you need to know is that I was just a man, with a man’s secrets and a man’s depths and a man’s right to keep some parts of himself hidden even from those who thought they owned him. One day, I decided that I’d had enough. I tried to walk away. My superiors didn’t trust my motives.”

“So. What did they do to you?”

“What didn’t they do? They imprisoned me, they tortured me, they drugged me, they interrogated me. They offered privileges every time I retreated and punishments every time I pushed back. At times they arranged for me to make allies who were only interested in betraying me. At other times they manipulated me into betraying others. A couple of times they even allowed me to escape, so they could take their own sweet time recapturing me; it was their way of demonstrating their ability to claim me again, any time they wanted. Their goal was to either break me completely, or reduce me to a manageable psychosis, and they came damned close to succeeding. By the time I broke free and ran so far that I thought I’d left them far behind . . . it no longer mattered. By then I carried my prison cell on my back. I’ve been living free on this tiny world of yours for thirty years, and I still felt like there was never anyone I could trust.”

She kneads his shoulders with a gentleness a million light years removed from the services

she offers in the room where the fat man sits intoxicated. “And yet you still made yourself my good friend.”

He shows some embarrassment. “I don’t know if this will make sense to you . . . but for me being a friend has always been easier than having one.”

She leans in to kiss him, but he pulls back, and the moment passes. She’s left blinking at him, not knowing what has happened, searching the features that have let slip a small moment of candor, but will not go any further.

Entire volumes of conversation take place without either one of them saying anything.

Then he takes her wrists and removes her hands from his shoulders. “Maybe we can talk after I find out what I need to find out.”

Aletha has been in her business for a very long time and is well used to promises that might never amount to anything. She just nods, turns her gaze over the low, tiled rooftops that form a truncated horizon within Greeve’s unlimited line of sea and sky. There can be no surprises in sight to a woman who has spent so many years surveying this street from this balcony; the glistening places where rainfall collects in puddles, the discolored patches where the tiles have not held proof against the bleaching effect of the sun. Even the first few stars beginning to appear, with the dying of the light, appear in the same places that they always have: an infinite distance away, but ultimately irrelevant to eyes that may never see them from any other angle.

“I need to know,” he says.

She wipes her long lashes with the edge of her palm. “I know. Just go, already.”

The fat man’s guesthouse is no luxury hotel. There is nothing of the sort on Greeve, and there would be no point in having anything of the sort within the shabbier borders of the village called Fritaun. It is a squat inn, two stories tall, flat in color and in character, its chief attraction an unspoken guarantee of anonymity. There are only three guest rooms, all of them on the second floor; and the marginal nature of the local economy is best gauged by the vacancy rate, which is more or less constant.

Finding out where Janus has been staying is the work of an hour. Identifying the specific room takes even less time. Waiting for the

day's light to start to fade, and for gathering shadows to start to provide him a modicum of cover, is a matter of waiting a couple of hours after that. Breaking into the room through the window requires accessing the roof, which takes minutes. That's one of the advantages of living on Greeve. Nobody owns much, and burglary is always easiest in those places where mere theft is pointless.

The windows are simple wooden shutters that swing inward with minimal persuasion. There is an ionic field at the threshold, in place to keep out bad weather and insects, but it is no more than a tickle to a grown man, and Draiken barely feels the tingle on his skin as he drops through and alights on the wooden floor. The air inside, maintained by the field, is less humid than the early evening air outside, but there's a staleness to it, a heaviness, that to Draiken seems saturated with the special kind of sweat a man like Janus would exude, when reliving his past deeds in nightmares. It is exactly the same kind of scent Draiken has left in the air overnight, in more cheap rooms than he wants to remember.

Beyond that, the room is devoid of character. There is no art on the walls, nothing but form following function. The bed is a hammock stretched tight in a metal frame, the closest thing to a bureau the small folding table that bears the traveler's suitcase. Another table bears a glass bottle of a popular local brew, half-full, the cap missing; an array of wall hooks hold the few clothes that require hanging.

The man Draiken remembers had always been immaculate in his dress and appearance. He had cultivated expensive tastes in food, drink, and accommodations, and flaunted them in the faces of the prisoners under his control, offering them as rewards for cooperation. Draiken finds it hard to imagine the years turning Janus into a happy derelict capable of finding even a moment's comfort in a place like this, but then, he has not walked the intervening years at the man's side, and does not know what countries of the mind he'd traveled through on his journey to the man he was now. It is a reason for suspicion, but not proof. Draiken needs more.

The suitcase is a simple plex box, with no special security systems or telltales. Draiken finds nothing inside but well-worn clothing,

an extra pair of shoes, and a battered sonic shower head, the one indispensable tool for the traveler who might find himself passing through regions unequipped with running water. There's enough paper money, an anachronism as outdated as the bartering of shells that has fallen back into use among the people of Greeve, to fund the man's stay here for a year; it can't be all the money he has, but he must have an account he can access through his hytex connection if he needs more.

A balled sock hides a ROM disk the size of Draiken's palm, a commercially available device that contains enough information for an entire planetary library; Draiken hesitates at the very prospect of reading it, and spends long minutes turning it over and over his hand as he agonizes over whether he wants exposure to its secrets. Ultimately, he decides it's his only next step and places it against his forehead.

No safeguards scramble the contents. There is the usual collection of all extant art, music, and literature, some flagged to indicate prior reading; there is the travel database, confirming an itinerary that has left the centers of power far behind and has for almost a decade now carried Janus through any number of rustic backwaters. There is a half-hearted attempt at a memoir, one that comprises some two thousand words and amounts to a boring recitation of the places seen in retirement, not the secrets pursued in his active career; there are the codes to the fat man's retirement account, which represent the first item of genuine interest since there are, by Draiken's calculation, a couple of zeroes too many, with too many infusions from another money source that Draiken cannot find in several minutes of searching.

This is enough to establish that the fat man has more money than he could have earned in his career, but not that he has access to government pockets; it might just mean that he's a thief or an embezzler, who has used his position to loot accounts at will. It also establishes that the fat man could be wallowing in luxury on some pleasure world if he wanted, but not enough to prove that he's lying.

As Draiken knows very well, sometimes luxury for people in their shared business is just the freedom to go someplace unknown, and

disappear . . . the very consummation he has achieved, the same one the fat man claims to want.

He plucks the ROM disk off his forehead and ponders. He is a man who spent much of his early life ferreting out secrets he was not supposed to know. If he wanted to, he could muster his own considerable hidden resources and journey to the very same worlds where the fat man's memoir claims that he traveled, confirming his visit to each and ultimately proving that nothing of any interest happened on any of them. He could devote as much time to his own travels as Janus took in his, following the trail all the way back to the worlds that would be dangerous for him, and in the end prove the fat man's claim of irrelevancy but sacrifice his own freedom. And that is no solution. To accomplish what he needs to accomplish, and still retain the life he has made for himself, he needs to employ more creative methods.

He takes the disk with him as he leaves through the main door, passes like a wraith through the narrow upstairs hallway sweltering in afternoon heat, and descends the stairs to the street entrance, where an obese local woman sits on a stool, cooling herself with a paper fan. Draiken has never spoken to this woman, or dealt with her, but she is a familiar sight from past travels in town; he knows that from dawn to well past dusk she can be found at this spot, her eyes slitted to the point of somnolence as she observes the endless interplay of the people passing to and fro on the streets outside her establishment. She is the proprietor, the stool is her front desk, and there is deep suspicion in the way she frowns at Draiken, the man who leaves without passing her on his way in. "Ye?"

Draiken spreads his unencumbered arms to show that he is not leaving with any items stolen from any of her tenants. "Forgive, mum. Ken ye stunsprised, but ye pinkie squat, Grade, left me cust of his 'zontal, pere suntime. Seen where he goes, for repay of his kindity?"

The landlady is terribly upset at Grade for sneaking in guests, probably amorous guests, without her knowledge, but seems to believe the story. She shakes her jowly cheeks, cooperating because the more she does the sooner this unpleasant and inconvenient conversation will be over.

He next asks her whether the fat man has been traveling with, or been seen alongside, any other offworlders. "Pinkies longside?"

She allows as how Grade has been seen, from time, in the company of one or more offworlders, though these encounters have as far as she can see been brief and it might be no more than the phenomenon, well known to innkeepers everywhere, of tourists seeking out other tourists to share their mutual disorientation.

According to her, there have been three others, a white-haired man and two younger male companions, all seen wandering around Fraitan in various combinations. She once asked Grade about them, not long after seeing the four in huddled consultation, and he pretended that he hadn't spoken to anybody at all.

Draiken takes this intelligence under advisement. "Thankee."

He strolls away from the old woman's station, performing the old spy's trick of pretending to be headed nowhere in particular, paying absolutely no attention to his surroundings, while actually watching every corner for assassins.

The old woman's testimony hasn't rendered the situation any less ambiguous. The presence of other offworlders might very easily be a coincidence, like the one Janus professes as explanation for his own presence here. There are always people checking out backwaters like this, for resources or people who can be exploited, rebellions that can occupy entire populations while the land is looted. So maybe the three others are just that: sinister, but not suspicious. Maybe the moment of huddled conversation she spotted is nothing more than the gravitation that attracts one group of strangers in town to another, and the conversation that passed between them is no more than a simple comparing of notes, over the best places to drink or the riskiest places to eat. But Draiken has not lived to his current age by comforting himself with such maybes.

Draiken turns off the main street, such as it is, and ambles down a narrow gap between houses, just as he would if he were heading to the beach. When he reaches the far side he makes an unhurried right turn and then ambles down an alley the locals use as a quick shortcut to the water, and the second his

doings are hidden by the wall, speeds up to circle the building and make his way back to the street.

He is not surprised when he turns a corner and meets a young offworlder in a suit that must be oppressively hot in this weather, circling the same house in the other direction.

Smoking out one of them hasn't taken long at all.

There's a moment of stupefied eye contact before the offworlder makes a move that could be a lunge for the weapon in his pocket.

Draiken puts him down. It is not difficult. There are always places to strike a man that make immobility a more viable option than movement. Hit one of those places quickly and a second strike to one that induces unconsciousness isn't even difficult.

Draiken would like to search the man for any clues to his purpose here but knows that he likely does not have the time; so he lowers the young man to the ground, reverses direction and follows the wall back the way he came.

The landlady's reference to two young men makes it no surprise when he encounters another offworlder, as overdressed for the tropics as the first, the second he turns back into the alley. This one has a weapon drawn. Though he carries it drawn like a gun, it is neither projectile nor energy weapon; it is something else Draiken recognizes, something that he has only encountered used by the representatives of governments.

Teemers are considered non-violent weapons, because they do nobody any physical damage; they just imprint a fractal image on the mind and induce a state not unlike catatonia capable of immobilizing an enemy for days or weeks. The horror people feel for them has less to do with the all-consuming helplessness that follows than the occasional grim side effect: flashbacks that can incapacitate a victim, at irregular intervals, for years.

The last thing Draiken wants is to have it used on him, so he shuts his eyes at once and gets only the impression of blinding light, not the more debilitating effect the device would have had on him if he had permitted an instant of direct eye contact. At the same moment, he lashes out and strikes his opponent at the seam between jaw and neck. It's soft tissue,

and the impact sends the young man stumbling backward, gagging.

The young man manages to raise the teemer again. This time Draiken blocks the barrel with his palm. Blinding light escapes through the gaps between his fingers, but no image hits Draiken's eyes and so the effect is nil. He rips the weapon away, flings it aside, and drives his right heel into his enemy's left foot, breaking three toes.

The young man falls. It would be easy to flee now, because though the young man is still dangerous at close range, there is no possibility of him getting up and running as fast as Draiken can. But if Draiken runs he is left with the same problems. So instead he dives for the teemer and returns with it while the young man is still writhing on the ground.

Kneeling, he presses the light-emitting end of the barrel against one of the young man's eye sockets.

He says, "Are there any more of you?"

The young man curses him in a language Draiken doesn't recognize: a language that in fact doesn't make any sense to him, because the phonemes sound garbled and arbitrary. Draiken can't even be sure it is a language.

He puts more pressure on the barrel. "I don't need to understand you, son, but I do need to confirm that you understand me. If you get the sense of my words, pat the ground twice."

The young man obliges.

"All right. Listen up. If you've ever been outside on a sunny day, you know that your eyelids are not opaque, but translucent. You can still make out bright light sources through them. I've never tried to teem anybody through a closed eyelid, but at this range I'm willing to bet that much of the image will still get through—and that even if it doesn't put you down it's still going to be extremely unpleasant, perhaps to the point of permanent disability. Understand that I'd rather not. Pat the ground twice if you're with me."

The young man pats the ground another couple of times.

"Would you like to escape this conversation without suffering any additional damage?"

Two more pats.

"Then answer me. Do you know who I am?"

No pat.

"Do you know how I mean when I refer to the white-haired man?"

Two pats.

"Very well, then. Get up and report to your master. Tell him that I am somebody whose acquaintance he would like to make. Tell him that I will be at the Glass Cathedral at midnight."

Draiken leaves the village immediately after passing on his message. He returns to his launch and pilots a course into deeper waters, taking a zigzag route until he's left land far behind.

The sea comforts him. He knows that it is not his friend. It can kill him any number of ways. It can drown him. It can present him with monsters capable of tearing him in half. It can confuse his sense of direction and leave him drifting far from the map points known by men, into places so far from Greeve's form of civilization that he will die of starvation and thirst. It can turn violent and crush him with a swat by some unexpected rogue wave. It is not his friend. It is terrain of no constancy, and therefore terrain of the greatest possible constancy, that serves him best by never offering reason for trust.

It is also terrain that offers distance from his fellow human beings, an attribute that can be lonely at times but also frees him from having to seek hidden snares in every sentence, unknown manipulations in every offer of friendship, horror lies buried in the most undeniable truths.

The need to think this way takes far more out of Draiken than he likes to admit, so much that he has long wondered if his refusal to treat this world as a home is the prudence he likes to pretend, or a form of broken cowardice. He doesn't know. He only knows that after the life he has lived even offers of love and friendship, such as he suspects he could have with Aletha, drain him.

Perhaps he is too good at playing the game of foes and enemies.

Perhaps, he thinks, he might find some way of brushing these current annoyances aside and set himself to building a life for himself, while it remains possible for him to have one.

But then, perhaps he might die tonight and be spared the necessity of making an effort.

By the time he decides he has retreated far enough, the night has gone dark, save for the

stars that glow by tens of thousands in the skies above Greeve. He has some time, and he needs to keep up his strength, so he opens up his stasis locker and takes out a favorite delicacy of his, a spicy fish called Chazheri. It is so common in Greevian waters that the locals have long since grown bored with its flavor, comparing it to cardboard or driftwood or sand; they consider it no good for anything but bait. He has never known what they were talking about. To his foreign palate, it is a subtle and delightful mixture of flavors, stunning at first bite and hypnotic with delicate aftertaste for long minutes to follow. He has long since given up on figuring out whether he has a more sophisticated sense of taste, or a more undemanding one, than those who grow up here. He only knows that his preferences are his.

When he is done he pilots the launch to a reef he knows about, a number of kilometers removed from the Glass Cathedral, and drops anchor there. He secures his belongings, activates his fail-safes, inflates the cover that will prevent the vessel from being swamped by any unexpected surf, and lowers himself into the water. He takes a deep breath and begins to swim.

What follows over the next hour or so is a fairly impressive feat of navigation without instruments, accomplished in darkness with only the stars to guide him. His stroke is smooth, steady, and controlled, disturbing the water not at all. It takes the strength of the currents into account and aims him not at his destination but an invisible point useful to him only in that if aimed for, the ocean will steer him toward the destination he wants, by an amount close to what he needs.

From time to time he stops, takes his bearings, and makes small corrections; once or twice he takes a deep breath and descends, finding in the geography of the ocean floor the landmarks that allow him to make small adjustments to his trajectory. Once he suffers a few bad moments when he descends and does not find the ancient wreckage that he's been depending on as touchstone; he reaches the surface thinking that he must be off course, but tries again after ten more minutes of swimming and locates the place he's been looking for, almost directly beneath him. He attributes the error to miscalculating both the strength of

the currents, and his own physical condition, which he confesses to himself must have slipped a few notches while he wasn't paying attention. Not happy about that but aware that it's only inevitable for the years on a world without rejuvenation treatments to have taken their toll, he makes the necessary adjustments to his internal map and presses on.

He swims, rests, swims some more, descends now and then to see if he recognizes underwater landmarks, and just when he's begun to wonder if he's lost again, stops, because he sees a moving light in the distance.

It's a skimmer, about twice the size of the boy Squall's, slowing to a stop about two hundred meters away. It's an open cabin and its lights blink as they're occluded by something passing before it, no doubt a passenger changing seats. It could belong to any native of Greeve, but the natives are not particularly fond of night fishing, and those that are would have little reason to be following that vessel's course toward the vicinity of the Glass Cathedral. Given the time of night, the location, and the specific confluence of circumstances, Draiken is comfortable with the provisional conclusion that these are the people he's been looking for.

He's not comfortable with how early they have arrived. His mental clock estimates that he still has ninety minutes or so before local midnight; they would not be here this early unless they wanted to get here before him.

Of course, they're likely prepared to track vessels, the major reason he's gone to this much effort to approach this meet as a lone swimmer. From this perspective he can see just how many people answer his invitation.

It's also good that their lack of concern about lighting up the water as they go gives him a destination he can track from a distance.

He stops paddling and lets the current sweep him in a direction parallel to theirs, until it becomes clear to him that they've stopped. At that point he ducks beneath the water again and descends about ten meters, just to confirm that he can find the light source he seeks. He does see a glow, lighting up the dark water in that direction. It's a small matter to swim as far as he can toward that glow, to surface for a breath, then descend again and make another swim for the light.

He is still a fair distance when he has erased all doubt that his destination stands before him.

The Glass Cathedral is not made of glass, nor is a cathedral. The name is a compromise between accuracy and poetry, a wink to a time when an offworld entrepreneur tried to sell Greeve in general and Fritaun in particular as a tropical paradise where the Confederacy's wealthy might want to vacation or build homes.

The venture failed because it was wrong-headed. The wealthy of the Universe don't want to live far from the centers of their power; they consolidate their little kingdoms and build their little paradises wherever that power is strongest. In an age when the privileged can engineer entire worlds to their specifications, Greeve is just too authentically undiscovered an Eden to be useful.

This had not stopped the misguided developers from making a number of small, welcome contributions to Fritaun's infrastructure, including a luxurious bungalow that never knew a paying client and is now occupied by the first families to claim it as squatter; and improvements to the sewage system that did wonders for the cleanliness of the waters immediately off-shore. No longer would clay pipes vulnerable to the region's many storms dump the region's effluent just offshore where any shift of currents could bring it back home so often that the locals had no recourse other than getting used to it; now a nanite scrubbing system that would have broken what little discretionary income the people here possessed compressed all waste to its most basic elements in a fraction of the time, a service that the wealthy would have appreciated had they ever deigned to come here and make use of it.

The Glass Cathedral is the most grandiose of the white elephants. It's a permanent bell-shaped structure standing on a trio of supports anchored thirty meters below the ocean surface, its only purpose the maintenance of a comfortable, enclosed lounge that visitors can use to survey the surrounding reef at their leisure. The locals have taken apart and scavenged all the furnishings, leaving the room bare. But the air recycling system still works years later and so nobody who bothers to swim down past the glass windows and enter

the chamber through its moon pool needs to worry about suffocation by CO₂ buildup.

It's a place where people could go if they wanted, except that there's no earthly reason but idle curiosity to motivate them. None of the locals are interested in the place. They have their own lives to live and see no point in a structure that offers nothing but an opportunity to gawk at what they can see every day. It's a whimsy, built for rich people and impractical for anybody who might actually have to make a living.

The only reason Draiken has never claimed the place as a permanent home is that he prefers to move about from one bolt-hole to another, never staying in the same place more than three nights in a row. Some of the other places he stays are outer islands, too low in the water to be considered fit for human habitation, but safe enough at low tide; more often, he lives on his launch or underwater in inflatable habitats that he anchors to the ocean floor and moves from one location to another in order to avoid the unacceptable risk of a fixed address. But the Glass Cathedral is still an old friend, useful in the current circumstances in that it's isolated, offers a three-hundred-and-sixty-degree view of the surrounding water, and is known by name to the locals. The white-haired man, whoever he is, would not have had any trouble finding a local willing to tell him how to get here.

Draiken surfaces, then half-swims, half-drifts as close to the structure as he dares, close enough to hear the voices of the men in the launch roll over the water, toward him. It seems that they're having a heated argument of some kind, and he doesn't need to risk swimming close enough to be detected in order to know what the substance of it might be. He knows what it would be if he were among them, himself. Somebody's saying that they're early. Somebody else is saying that this is an unacceptable risk. Somebody's suggesting that this might be a trap—in short, all the usual things. Draiken could lip-synch it, if the inclination struck. The most heated disagreements would no doubt have to be about security: to wit, whether it would be acceptable to leave their negotiator alone in the Cathedral, where anything could happen; or whether those who have raised the objections have any smarter suggestions.

Draiken will not glean any useful intelligence listening to any of it, and the longer he stays here, the more he risks the possibility that these men have instruments capable of detecting a warm-blooded body in the water.

So he takes a deep breath and swims down, past the bell-shape of the cathedral, past the long metal legs anchoring it to the ocean floor, past the deepest point that even he is usually willing to swim, where he can feel the pressure pounding on his ear . . . and to a certain underwater structure he knows about, which is anchored at the structure's base.

The Glass Cathedral is powered by ocean currents but puts the necessary machinery out of the way in order to avoid marring the simple beauty of the structure above. What Draiken approaches now is a closet-sized maintenance shed, complete with tiny airlock and a cramped cabin large enough for one man.

Few people talk about the shed. There's no reason to. It's utilitarian, functional, wholly unspectacular; it's been pretty much forgotten. But there have been times over the years when the instinctive need to drop out of sight for a while led Draiken to spend days at a time here, out-waiting offworld threats that might or might not have been figments of his imagination.

He suffers a frisson of apprehension when the wheel gear refuses to turn, because descending to this depth has taken so much of his hoarded breath that he's not sure he has enough left to make it back to some source of air before he passes out.

But then the door slides into the ocean floor and he is able to enter the little airlock in time to close it behind him and purge the water.

Breath, when it comes, comes in a gasp.

He is aware that once upon a time, not so many years ago, he was able to make it down to this chamber and inside the habitat in relative ease, with much more time to spare before spots started flickering at the edges of his vision. Once upon a time, not so many years ago, if he'd run into trouble with the wheel gear, he would have still felt comfortable with his chances of returning to the surface, or at least the Cathedral, alive.

It might be that the long swim, much more than even he's used to, has taken more out of him than he expected.

But the simpler and more reasonable explanation gnaws at him.

Old, old man.

The inner door opens with no difficulty. Draiken steps aside into a warm and humid place, lined on one side with cabinets and drawers and protruding machinery, and on the other side by a workstation with a monitor providing real-time updates of local weather and water conditions. On the far end there's a small bathroom. He enters this now and uses the heat lamp to dry himself off as best he can. Then he returns to the main chamber.

There's enough floor space in here for a man to lie down and sleep, though the floor is hard and more like the accoutrement of a jail cell than the perversely pleasant two-room apartment Draiken was provided during his time in custody. The inflatable mattress Draiken used when he stayed here regularly is gone, which disturbs him because he's not sure whether he took it with him the last time he was here or left it to be scavenged by somebody else. It doesn't matter. After the day he has had, the swim he has just completed, he wants nothing more than to sleep for eight or ten hours. He knows that he can afford maybe twenty or thirty minutes at most, and after a moment of fumbling at the workstation, succeeds in setting an alarm.

Once he lies down, unconsciousness comes almost immediately.

He dreams of another room with no windows.

Draiken sits immobile in his chair, a device at his neck canceling all autonomous nerve function and thus reducing him to temporary quadriplegic. It is better than chains in that being turned off in this manner does him no lasting damage as ropes or chains might, but he is so half-maddened by the stress of his own immobility that sweat pours from his temples in rivulets. He would almost, but not quite, sell his soul to scratch the errant itch at the tip of his nose.

The room is cylindrical, with a ceiling so high above the floor-mounted lights that it might as well be the night sky. The lamps around the periphery amplify the shadow of the man who paces before Draiken in circles. He's not quite as fat as he will become by the time he journeys to Greeve, but even at this

moment from a lifetime ago he's a soft figure, tending toward the round; with cheeks already beginning their sad transformation into jowls.

It took Draiken no time at all to peg him as the worst kind of man to ever be given power over another: the kind whose inadequacies have pursued him his entire life. The fat man was a disappointment to his parents, a target in the playground, a sweaty non-entity to any women he might have half-heartedly tried to impress. His distastefulness has likely impeded his rise in his own organization as well. He will never be a leader. He will always be the man who facilitates the decisions of leaders, the man who always stands one step behind and one step down, waiting for the orders to be passed down from on high.

He resents this and is thus a perfect candidate for torturer.

He has never demanded information. He's wheedled.

Draiken in turn has been a most unsatisfactory interview subject, in part because he has no intention of cooperating and in part because even if he wanted to the questions are meaningless; he has no agenda, he's running no game, he has no hidden masters he can betray; even if he wanted to talk there's nothing he could say.

The man he will one day know as Janus says, "Would you like to know the one thing that puzzles me, my friend?"

Draiken says, "I am not your friend, and I am certain that any number of things puzzle you."

"I am puzzled by your refusal to lie."

"That's interesting. I thought you were after the truth."

"Oh, I am, I am. But the key motivation guiding a prisoner's conduct during an enhanced interrogation such as this has classically always been the cessation of pain. Faced with a question he cannot answer, either because he does not actually possess the information or more likely possesses an overwhelming duty to withhold it, any prisoner in a situation like yours will usually seek other means of relief . . . which will often be concocting some fable believable enough to simulate cooperation." He assumes a falsetto. "Yes, Captain, I do think I remember the man you're talking about. He had brown eyes, a

droopy mustache, and a wooden leg. He gave the orders. You should send all your men out to go looking for him now. See? I'm cooperating. With a fiction, of course. But cooperating. And yet, you haven't tried that tactic at all. Why not?"

The imprisoned Draiken chuckles. "Two reasons."

"Oh?"

"First, I know the torture playbook."

"And what would that say?"

"It says that any answer I give you, true or false, will always be assumed to be false until you obtain independent verification. Until then, you will press harder, with ever more extreme methods, on the theory that the truth can be found in the careless liar's tendency to contradict himself." He offers his tormentor a sardonic nod. "I am not a careless liar. I am in fact an excellent one. I have been trained by the best. But that just means your assumption that I will contradict myself eventually will only encourage you to do whatever you can to break me. Therefore no lie, and no truth, will ever make my situation better in this room. Telling you anything can only make my situation worse."

There is no smile from the man he will someday know as Janus. "And your second reason?"

"Exists as a direct result of the first. If respecting your power over me presents no concrete advantage over defying you, then your power over me is imaginary and defying you is the only option that makes sense."

The man Draiken will someday know as Janus responds with a nod: simple, honest, unsurprised, not at all the gesture of a torturer thrown off his stride. "That is excellent reasoning, my friend. I applaud every word of it. You do recognize, of course, that it has a corollary in my own behavior."

"Of course it does," Draiken replies. "If you obtain the same total lack of results whether you break me or not, then you have no reason not to attempt to break me as long as you're here."

The other man nods. "As long as we understand each other, then. My mission is to break you for the sake of breaking you. I will be back this time tomorrow."

He exits. Or Draiken can only assume he exits. It is hard to tell. What happens is, he

strides out of Draiken's proscribed field of vision, and a few seconds later a door slams somewhere in the part of the room that Draiken cannot see. One by one the lights at the base of the curved walls click off, ceding their territory to darkness until the last one goes and Draiken is abandoned to yet another night of anticipating what new angle of attack they might take with him tomorrow.

This is the terrible moment that he realizes: He's losing.

Draiken awakes ahead of the alarm, gasping, one hand clutching his chest. It takes him long seconds to recall where he is and how he ended up here, but once he does he mutters a soft obscenity, more out of self-loathing than any other reason.

Once upon a time he dreamed of that room so often that he endangered his health by avoiding sleep for days on end. Here on Greeve, the dream has been at most an occasional annoyance, the periodic reminder of a life that he has tried to escape. It must have been a year or more since the last time he closed his eyes and found himself returned to that room, but being forced back into old ways of thinking has clearly taken its toll.

He is too old for this.

It would be nice to have a week to prepare.

It would be nicer to not have to do this at all.

But the catnap has been beneficial well out of proportion to its length. His mind feels clearer, his confidence in his wits restored to something close to their current peak efficiency.

He will need to confirm that his stage has been properly set.

He rises and takes his place at the workstation, cycling through monitor functions until he activates a holo of the Glass Cathedral interior. What pops into view is the familiar circular room, defined by the central moon pool and the transparent walls now as black as the night beyond them. A white-haired figure clad in wet suit sits cross-legged by the pool, wearing the special contradictory expression of the simultaneously alert and skeptical. He has followed instructions and has come alone. His companions must be one short distress signal away, but for the moment at least he is alone, and on Draiken's ground.

He is nobody Draiken recognizes.

That is unexpected. Draiken can summon many faces from the old days, the largest number of them from his time in custody. But the face in the monitor is a stranger. Of course, he might still turn out to be someone Draiken knows; the worlds beyond Greeve possess any number of techniques capable of turning an old man into a young one, or a notorious set of features into a more anonymous one. But Draiken's instincts continue to insist: no such explanation applies here. He has never met this man. This man is too young to have been one of the tormentors from his past life. He is someone new, an unknown quantity.

This does make sense.

It has been many years.

Draiken drums his fingertips of the console, considering how this affects things, and after a while decides that it changes nothing.

It is his nature to ask the questions, to demand the answers.

He stands. Flexes. Regards the airlock door as a nauseated man would regard a plate of food he's been assured he must eat, then leaves the little chamber and enters the airlock.

Thirty seconds later he is again deep underwater, kicking his way toward the glittering bubble at the base of the Glass Cathedral.

He breaks surface at the center of the moon pool, by happenstance facing a direction where the white-haired man is not within his field of vision, but then he turns in the water and spots him.

Discounting any hypothetical rejuvenation treatments, the white-haired man cannot be older than forty. He has a smooth, chiseled face missing any of the scars left by time, and a forehead that has yet to develop even the first of its wrinkle lines. He seems genial enough, though his penetrating gaze is that of a man who cannot quite figure out the species of the creature he beholds.

He speaks in the refined accent of New London, the diplomatic hub of the Hom.Sap Confederacy. "I must say, I had my friends on the surface keeping an eye out for some kind of boat. Did you *actually* swim here under your own power? That's remarkable. I commend you, sir."

Draiken doesn't bother to answer him. He hauls himself out of the water, keeping the

pool between himself and the white-haired man. He half-expects to be attacked at this, his most vulnerable moment, but the other man keeps his distance and allows him to choose his position on the chess board undisturbed.

They stand as approximate equals with the comforting barrier of moon pool between them.

Several seconds pass in silence as the slight incline of the floor toward the pool channels the water dripping from Draiken's body into rivulets, returning to the sea where they belong.

Then white-haired man shrugs and turns his attention toward the ocean of black on the other side of the glass. "This structure is also remarkable, sir. Pointless, of course, but remarkable; a true curiosity, left over from some age when the project must have made some kind of sense, to somebody. Now, of course, not one of the briefings I received about this place even bothered to mention it. It certainly leads a restless mind to wonder: just how many artifacts once considered vital but now entirely useless remain from times where the forces in power once believed in them. Perhaps you are familiar with the phenomenon, sir?"

Draiken doesn't provide that the dignity of an answer.

The white-haired man sighs, turns away from the glass, and spreads his arms, palms outward. "Do you have the disk?"

Draiken doesn't answer that either.

The white-haired man doesn't even look annoyed. "Very well. You issued the invitation. You can go first."

Draiken says, "Who are you?"

"My name would not be useful to you. You may call me Brent for the purposes of this conversation."

Draiken resolves to not call him Brent. "Who do you work for?"

"That's none of your business."

"The fat man, the one traveling under the name Grade . . ."

"He's none of your business either."

"I'll be the judge of that."

The other man responds with a kind smile. "All right."

"Do you work for him, or for somebody else?"

"Also: none of your business."

"Why?"

"Because, as far as we could determine in the limited time we've had, you're just a local fisherman. Our business with him really does have nothing to do with you."

"Persuade me of that."

Brent brings his fist up to his lips, and clears his throat at length. "I'm not certain what I could say that you would find adequate."

"Try."

"Very well. It's clear from your behavior that you're somebody from his past."

"And?"

"It took the work of an hour to establish that the locals call you John. You're no stranger to the people of Fritaun, but no close friend. Nobody we spoke to knows your last name, but nobody seems to care. They consider you a harmless eccentric and assert that you've been here, fishing these waters, for at least thirty years. This places you well outside any period my people are interested in."

"You sent your men to attack me."

"My men acted on their own initiative."

"Why?"

"They had no problem with you taking Mr. Grade to the prostitute, or even with you leaving him there in what we presume to be a drugged state. Lying drugged under the protection of a whore is not out of character for him, after all."

Draiken growls. "Watch how you speak about her."

"As you wish. They were, in any event, willing to let whatever business you have with him pass without interruption. But then they saw you enter and leave Mr. Grade's hotel room in his absence. They suspected you of taking something that belongs to him, and considered intervention prudent."

"What would you say if I told you I suspected Grade of coming to this world to look for me?"

"Whoever you are: I would consider you demented."

"Again: persuade me."

The man he cannot bring himself to think of as Brent sighs. "Who could you possibly be, John? Some ancient terrorist or war criminal who's been keeping his head down for a lifetime? Some intelligence professional who's outlived any possible secret he might still have, rattling his head? At the very most grandiose

extreme, some deposed head of state hiding from imaginary assassins? Think about it. What conceivable past could render you even remotely relevant to anybody still in power at this late date?"

"We were contemporaries, he and I. And here you are, tracking him."

"You might have been contemporaries once, John. Decades ago, before you came to this planet, your path crossed his, and the two of you had business together. Maybe you fought together, and maybe you fought each other; maybe both. Maybe you once shared secrets you consider cataclysmic. But he clearly lasted in his line of work longer than you did. Whatever the circumstances of your own exit, he hung on until about ten years ago . . . and I don't mind telling you that he was regarded a sad old has-been even then. He has nothing that could possibly interest anybody of importance . . . and that means you must have even less."

It is taking everything Draiken has to avoid trembling with rage. "Why are *you* here, then?"

"To fulfill the most boring of all possible purposes, John. Think about it: whatever we can say about how he ended it, he still served with distinction, and retired with honor. When a man like him decides to change residences, even if it's just to disappear in some out-of-the-way hole like Fritaun to drink and whore himself into oblivion . . . there are always a couple of us sticking around just long enough to make sure he's safe, and settled in comfortably. It's a retirement benefit. Nothing more."

Draiken is accustomed to being lied to. He's been manipulated, cheated, drugged, brutalized into believing things that weren't true, and more. His bullshit detector has never been flawless. But there have also been times, in his life, when the truth was presented to him and the perspective it offered was so undeniable that it landed like a nearby burst of thunder.

This is one of those times.

Whether he likes it or not, he's been freed.

And he's also been told that he's no longer relevant to the world he fled.

He's not sure that the comfort of one is worth the insult of the other.

He turns away and faces the dark water through the panoramic glass on his side of the

moon pool. It is impossible to make out any of the life he knows to fill these waters, but he is aware that there is an entire complex ecosystem, that continues to thrive regardless of the secrets and struggles of men. It is oblivious to anything that goes on inside the Cathedral. After a few seconds, he says, "At one point in the old days Grade ran a kind of . . . penal colony . . ."

"Yes," the other man says, with sudden interest. "Is that where you knew him from? Were you one of his inmates?"

Draiken ignores the question. "Does it still exist?"

"I'm obliged to tell you that the answer's none of your business, but you clearly do have a proprietary interest, so I'll share this much. No, John. That particular place no longer exists. It was no longer considered useful, so it was decommissioned. If you made a pilgrimage to the site where it stood, you would find nothing but ruins."

"Was it rebuilt somewhere else?"

The white-haired man spreads his arms again. "You know I can't confirm or deny. But I'm sure you can guess. The world moves on. It figures out different ways of dealing with its problems. It refines some techniques and discards others. All in all, John, depending on where you draw the lines, the answers are wherever you want them to be. But there's no reason for them to involve you any more. Once you return Grade's stolen property, this can end."

"You won't look for me," Draiken says.

"No reason," the white-haired man replies. "You've been contained."

That is perhaps the worst thing the white-haired man could have said to him.

But he must admit to himself it rings true.

So he removes the disk from his belt and tosses it across the moon pool, where the white-haired man snatches it from the air.

Draiken says: "If I ever see you again, this will not end the same way."

"That is true," the white-haired man replies, "but perhaps not in the way you imagine. Good luck, sir."

"Go to hell," Draiken replies. "Sir."

He dives into the moon pool and begins paddling downward. He is aware that this is the most dangerous moment; if the white-haired man has a trap planned, it will be

sprung now, with the disk retrieved and all possible intelligence mined. Even as the black waters close over him again, he fully expects to find himself surrounded by divers, brought down by a dart, drowning in a net. Indeed, as he heads straight down, toward the shed where he intends on waiting out the next few days in silence, he thinks he sees a terrible shape draw close enough to eclipse the entire world, and he feels a great relief descend upon him, with the thought that he has not made a fool of himself by imagining himself surrounded by danger, that the forces he has never been able to trust proved trustworthy after all, by betraying him exactly as he always expected to be betrayed.

But the shape, more sensed than seen, continues to glide on past, and he belatedly recognizes it what it is: a bladderfish, essentially a big gas-filled balloon, big and round and mindless and no good for any purpose human beings know: not as food and not as bait and not even as a threat to be avoided.

It is the illusion of danger, nothing more.

It is, he realizes decades too late, the very life he has lived on Greeve, personified by a creature with the brains of a sponge.

He is still figuring out just how he feels about that when he finds himself bathed in blinding light from above.

He peers over his shoulder and sees two divers in mesh re-breathing suits, likely the same two men he waylaid in Fritaun, descending toward him in heavy gear. Their lamps, mounted atop their helmets, pierce him in cones of light.

He has lost. They have an unlimited supply of air. He only has a pair of exceptional lungs. They have what amounts to armor. He only has flesh tanned to leather by the tropical sun. They have light capable of cutting through the deep water; he has darkness, which they have taken from him. They have weapons he can only guess at: he only had the stealth that, he now realizes, they were always prepared for and which they can only see as the asset overestimated by one naïve old man. If they want to drag him back to the white-haired man for more questioning, or even back to whatever torture facility the forces in power have erected in place of the hellhole he once escaped, there is nothing he can do to fight them. His freedom, his fate, is in their hands.

There is no point in trying to out-swim them. Even if he gets to the shed before they do, the most that would accomplish is place a locked door between him and them. They will be able to starve him out, or worse, seal him in.

He can only wait for them as they paddle toward him, and with whatever breath remains in him throw what will likely be an ineffectual punch or two, to demonstrate what defiance he can still afford.

The two men descend to his depth and right themselves. Both carry flechette guns. One also carries an opaque plastiseal sack. They smile at him through their masks, though there seems no particular malice in it. The one with the sack unclips it from his belt and offers it to him, indicating with a nod that he should take it.

Draiken has no choice, so he takes the sack from the diver's hand. It is not very heavy. Whatever it contains is about the size of his fist.

The diver points downward, smiles again, and with his partner begins his ascent.

Draiken does not have the time or the inclination to chase them for answers. The encounter has eaten up too much time. The need to breathe is burning in him. If he's to get back inside the shed, and what passes for safety, he has to start making up time now.

So he goes, with the sack tied at his belt.

It is a near thing.

But once he is past the airlock and inside the little room so much smaller than any cell where he has ever been held against his will, once he has dried off in the bathroom and once he has brought his breathing back to normal, he regards the parcel with apprehension.

He doesn't think it's a bomb. He doesn't think it's anything that can present any physical threat to him.

But he knows that whatever it is must be meant to destroy him.

He should discard it and forget it exists.

But in his old life he was tasked with ferreting out secrets. He is constitutionally incapable of abandoning one, no matter how malignant in potential, to the darkness and silence.

He must know.

So he opens the sack and looks inside.

Five days later, he breaks surface in the waters near the Glass Cathedral, physically re-

signed to the swim that, because of the countervailing currents he will have to fight, will not take him back to the launch or to Fritaun, but to one of the lesser islands in the same island chain.

When he gets to where he's going, he will have to rest up and embark on a series of shorter swims, from one outcropping of land to another, until he can get back to Fritaun and with luck a ride back to the reef where he anchored his launch. As a result, he has more than one reason to feel relief when he pops his head above water to blink in the first sunlight he has seen in several days and hears a familiar skimmer, sitting idle about twenty meters, power up when its pilot spots him.

It's the boy Squall, looking bored as he greets Draiken with the friendly derision even the best of the young traditionally have for the old. "Is long-time, greybeard. Kenned I could have waited here another five-day, six-day, waiting on your raisined flesh."

"Good to see you, too," Draiken says, as he climbs aboard. "How did you know I was here?"

"The Pinkies spilled afore they flit. Took the fat one wif 'em. Paid fine coin for me to wait for ye."

Draiken freezes. "And?"

"Give ye ride, wherever. Course yours. Considered it favor to save ye from drowning cramps. Why? That rude?"

Draiken is half-tempted to say yes, that the offer of a ride paid for by his enemies is neither wanted nor appreciated, but the truth is that his limbs ached for days after his return to the shed, and that he feels his age more than he ever has before. Besides, it would be an insult to the boy, who has never been anything but a loyal friend. So he sighs, "No. That's fine. You can take me to my launch, if it's still there."

Squall adjusts the saddle for an extra passenger. Draiken gives the boy directions, and they're off.

It is a pleasant ride. For the first time in years, Draiken looks on the world around him as something other than potential battlefield. He feels the salt spray on his face and the sun on his back and the razor sharp line of the horizon, and he thinks of all the decades he spent with these things reduced to relative background noise. He thinks of

the years before that when his life was a series of feints and countermoves, attacks and defenses. He cannot say he misses it, and he cannot say that for all he did in those years, that the world he knows has become one iota safer.

They are almost halfway back to his launch when Draiken is moved to ask: "Squall?"

"Ee, Greybeard?"

"Are you happy here?"

"Where here?"

"Here." He includes the world in an expansive wave. "This world. Greeve."

"What not to be happy?" the boy inquires.

"Sun, fish, friends, and full belly."

"Have you never considered going anywhere else? Seeing the greater universe outside Fritaun?"

The boy considers that, pausing just long enough to howl as he leaps his skimmer off a choice wave.

Then he replies, in toto:

"Done no real good for ye, greybeard."

Draiken's launch has survived the last week intact. He performs an extensive search to determine whether its contents have been disturbed or if any tracers or listening devices have been installed. But as far as he can tell, everything is exactly where it was when he left it. He thanks the boy and sets course for Fritaun, unsurprised how hard his heart now pounds in his chest.

Once in town, he goes to the public shower and scrubs a week's worth of sweat and salt from his skin. He then goes to a clothier he knows, who agrees to discard his ancient fisherman's rags when he walks out with a respectable suit bought off the rack: far from a perfect fit, but he does not have the time or the patience for custom tailoring. It is enough to put aside the man he has been for too many years and claim a man of an entirely different sort.

His next stop is the set of stairs heading up to Aletha's balcony.

He arrives just as her most recent customer leaves, wearing the guilty look some men cannot suppress when they leave the workplace of women like Aletha. He says nothing to the man, and the man says nothing to him. A few seconds pass before Aletha steps out, looking so fresh and collected in her beauty that she

might have spent the last two hours arranging every hair to achieve the look. She offers her well-dressed next visitor a professional smile before performing a quite comical double-take.

She embraces him. "John! They told me you were all right when they left you, but I didn't dare to believe them!"

He doesn't return her kiss. "Hello, love."

"Are you . . . upset at me? They didn't give me any choice, over giving up the fat man. They were armed. There was nothing I could—"

He does kiss her then, but on the forehead, a fatherly buss that has nothing to do with passion. "I'm not upset with you, love. Not for surrendering to superior forces, or returning to your trade in my absence. I have no claim on you there, and I don't look down on you for it. Seeing you well makes me happy. But I would like to speak with you for a few minutes, if I may."

"All right," she says, uncertain around him in a way that he's never seen before. "Inside?"

They enter her bedroom. Her little two-tailed native pet, familiar with her routine, jumps off the bed and scurries for a hiding place. But Draiken stops just past the threshold, and Aletha is halfway across the room before she realizes that he is no longer following.

Her hand jumps to her throat, clutching a little bell she wears on a ribbon around her neck. "Something *is* wrong. I've never seen you so cold."

"Not cold," he murmurs. "Resigned."

"What?"

"I must know, love. Did the fat man say anything else before they took him?"

"Nothing that he didn't also say in your presence."

"I remember one point he made, before your drugs took effect: that you and I could love each other."

She swallows. "Yes."

"He was right, I think. I even think he was trying to be kind. I think . . . declaring myself would not be a bad thing. He was right. It would not be difficult for me to love you."

She gestures at his fine clothes. "Is that why you're dressed the way you are? To court me?"

"I am very sorry to say no. I'm dressed for travel. As soon as we're done here I'll be headed

north to the main island . . . where I'll be seeking passage offworld. You'll likely never see me again. But you shouldn't think you meant nothing to me." He reaches into his jacket pocket and removes a small black cube, which he turns over in his hand before placing it on her vanity. "They gave me this before they left."

He taps the cube as he sets it down and it projects the three-dimensional image of his own face, as it looked when he was a younger man. The lines are gone from his cheeks, the gray is gone from his hair, and the expression of the rotating head in the projection is not that of a man long-defeated but a man ready to face any challenge that confronts him.

Aletha says, "What is this? A goodbye gift?"

"I'm not such an egotist that I think you would have a place for it. It's not why I'm showing it to you."

"Then I don't understand."

"They brought this with them," he tells her. "From the very start, they already knew who I am and where I was hiding. They came prepared with this, in case they ever needed to confront me with that knowledge. In the end, they gave it to me—after first doing everything they could to persuade me, really persuade me, that they had no idea who I was."

"But, why . . ."

"I don't know. It could have been cruelty, but I've had days alone to think it over—days that tortured me, Aletha—and I now believe that it was something far worse: mercy. I think they knew that if they just continued to pretend that they didn't know or care who I was, I might have spent the rest of my life here wondering if they would ever realize their mistake and come back. So instead they brought an old holo of mine from their files and handed it to me at the moment when it would have been easiest for them to kill me, or retake me, if they wanted. It was their way of saying, see? It is true what we said. Nobody wants to come after you. Nobody wants to take you prisoner. Nobody wants any secrets you might still have in your head. You're no longer anybody's business. You're free."

Aletha's lips part, form an attempt at a response, then close again without making a sound. It is only with her second attempt

that words emerge. "But I don't understand. Isn't that a good thing? Isn't that a reason to stay?"

"It's a very good thing," he says. "And if I were a different man, I'd be content with that and be able to move on to the rest of my life."

Anger flares in her eyes. "Then why don't you? What the hell's wrong with you, that you would use this as an excuse to throw away what you can have?"

He suddenly feels very, very tired. He casts about for a chair, sees one at her vanity, and lowers himself into it, for the moment looking like he feels each of his years weighing upon his back. "When they had me, years ago . . . I told them they would never break me. I told them that I'd never belong to them. I told them I would never give up on being a free man."

"But you have that now!"

For the first time he raises his voice to her. "*I reject the implication that they ever had the right to hand it to me, like a treat to a tamed dog.*"

Her eyes widen as she takes that in, and then something new appears there: pity. Just by being a woman, she knows all the secrets of this man whose life has been all about holding on to his secrets, and she knows them without any of the extreme measures his old enemies once resorted to, when they defined the problem as an exercise in breaking the unbreakable. "I never would have expected it from you, John. That's nothing but stupid male pride."

"It's not my only reason. They must still be up to the same things they were up to when they had me, and they should not be allowed to continue. But yes, love, pride does enter to it. My life has always been about dignity."

He stands, hesitates, spreads his arms in acknowledgment that there's nothing left to say, and turns to leave.

She stops him. "This is crazy, John. What do you even think you're going to do?"

He faces her again, and looks both trapped and unleashed, at the very same time.

"I'm going to find them," he says. "I'm going to outfit myself and I'm going to go wherever I have to go to find every single last one of them, and I'm going to teach them the price of declaring a free man . . . irrelevant." ■

Every once in a while, SF invents something that escapes the confines of our genre to take over the world. One sterling example is steampunk.

Very broadly, steampunk involves real or imagined nineteenth-century technology married with retro-Victorian culture, whether in an alternate universe (past, present, or future) or in a projected future.

The modern steampunk movement traces its origins to the works of SF writers James Blaylock (*Homunculus*, 1986; *Lord Kelvin's Machine*, 1992), K. W. Jeter (*Morlock Night*, 1979; *Infernal Devices*, 1987), and Tim Powers (*The Anubis Gates*, 1983). The term "steampunk" was famously coined by Jeter in a 1985 letter to *Locus*.

As is often the case, once the genre was identified and named, earlier examples were found. These included *Queen Victoria's Bomb* by Ronald W. Clark (1967), Michael Moorcock's Oswald Bastable series (beginning with *The Warlord of the Air*, 1971), and Harry Harrison's *Tunnel Through the Deep*s (serialized in *Analog* in 1972 as *A Transatlantic Tunnel, Hurrah!*). The steampunk aesthetic appeared even earlier onscreen, in movies such as *20,000 Leagues Under the Sea* (1954), *The Time Machine* (1960), *Master of the World* (1961), *First Men in the Moon* (1964), and *Time After Time* (1979), and on television in *The Wild, Wild West* (1965). Various visual incarnations of Sherlock Holmes also exemplified a similar look and feel.

Some critics attempt to trace steampunk back to H. G. Wells, Jules Verne, or even Mary Shelley, which misses the entire point: steampunk depends on viewing the technology and culture of the Victorian era through the sensibilities of today.

Steampunk gained popularity in the 1990s. Besides the books of Blaylock and Jeter, important steampunk works included *Howl's Moving Castle* by Diana Wynne Jones (1986), the roleplaying game *Space 1889* (1988), *The Difference Engine* by William Gibson and Bruce Sterling (1990), Paul Di Filippo's *The Steampunk Trilogy* (1995), *The Diamond Age* by Neal Stephenson (1995), and Alan Moore and Kevin O'Neill's comic series *The League of Extraordinary Gentlemen* (beginning in 1999).

After the turn of the century, steampunk exploded. Among the seminal works of the aughts are *Perdido Street Station* (China Miéville, 2001), Philip Reeves's *Mortal Engines* (2001), *Girl Genius* by Phil & Katya Foglio (beginning in 2001), *Mainspring* by Jay Lake (2007), Cherie Priest's *Boneshaker* (2009), the *Leviathan* trilogy by Scott Westerfield (2009 and later), and Chris Wooding's *Retribution Falls* and sequels (2009 and later). The torrent of steampunk has continued this decade, with far too many titles to list.

Some significant anthologies have featured steampunk stories, notably *Extraordinary Engines* (edited by Nick Gevers, 2008), *Steampunk and Steampunk II* (Ann & Jeff VanderMeer, 2008 and 2010), *The Mammoth Book of Steampunk* (Sean Wallace, 2012), *SteamPowered* and *SteamPowered II* (JoSelle Vanderhooft, 2011), and *Steampunk!* (Kelly Link & Gavin J. Grant, 2012).

Since its emergence as a distinct genre, steampunk has become tremendously popular. It has transcended SF and fantasy to become a popular culture movement, reaching into the worlds of art, architecture, fashion, music, film, gaming, and even lifestyle. Steampunk conventions are regularly held in all parts of the world, and steampunk is

regularly included in pop culture events from San Diego Comic Con to Renaissance Faires and Festivals.

Steampunk has even developed its own subgenres: dieselpunk, clockworkpunk, gaslight romance, postapocalyptic steampunk, and many others.

There are myriad theories about why steampunk is so popular. They range from the simple (it's a fashion that's kind to all body types; gears and airships are cool) to the sublime (today's technology leaves us alienated and starved for the straightforward tech of the past; like our own age, the Victorian era was a period of rapid social change and culture shock). There's an undeniable appeal to steampunk's intricate, baroque machinery and social rules.

For *Analog* readers, I think a large part of the attraction is that steampunk is all about tinkering with things: gears and valves, historical events and personalities, cultural assumptions. We love to ask questions, explore alternate possibilities, and read about worlds and people who share our inclinations. It's why we read science fiction, and I believe it's a big reason many of us fancy steampunk.

The Iron Assassin

Ed Greenwood

Tor, 304 pages, \$25.99 (hardcover)

iBooks, Kindle, Nook: \$12.99 (ebook)

ISBN: 978-0-76533846-4

Genre: Alternate History, Steampunk

The Iron Assassin is set in an alternate Victorian era, an industrial civilization based on steam and clockwork in which airships run on regular schedules and the throne is held by Queen Victoria III, an elderly woman kept alive by a steam-powered heart and lungs. London, overpopulated and choked with smoke, is the capital of the far-flung Empire of the Lion; the city is also menaced by the dastardly secret organization known as the Ancient Order of the Tentacles.

Jack Straker, Lord Tempest, is a nobleman and inventor. He comes before a group of high-power lords to reveal his latest invention, a weapon that he hopes will defend the throne and serve as a prototype for the empire's protection.

Straker's invention, the Iron Assassin, is a new type of agent: created by reanimating the corpse of a dead chimneysweep and enhancing his strength and vitality with intricate clockwork. If the lords approve, Straker intends for the Iron Assassin to serve Frederick, the Crown Prince, who is known and feared throughout the empire as the Lord Lion.

In the wake of an attack on the Lord Lion by the Order of Tentacles, it becomes apparent that the Iron Assassin is far more independent than Straker intended. In addition, it seems that the chimneysweep who became the Assassin wasn't nearly as innocent as Straker believed.

As he goes off to confront the evil agents of the Tentacles, Straker doesn't know for sure if the Assassin's defects make it an uncontrollable monster or the Crown's best defender.

Ed Greenwood is best known for his work in fantasy and gaming, particularly as part of the *Forgotten Realms* franchise. He's a fine storyteller, and *The Iron Assassin* is a tongue-in-cheek combination of Sherlock Holmes, James Bond, and Frankenstein. The action's nonstop, the characters are fun, and the setting is compelling. The heroes—which include both men and women—are dashing and resourceful; the villains (again, of both genders) are satisfyingly ruthless and dastardly. There are double agents, codenames, secret hideouts, chases, cliffhangers, betrayals, kidnappings, and everything else you'd expect from an adrenaline-fueled espionage thriller.

This one is definitely a lot of fun.

A Bodyguard of Lies

Raymund Eich

CV-2, 289 pages, \$16.99 (trade paperback)

iBooks, Kindle, Nook: \$6.99 (ebook)

ISBN: 978-0-69233838-4

Series: Confederated Worlds 3

Genre: Military SF, Psychological/Sociological SF

In the universe of Raymund Eich's *Confederated Worlds*, politics reigns supreme.

After a thousand years of human expansion through terraformed worlds across space, Earth has withdrawn into virtual reality isolation. Three opposing governments—the Confederated Worlds, the Unity, and the

Progressive Republic—struggle to link scattered human worlds with artificial wormholes. Where their interests overlap, they fight.

In the first book, *Take the Shilling*, Tomas Neumann left his backwater planet to serve the Confederated Worlds. The military implanted in his brain all the skills he needed to be a ruthless soldier . . . but the trauma of war and the psychological scars were something he had to deal with himself.

In book two, *Operation Iago*, Neumann and his demoralized platoon arrived on the planet Arden. After a stunning loss to the Progressive Republic, the peace treaty allowed Arden to choose whether to remain with the Confederated Worlds or join the Republic. Neumann and his command countered shadowy, deceptive forces that not only threatened his side's interests on Arden, but the survival of the Confederated Worlds itself.

Now Neumann and his friends are on the planet Challenger, the capital of the Confederated Worlds, in the middle of the election campaign for the next president. When he attends a rally for candidate Roderick Forrester, he manages to be in the right place to foil an assassination attempt.

When Forrester wins, Neumann finds himself assigned to protect the new president. All at once, he's embroiled in a mix of politics, surveillance, spies, and assassins. There are conspiracies aplenty, and as Neumann pursues the truth, he moves between the palaces of the ultra-rich and hidden basements where the secret police scan the brains of suspects. Someone is working toward the destruction of the Confederated Worlds—but can he find out who it is, and manage to stop them before he runs out of time?

The Confederated Worlds milieu is unusual among military science fiction for its concentration on the psychology and politics of societies in conflict. As much espionage thriller as military adventure, *A Bodyguard of Lies* tells the story of an earnest yet very human man doing his best to salvage what good he can from the wreckage of war. I'm reminded of Poul Anderson's Dominic Flandry series, or more recently, Kristine Kathryn Rusch's Anniversary Day saga.

* * *

Going Solo

Alan Tucker

MAD Design, 227 pages, \$3.99 (Kindle ebook)

ISBN: 978-0-9885047-5-2

Series: Tales of Uncertainty 3

Genre: Adventure SF, Artificial Intelligence, Parallel Worlds, Teen SF, Time Travel

Orphan Darius "Dare" Heisenberg is a great-great nephew of the famous scientist. A nineteen-year-old dropout, Dare was recruited by the Keepers of Time, an organization of aliens who work to repair damage to the alternate timestreams (called threads) that comprise the multiverse. Aiding Dare are an assortment of helpers including his boss, Sacrifice; Kim, a friendly yet intimidating artificial intelligence; and various members of the pahsahni race, interstellar refugees.

In the first book, *Knot in Time*, Dare dealt with an agent from the far future. When Mars was invaded by hostile aliens, the agent came back to the present in an attempt to prevent the invasion—which caused further complications in the threads of time. With the help of his fellow Keepers agents, Dare was able to rescue future Mars without causing irreparable damage.

Abandon Hope, the second title, involved Dare and his friends with parallel worlds, various duplicate versions of themselves, and the growing suspicion that there's more to the Keepers of Time than meets the eye.

Following the events of the previous book, *Going Solo* opens with a new mission for Dare and his friends. Kim, the artificial intelligence that serves the Keepers, was left fractured and underpowered. If the Keepers are to have any hope of untangling the knotted threads of time, Kim's brain core must be reunited with the neutron star that serves as her body. But first, Dare has to navigate a brand-new time machine to a Martian warehouse full of dangerous experiments in order to pick up some anti-matter. What could possibly go wrong?

Of course, things *do* go wrong, and before long Dare's down a rabbit hole of alternate universes and menacing aliens, with only his wits to get him out.

Like the best teen books by the like of Andre Norton and Robert A. Heinlein, *Going*

Solo and its predecessor volumes have plenty to appeal to adults. Well-conceived aliens, time travel, cheeky AIs, breathless adventure . . . what's not to like? You need no sophisticated justification to read these books—they're just plain *fun*.

Undercity

Catherine Asaro

Baen, 292 pages, \$15.00 (trade paperback)

iBooks, Kindle, Nook: \$8.99 (ebook)

ISBN: 978-1-4767-3692-1

Series: Skolian Empire: Major Bhaajan 1

Genre: SF Mystery

Catherine Asaro's Skolian Empire is vast both in space and time, encompassing scores of planets and thousands of years of history. It all centers on the planet Raylicon, the ancient capital of the Ruby Empire and future capital of the Skolian Empire.

On the shores of the Vanished Sea on Raylicon sits the City of Cries. Bhaajan, a child of the slums, escaped the City of Cries and Raylicon when she was fifteen, enlisting in the military. Now retired, Bhaajan is a private investigator. And her newest case brings her back to the City of Cries to investigate the disappearance of a nobleman.

The House of Majda is royalty, living at the apex of the Empire's society. Majda's enigmatic princes are always secluded, hidden away from the world. Except now, Prince Dayj has gone missing. Run away or kidnapped, he must be recovered quickly and with complete discretion.

Bhaajan's investigations take her into the Undercity, the slums in which she was raised and thought she'd left forever. Among the canals and aqueducts, teenage gangs run rampant, and criminals are everywhere. But something's changed since Bhaajan's childhood—adults are at war with one another, and the gangs, which used to care for younger children, now neglect them.

Amid famine and unrest, Bhaajan uncovers evidence of a plot that threatens the Undercity and, ultimately, the entire empire. And the key may be with a man Bhaajan left behind a lifetime ago. . . .

Not only is *Undercity* a cracking good read, it's an excellent introduction to the Skolian Empire for those who haven't read any of

the previous books. Bhaajan is strong and competent yet fully sympathetic; her personal journey unfolds in perfect time with the larger story of the Undercity and its destiny. Although this book comes to a satisfactory conclusion, it's the first of a series of adventures for Bhaajan.

Tales of Time and Space

Allen Steele

Fantastic Books, 242 pages, \$14.99 (trade paperback)

ISBN: 978-1-62755-634-7

Genre: Short Fiction Collection

Allen Steele is probably the archetypal *Analog* writer who's appeared least in *Analog*. Although he's no stranger to these pages, you're more likely to find his stories in our sister magazine. But make no mistake, he's one of us: he generally writes the kind of science-based, extrapolative tales that we all enjoy.

Tales of Time and Space brings together an even dozen of Steele's stories, and each one is a delight.

Take, for instance, "Martian Blood." It's an alternate-world story of a visit to a native village on the Mars that existed in science fiction before *Mariner* and all those other space probes ruined the planet.

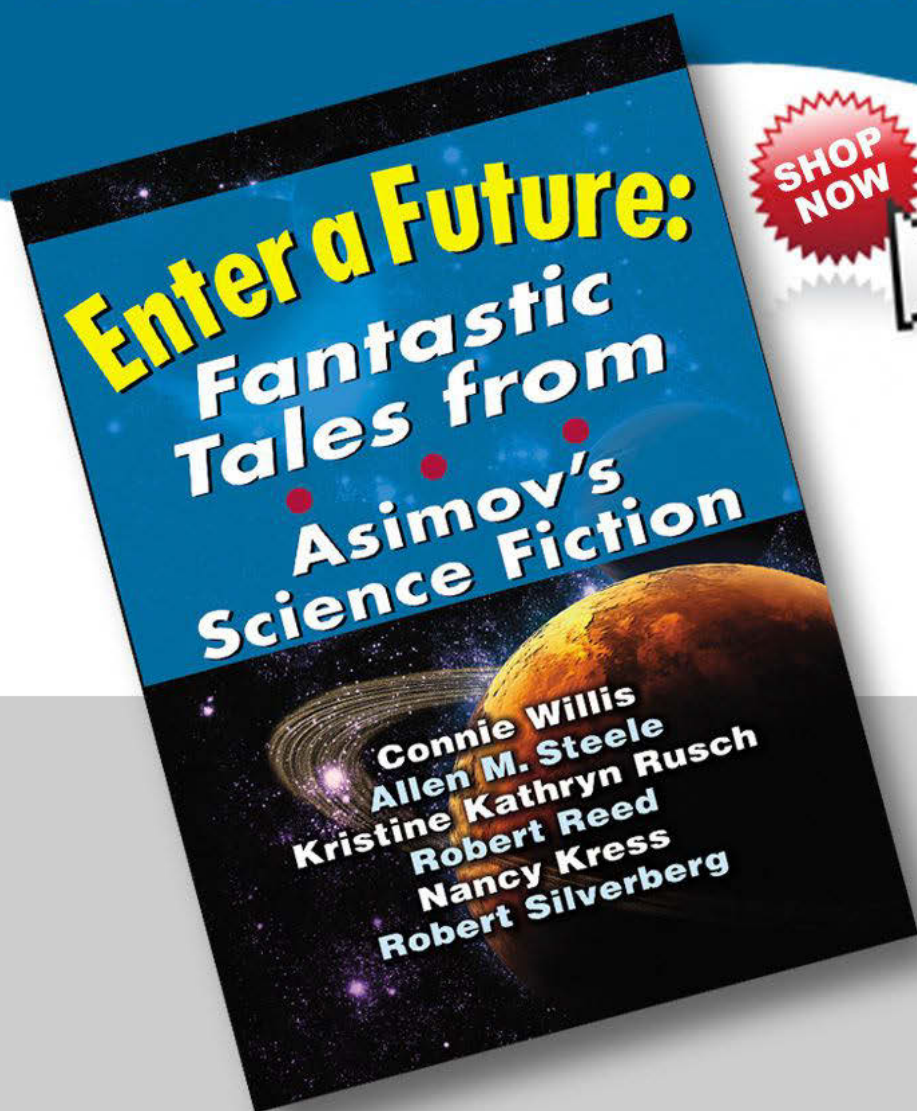
"The Big Whale" is a hilarious mash-up of Herman Melville and pulp detective stories, while "The Jekyll Island Horror" is an homage to the pulp writers of the 1930s. "The Observation Post" is a cautionary tale about meeting time travelers.

Steele's two major SF series aren't neglected: this volume contains two stories set in the Coyote universe and no fewer than four from his Near Space universe. A personal introduction to the volume, along with individual introductions to each story, round out the package.

I see by the wordcount on my steam-powered analytical engine that my space is up, so I'll bid you a fond farewell until next time.

Don Sakers is the author of *Children of the Eighth Day* and *Meat and Machine*. For more information, visit www.scattered-worlds.com. ■

GET YOURS TODAY!



Only on Amazon.com!

Asimov's is famous for captivating stories and richly rewarding tales by some of today's *best-known SF writers*. Whether they're a jazz musician on a starship, the spirit of H.L. Mencken tangling with a twenty-first century medium, or the new personality of a wayward teenager trying to stake a claim on a body that is and sort of isn't hers, they must all find their way in uncharted territory. Join them on their journey. Turn the electronic page and enter a future!

Dear Mr. Quachri:

Thank you, a thousand times over, for including Stanley Schmidt's wonderful article "Hiding the Info-dump or: Feeding Information Without Choking the Reader" [April 2015]. With the plethora of self-published SF and techno books now being published due to the ease with which this can be accomplished, I have noticed a very alarming trend of really badly written info-dumps even among the works of some highly successful and highly lauded authors and some who have made the best-seller lists. (Contrary to what one might suspect, there appears to be little correlation between the quality of info-dump inclusion and having higher standards for typos and grammatical errors! On that very subject, I recently found and highlighted well over 150 typos and grammatical errors in a new book from a very successful self-publishing author of SF.) As a reader of *Analog* for over half a century I have grown to truly appreciate the editorial hand guiding me to stories that are, in general, a cut above in the art of writing. As a voracious reader, I will not pretend to have any disdain for the ready availability of thousands of titles to read on my Kindle and other devices, but this requires risk tolerance on the part of the reader, and one has to wade through a lot of dreck to find the gems, even when utilizing reader and other critical reviews. (As a side note, *Analog* is now the only magazine to which I subscribe that I receive in print form. I can no longer pretend, for the sake of appearances, to be solidly in the camp of those who insist a printed book is inherently [or innately—choose your preferred adjective] superior to a digitized book. Thus, holding on to a print subscription to *Analog* is not a protest so much as it is nostalgia. I suppose that, when I finally upgrade to a portable reading device with a color screen and can still experience the cover art, I might finally give up my print subscription. Maybe.) Never fearing to be outspoken, I have pointedly written to a number of authors whose works I like, but which suffer from some of the sins of bad info-dumps, pointing them to Dr. Schmidt's article.

I hope they will heed some of the excellent advice to be found within it.

Adrian A. Durlester
Southington, CT

Dear Sir:

I enjoyed Schmidt's article, "Hiding the Info-Dump," but I question whether we ought to hide our info-dumps because the "English-literature community" objects to them. I think most in that community would agree that info-dumps are bad and that *Moby Dick* is one of the greatest American novels of all time. That's interesting, since a significant proportion of *Moby Dick* is info-dumps on technical aspects of nineteenth-century whaling.

SF might be better off if we ignored the hypocrites and wrote a little more like Melville.

Jeffrey R. Carter
Mesa, AZ

Dear Editor,

I did enjoy "Partible" by K. J. Zimring [April 2015]. Nicely written and good conceptual usage of near future bioscience. Except for the repeated and consistent use of the term "emigration" in place of the correct "immigration" to denote the process and even the governmental institution for foreigners moving into another country. Somewhere, your editorial processes seem to have hit a linguistic or cultural bump.

I have been an *Analog* subscriber in excess of fifty years and been annoyed occasionally by poor understanding of scientific principles. But the stuff generally considered as proof-reading was always done satisfactorily. You should not make silly mistakes like this.

Wolfgang Gunther
West Chester, PA

Well, you're not wrong, in the sense that from the point of view of the US, incoming unaccompanied minors are considered "immigrants," and so there are a number of places in the story where we could have gone with that, but didn't. However, you seem to believe that "emigrant" is just a typo or Britishism. Not so. Immigration and

emigration are two separate (but similar) things. "Foreigners moving into another country" is immigration from the point of view of the new county, but "emigration" from the point of view of the originating country. And, for the person making the transition, it can be either or both, depending on their frame of reference at the time.

Dear Editors,

A human can't easily be a solar autotroph ("Karma Among the Cloud Kings," March 2015, and also "Elysia, Elysium," November 2014).

A two-thousand-calorie-per-day adult needs roughly eight mega-joules per day. A nude person lying in noonday equatorial sunlight might have eight hundred watts of solar irradiance (at 1000W/m^2 and roughly $.8\text{ m}^2$ of exposed skin). You'd need to sunbathe for roughly three hours—assuming 100% efficiency. At 10% efficiency (real photosynthesis is less than that), they'd need thirty hours per day of sunbathing.

And then there are vitamins, amino acids, all the other things our cells have forgotten how to produce. Chloroplasts produce carbohydrates, not fats or amino acids.

You'd need some pretty fancy cellular biochemistry enhancements, plus some massive solar collector structure to make it work.

Steve Briggs
Champaign, IL

Thanks for the calculation. That's the main reason I've resisted any depiction of humans (or human-analogues) receiving nutrition solely from sunlight. In the case of "Elysia, Elysium," for example, the first modified generation still has to eat. We probably could have gone with a lower amount with energy gained by the second generation in that case, but there's always going to be some extrapolation in SF.

Dear Editor:

I wanted to actually address two things in Don Sakers' Reference Library column. The first one is from his September 2014 column where he mentions the controversy over romantic SF. It seemed that he was talking about only males that were against female characters in SF, though I could be mistaken. However, as a female, I have to agree with those readers who "vociferously" object to romantic SF because of the "girly" stuff he mentions. I find

that having female characters in SF doesn't mean that it has to be romantic, and in fact, "girly" characters spoil the story for me, as the last thing I want is a story with a character who is portrayed as weak, whiny, and needing protection. Stories that have strong, independent, intelligent, females who are able to defend themselves are exactly what we need to combat the stereotypical "female" portrayal. I don't think that they need to act "male" unless that is the only way to describe being tough, independent, intelligent, and resourceful. I was raised by a mom who was an attorney from the 1960s on, and who taught me that I should go through life being a human and to focus on my career, hobbies, interests, etc., to be taken seriously as an athlete, or physical therapist, or martial artist—but never focus on being a "female" athlete or martial artist. Competency was not solely the attribute of men, but rather anyone who put their effort into it.

I get irritated when I see a movie, TV show, or book with the female character screaming or crying over petty little things so that the male character can rescue her. That to me is the thing we need to avoid. So, I get that there are men who want their women—whether characters or real—to stay in their own little sphere, but I don't have an issue with wanting them to act like "men," if by that we mean the aforementioned characteristics.

Secondly, Mr. Sakers' column from December 2014 (and this could possibly have occurred in other months) contained glaring mistakes to me. I like his intros to the column, but since he is writing about books, and the books and his column should be grammatically correct, he needs to watch his pronouns. For example, in his review of *The Time Traveler's Almanac* he writes in the sixth paragraph that "It's hard to imagine that any reader (singular) who likes time travel . . ." and then continues in the next sentence, "You don't have to tell them (plural) . . ." He does this again in the next paragraph with "friend" and "them" in the same sentence. I realize there are people who dislike using the masculine pronoun "he/him" when referring to a generic person, but I think that it is better to choose either "him/he" or "her/she," and stick with it. Just my two cents. Thanks for reading my letter and keep up the interesting intros.

Kip Freytag ■

UPCOMING EVENTS Anthony Lewis

NOTE: Membership rates and other details often change after we have gone to press. In addition, most conventions have age-based membership rates in advance and at the door. There also may be rates for single days. Check the websites for the most recent information.

25–28 June 2015

LEPRECON 41 (Phoenix area SF conference) at Embassy Suites Phoenix North, Phoenix, AZ. Guests of Honor: Ken Kelly, Larry Hama, Jennifer Brozek, Camille and Kennerly—the Harp Twins. Info: leprecon.org.

26–28 June 2015

SOONERCON 22 (Oklahoma City area specific conference) at Reed Conference Center & Sheraton Hotel, Midwest City, OK. Literary Guest of Honor: Elizabeth Moon; Artist Guest of Honor: Lubov; YA Guest of Honor: Rachel Caine; TM: Selina Rosen; MC: Peter Pixie; Featured Guests: Robert Picardo & Jamie Marchi. Info: www.soonercon.com; info@soonercon.com, SoonerCon Syndicate, 1848 Hemingway Drive, Edmond, Ok 73013.

2–5 July 2015

CONVERGENCE 2015 (Bloomington MN area SF/Fsy/Media conference) at DoubleTree by Hilton Hotel, Bloomington, MN 55439. Guests of Honor: Wesley Chu, Nicole Dubuc, Chad Frey, Charlotte Fullerton, LeeHarris, Jennifer Ouelette, Gordon Smuder, Toni Weisskopf, Bryan Thao Worra. Info: <http://www.convergence-con.org/>; +1.612.234.2845; Convergence Events, Inc. 1121 Jackson St NE 106 Minneapolis MN 55413.

2–5 July 2015

WESTERCON 68 (West coast science fantasy conference) in conjunction with Conjecture 13 and Conchord 27 at Marriott City Creek, San Diego CA. Author Guest of Honor: Spider

Robinson; Artist Guest of Honor: John Picacio; Fan Guest of Honor: Seanan McGuire; Special Guest: William Nolan; Conjecture Guest of Honor: Steven Brust; Conchord Guests of Honor: Vixy & Tony; Interfilk Guests: Morva Bowman & Alan Pollard. Info: <http://www.westercon68.org/>; info@westercon68.org; Westercon 68, PO Box 927388, San Diego, CA 92192-7388.

24–26 July 2015

CONFLUENCE 2015 (Pittsburgh area SF conference) at Doubletree by Hilton Cranberry, Pittsburgh PA. Guest of Honor: Joan Slonczewski; Featured Filk Guest: Brooke Abbey; Special Guest: Roberta Rogow. Info: <http://parsec-sff.org/confluence/>; confluence@parsec-sff.org

19–23 August 2015

SASQUAN (73rd World Science Fiction Convention) at Spokane Convention Center, Spokane, WA. Guests of Honor: Brad Foster, David Gerrold, Vonda N. McIntyre, Tom Smith, Leslie Turek. Membership: currently. Attending \$170 (adult), \$90 (young adult 17–21), \$70 (child 6–16), \$40. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Nominate and vote for the Hugos. Info: sasquan.org/; info@sasquan.org; 15127 Main Street East, Suite 104, PMB 208, Sumner WA 98390.

28–30 August 2015

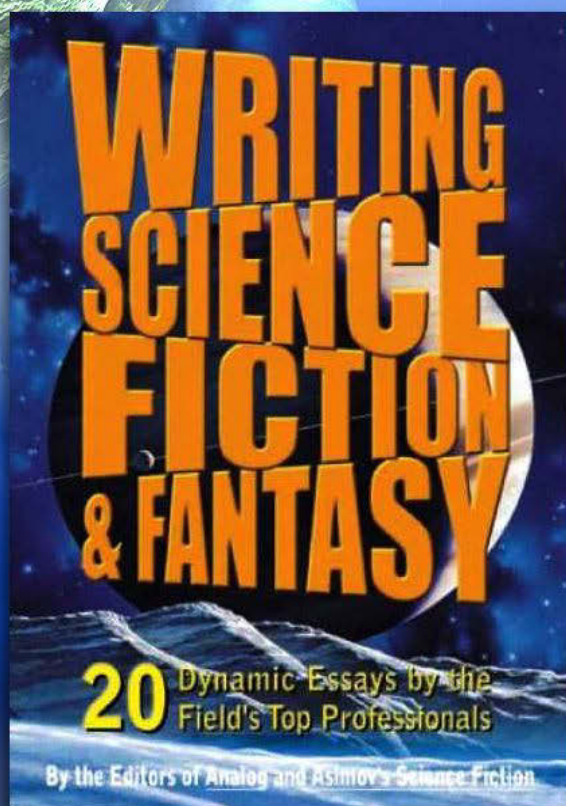
BUBONICON 47 (Albuquerque area SF conference) at Albuquerque Marriott Uptown, Albuquerque NM. Theme: Women of Wonder. Guests of Honor: Tamora Pierce & Catherynne M. Valente; TM: Mary Robinette Kowal; Guest Artist: Ruth Sanderson. Info: <http://bubonicon.com/>; Bubonicon Inc, 933 San Mateo Blvd NE, Suite 500-208, Albuquerque, NM 87108. ■

From the editors of *Asimov's* and *Analog Science Fiction*

Practical writing advice for writers of all levels...

**BUY YOUR
COPY TODAY!**

[CLICK HERE](#)



Explore the Universe!

Visit www.analogsf.com
&
www.asimovs.com

Home of the world's leading
Science Fiction magazines



Log on and enjoy:

Award-nominated stories
from the genre's leading authors



Excerpts of current stories



SF news and events



Book reviews

Asimov's
SCIENCE FICTION

ANALOG
SCIENCE FICTION AND FACT